Texas Commission on Environmental Quality
Instructions and Procedural Information
for Filing a Permit Application for a
Hazardous Waste Storage, Processing, or Disposal Facility

Part A

[**Form Availability**: This form, as well as other Industrial and Hazardous Waste documents, is available on the Internet World Wide Web, Waste Management home page at address http://www.tceq.texas.gov/permitting/waste_permits/waste_mgmt.html]

General Instructions

1. A person (individual, corporation or other legal entity) who stores, processes or disposes of hazardous waste (except where such storage and/or processing is excluded from permit requirements in accordance with 30 Texas Administrative Code (TAC) Section 335.2) must obtain a permit pursuant to the Texas Health and Safety Code. In applying to the Texas Commission on Environmental Quality, hereafter referred to as the Commission, the applicant shall follow the procedures outlined below, on the application and in the Rules of the Commission.

2. The application (one original plus three (3) complete copies[1]) should be mailed to:

   Texas Commission on Environmental Quality
   Attention: Waste Permits Division, MC126
   P. O. Box 13087
   Austin, Texas 78711-3087

3. Signature on Application [30 TAC 305.44]. The application shall be signed by the owner and operator or by a duly authorized agent, employee, officer, or representative of the owner or operator and shall be verified before a notary public. When another person signs on behalf of the owner and operator, this person's title or relationship to the owner or operator should be shown. In all cases, the person signing the form should be authorized to do so by the owner or operator (the Commission may require a person signing on behalf of an owner or operator to provide proof of authorization). An application submitted for a corporation must be signed by (or the signatory must be authorized by) a responsible corporate officer such as a president, secretary, treasurer, vice-president, or designated manager; or for a partnership or sole proprietorship, by a general partner or the proprietor, respectively. In the case of a municipal, state, federal, or other public facility, the application shall be signed by either a principal executive officer or ranking elected official.

4. An application will not be processed until all information required to properly evaluate the application has been obtained. When an application is severely lacking in detail and/or the applicant fails to submit additionally requested information in a timely manner, the application

[1] The third copy may optionally consist of paper copies of all plans and maps and a computer diskette of the remaining document. The document should be formatted in Word processing software up to and including version 6.1 or a 100% compatible format. Files may be compressed using PKZIP Ver. 2 or a 100% compatible program.

will not be considered to be "filed in accordance with the rules and regulations of the Commission."

Please submit any application revisions with a revised date and page numbers at the bottom of the page(s).

5. Fees and Costs

   a. The fee for filing an application is discussed in Section XI of Part B, form number TCEQ-0376.

   b. The applicant for a permit is required to bear the cost of publication of notice of the application in a newspaper as prescribed by 30 TAC Section 39.5(g).

6. A person may not commence operation of a hazardous waste management facility until the Commission has issued a permit to authorize the storage, processing, or disposal of hazardous waste, except with the approval of the Commission.

7. Designation of Material as Confidential

   The designation of material as confidential is frequently carried to excess. The Commission has a responsibility to provide a copy of each application to other review agencies and to interested persons upon request and to safeguard confidential material from becoming public knowledge. Thus, the Commission requests that the applicant (1) be prudent in the designation of material as confidential and (2) submit such material only when it might be essential to the staff in their development of a recommendation.

   The Commission suggests that the applicant **NOT** submit confidential information as part of the permit application. However, if this cannot be avoided, the confidential information should be described in non-confidential terms throughout the application, and submitted as a document or binder, and conspicuously marked "CONFIDENTIAL."

   Reasons of confidentiality include the concept of trade secrecy and other related legal concepts which give a business the right to preserve confidentiality of business information to obtain or retain advantages from its right in the information. This includes authorizations under 18 U.S.C. 1905 and special rules cited in 40 CFR Chapter I, Part 2, Subpart B.

   Section 361.037 of the Texas Health and Safety Code does not allow an applicant for an industrial and hazardous waste permit to claim as confidential any record pertaining to the characteristics of the industrial solid waste.

   The applicant may elect to withdraw any confidential material submitted with the application. However, the permit cannot be issued, amended, or modified if the application is incomplete.

Part II

Procedural Information

After the submittal of Parts A and B of the application, the TCEQ will provide public notice of receipt of the application. The Executive Director's staff will review the application for completeness of information submitted. During the review, the applicant may be contacted for clarification or additional information. When all pertinent information is present, the application or a summary of its contents will be forwarded for review by other state agencies and local governmental entities interested in water quality control and solid waste management. After technical evaluation, opportunity for public hearing will be afforded.

Note that for facilities which had "commenced on-site storage, processing, or disposal of hazardous waste" [see 30 TAC Section 335.43(b)] on or before the date such waste is identified or listed as hazardous by EPA, the Texas Health and Safety Code provides in Section 361.082(f) that these facilities may continue to manage hazardous waste until such time as the Commission approves or denies the application, provided that the applicant has filed the permit application in accordance with the rules and regulations of the Commission.

The Commission may act upon an application for a permit, permit amendment, permit modification, or renewal of a permit without the necessity of holding a public hearing:

1. (a) When notice of the application has been mailed to persons possibly affected by the proposed permit; and

   (b) When notice has been published at least once in a newspaper regularly published or circulated within each county where the proposed facility is located; and

   (c) Within forty-five (45) days following publication of the Commission's notice, a Commissioner, the Executive Director or an affected person has not requested a public hearing; or

2. For a Class 1 or a Class 2 permit modification or a minor amendment to a permit. The Commission may, in certain cases, hold a public hearing for a Class 2 permit modification or a minor amendment.

A public hearing may be scheduled on an application for a RCRA hazardous waste permit when requested by a Commissioner, the Executive Director, or an affected person within forty-five (45) days following the newspaper publication.

Requirements of Giving Notice of the Application:

1. By the Applicant: Every applicant for a permit, permit amendment, permit modification, or permit renewal shall publish notice (see note below) of the application at least once in a newspaper regularly published or circulated within each county where the proposed facility is located. Where a public hearing has been requested, notice will be mailed to the applicant in ample time for publication, which shall be not less than thirty (30) days prior to the date set for the hearing. Except in the case of a notice of a permit modification request, the Commission will mail the appropriate notice and instructions for publication to the applicant.

NOTE: Additional publication and direct mail notice to affected persons will result if a public hearing is requested following newspaper publication of the notice of application. The cost of providing this additionally required publication and service of notice to affected persons will be assumed by the applicant.

2. By the Texas Commission on Environmental Quality: The Commission will mail notice of the application (except for permit modifications) to affected persons and certain governmental entities. The notice will be mailed at the same time instructions for newspaper publications are mailed to the applicant.

3. Bilingual Notice Instructions:

   For certain permit applications, public notice in an alternate language is required. If an elementary school or middle school nearest to the facility offers a bilingual program, notice may be required to be published in an alternative language. The Texas Education Code, upon which the TCEQ alternative language notice requirements are based, requires a bilingual education program for an entire school district should the requisite alternative language speaking student population exist. However, there may not be any bilingual-speaking students at a particular school within a district which is required to offer the bilingual education program. For this reason, the requirement to publish notice in an alternative language is triggered if the nearest elementary or middle school, as part of a larger school district, is required to make a bilingual education program available to qualifying students and either the school has students enrolled at such a program on-site, or has students who attend such a program at another location to satisfy the school's obligation to provide such a program.

   If it is determined that a bilingual notice is required, the applicant is responsible for ensuring that the publication in the alternate language is complete and accurate in that language. Electronic versions of the Spanish template examples are available from the TCEQ to help the applicant complete the publication in the alternative language.

Bilingual Notice Application Form:

Bilingual notice confirmation for this application:

1. Is the school district of the elementary or middle school nearest to the facility required by the Texas Education Code to have a bilingual program? ☒YES ☐ NO

   (**If NO**, alternative language notice publication not required)

2. **If YES** to question 1, are students enrolled in a bilingual education program at either the elementary school or the middle school nearest to the facility? ☒ YES ☐ NO

   (**If YES** to questions 1 and 2, alternative language publication is required; **If NO** to question 2, then consider the next question)

3. **If YES** to question 1, are there students enrolled at either the elementary school or the middle school nearest to the facility who attend a bilingual education program at another location?

   ☐ YES ☐ NO

(**If Yes** to questions 1 and 3, alternative language publication is required; **If NO** to question 3, then consider the next question)

4. **If YES** to question 1, would either the elementary school or the middle school nearest to the facility be required to provide a bilingual education program but for the fact that it secured a waiver from this requirement, as available under 19 TAC §89.1205(g)? ☐ YES ☐ NO

   (**If Yes** to questions 1 and 4, alternative language publication is required; **If NO** to question 4, alternative language notice publication not required)

   If a bilingual education program(s) is provided by either the elementary school or the middle school nearest to the facility, which language(s) is required by the bilingual program?
   Spanish

Consideration of the Permit Application by the Commission:

The applicant will be notified by the Commission when the application is set for final consideration. If the Commission issues the permit, the applicant will be mailed a copy of the permit by the TCEQ Office of the Chief Clerk within one (1) month following Commission approval. (NOTE: Only one copy is mailed to the applicant and that copy will be sent to the official mailing address of the applicant as shown on the permit application form.)

Texas Commission on Environmental Quality
Permit Application for a Hazardous Waste Storage/Processing/Disposal Facility
Part A - Facility Background Information

I. General Information

A. Facility Name: Union Pacific Railroad Company Houston Wood Preserving Works
(Individual, Corporation, or Other Legal Entity Name)

B. TCEQ Solid Waste Registration No: 31547 EPA I.D. No. TXD000820266

Street Address (If Available): 4910 Liberty Road

City: Houston , State TX Zip Code 77026

County Harris

Telephone Number: 414-267-4164 Charter Number 800725939

If the application is submitted on behalf of a corporation, please identify the Charter Number as recorded with the Office of the Secretary of State for Texas.

C. Facility Contact

1. List those persons or firms who will act as primary contact for the applicant during the processing of the permit application. Also indicate the capacity in which each person may represent the applicant (engineering, legal, etc.). The person listed first will be the primary recipient of correspondence regarding this application. Include the complete mailing addresses and phone numbers.

Kevin Peterburs
Manager, Environmental Site Remediation
Union Pacific Railroad Company
4823 N 119th Street
Milwaukee, WI 53225
Phone: 414-267-4164
kjpeterb@up.com

2. If the application is submitted by a corporation or by a person residing out of state, the applicant must register an Agent in Service or Agent of Service with the Texas Secretary of State's office and provide a complete mailing address for the agent. The agent must be a Texas resident.

C T Corporation System
1999 Bryan Street, Suite 900
Dallas, TX 75201-3136
Phone: 214-979-1172

D. Operator[1]: Identify the entity who will conduct facility operations.

Operator Name Union Pacific Railroad Company

Address: 1400 Douglas St., STOP 1030

City: Omaha State NE Zip Code 68179

Telephone Number: 402-544-5000 Charter Number NA

E. Owner

1. Indicate the ownership status of the facility:

   a. Private X

      (1) X Corporation
      (2) _____ Partnership
      (3) _____ Proprietorship
      (4) _____ Non-profit organization

   b. Public _____

      (1) _____ Federal
      (2) _____ Military
      (3) _____ State
      (4) _____ Regional
      (5) _____ County
      (6) _____ Municipal
      (7) _____ Other (specify)

2. Does the operator own the facility units and facility property?

   ☒ Yes ☐ No

   If you checked "no",

   a. Submit as "Attachment A" a copy of the lease for use of or the option to buy said facility units and/or facility property, as appropriate; and

   b. Identify the facility units' owner(s) and/or facility property owner(s). Please note that the owner(s) is/are required to sign the application on page 5.

Owner Name Union Pacific Railroad Company

Address: 1400 Douglas St., STOP 1030

[1] The operator has the duty to submit an application if the facility is owned by one person and operated by another [30 TAC 305.43(b)]. The permit will specify the operator and the owner who is listed on this application [Section 361.087 Texas Health and Safety Code].

City: Omaha State: NE Zip Code: 68179

Telephone Number: 402-544-5000

F. Type of Application Submittal:

Initial _____ or Revision ___X____

G. Registration and Permit Information

Indicate (by listing the permit number(s) in the right-hand column below) all existing or pending State and/or Federal permits or construction approvals which pertain to pollution control or industrial solid waste management activities conducted by your plant or at your location. Complete each blank by entering the *permit number*, or the *date of application*, or *"none"*.

	Relevant Program and/or Law	Permit No.	Agency*
1.	Texas Solid Waste Disposal Act	31547	TCEQ
2.	Wastewater disposal under the Texas Water Code	None	
3.	Underground injection under the Texas Water Code	None	
4.	Texas Clean Air Act	None	
5.	Texas Uranium Surface Mining & Reclamation Act	None	
6.	Texas Surface Coal Mining & Reclamation Act	None	
7.	Hazardous Waste Management program under the Resource Conservation and Recovery Act	50343	TCEQ
8.	UIC program under the Safe Drinking Water Act	None	
9.	TPDES program under the Clean Water Act	None	
10.	PSD program under the Clean Air Act	None	
11.	Nonattainment program under the Clean Air Act	None	

12. National Emission Standards for Hazardous Pollutants (NESHAP) Pre-construction approval under the Clean Air Act	None	
13. Ocean dumping permits under the Marine Protection Research and Sanctuaries Act	None	
14. Dredge or fill permits under section 404 of the Clean Water Act	None	
15. Other relevant environmental permits	None	

*Use the following acronyms for each agency as shown below:

TCEQ	= Texas Commission on Environmental Quality
TRC	= Texas Railroad Commission
TDH	= Texas Department of Health
TDA	= Texas Department of Agriculture
EPA	= U.S. Environmental Protection Agency
CORPS	= U.S. Army Corps of Engineers

H. Give a brief description of the nature of your business.

I. TCEQ Core Data Form

The TCEQ requires that a Core Data Form (Form 10400) be submitted on all incoming applications. For more information regarding the Core Data Form, call (512) 239-1575 or go to the TCEQ website at http://www.tceq.texas.gov/permitting/central_registry/guidance.html.

Signature Page

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Operator Signature: _____ Date: 2/2/2018

Name and Official Title (type or print): VP Safety + CSO

Operator Signature: _____ Date: _____

Name and Official Title (type or print): _____

Operator Signature: _____ Date: _____

Name and Official Title (type or print): _____

Owner Signature: _____ Date: _____

Name and Official Title (type or print): _____

To be completed by the operator if the application is signed by an authorized representative for the operator

I, _____ hereby designate _____
(operator) (authorized representative)
as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

Rodney D. Doerr
Printed or Typed Name of Operator or Principal Executive Officer

Signature

(Note: Application Must Bear Signature & Seal of Notary Public)

Subscribed and sworn to before me by the said _____ on this

2nd day of February, 2018.

My commission expires of the 3rd day of June, 2020

Notary Public in and for Douglas County, Texas ~~Texas~~ NEBRASKA

GENERAL NOTARY - State of Nebraska
TONY L. PAULSEN
My Comm. Exp. June 3, 2020

Signature Page

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Operator Signature: RM Grimaila Date: _____

Name and Official Title (type or print) Bob Grimaila, VP Safety

Operator Signature: _____ Date: _____

Name and Official Title (type or print) _____

Operator Signature: _____ Date: _____

Name and Official Title (type or print) _____

Operator Signature: _____ Date: _____

Name and Official Title (type or print) _____

To be completed by the operator if the application is signed by an authorized representative for the operator

I, _____ hereby designate _____
(operator) (authorized representative)
as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

_____
Printed or Typed Name of Operator or Principal Executive Officer

_____
Signature
(Note: Application Must Bear Signature & Seal of Notary Public)

Subscribed and sworn to before me by the said Bob Grimaila on this 16th day of January, 2015.

My commission expires of the 7 day of Dec., 2017

Julie A Zabrowski
Notary Public in and for Douglas County, Nebraska

GENERAL NOTARY - State of Nebraska
JULIE A. ZABROWSKI
My Comm. Exp. December 7, 2017

Signature Page

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Operator Signature: _____ Date: 11-13-2015

Name and Official Title (type or print) JOEL STRAFELDA GENERAL MANAGER ENVIRONMENTAL MANAGEMENT

Operator Signature: _____ Date: _____

Name and Official Title (type or print) _____

Operator Signature: _____ Date: _____

Name and Official Title (type or print) _____

Operator Signature: _____ Date: _____

Name and Official Title (type or print) _____

To be completed by the operator if the application is signed by an authorized representative for the operator

I, _____ (operator) hereby designate _____ (authorized representative) as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

_____
Printed or Typed Name of Operator or Principal Executive Officer

_____
Signature

(Note: Application Must Bear Signature & Seal of Notary Public)

Subscribed and sworn to before me by the said Joel Strafelda on this 13th day of November, 2015.

My commission expires of the 7th day of December, 2017

_____
Notary Public in and for Douglas County, Nebraska

GENERAL NOTARY - State of Nebraska
JULIE A. ZABROWSKI
My Comm. Exp. December 7, 2017

Signature Page

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Operator Signature: _____ Date: 11-13-2015

Name and Official Title (type or print) JOEL STRAFELDA GENERAL MANAGER ENVIRONMENTAL MANAGEMENT

Operator Signature: _____ Date: _____

Name and Official Title (type or print) _____

Operator Signature: _____ Date: _____

Name and Official Title (type or print) _____

Operator Signature: _____ Date: _____

Name and Official Title (type or print) _____

To be completed by the operator if the application is signed by an authorized representative for the operator

I, _____ hereby designate _____
(operator) (authorized representative)

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

_____
Printed or Typed Name of Operator or Principal Executive Officer

_____
Signature

(Note: Application Must Bear Signature & Seal of Notary Public)

Subscribed and sworn to before me by the said Joel Strafelda on this 13th day of November, 2015.

My commission expires of the 7th day of December, 2017

_____
Notary Public in and for Douglas County, Nebraska

GENERAL NOTARY - State of Nebraska
JULIE A. ZABROWSKI
My Comm. Exp. December 7, 2017

II. Facility Background Information

A. Location of Facility for which the application is submitted

1. Give a description of the location of the facility site with respect to known or easily identifiable landmarks.

The facility is located on the south side of Liberty Road between the intersections of Liberty and Lockwood Drive and Liberty and Waco Street, approximately one mile from the intersection of Interstate 10(I-10) and Waco Street.

2. Detail the access routes from the nearest U.S. or State Highway to the facility.

3. Enter the geographical coordinates of the facility:

Latitude: 29 deg 47 min 14 sec

Longitude: 95 deg 19 min 13 sec

4. Is the facility located on Indian lands?

☐ Yes ☒ No

B. Legal Description of Facility

Submit as "Attachment B" a legal description(s) of the tract or tracts of land upon which the waste management operations referred to in this permit application occur or will occur. Although a legal description is required, a metes and bounds description is not necessary for urban sites with appropriate "lot" description(s). A survey plat or facility plan drawing which shows the specific points referenced in the survey should also be included in Attachment B.

C. SIC Codes

List, in descending order of significance, the four digit standard industrial classification (SIC) codes which best describe your facility in terms of the principal products or services you produce or provide. Also, specify each classification in words. These classifications may differ from the SIC codes describing the operation generating the hazardous wastes.

4-digit SIC Code	Description
4011	Railroad – Line Haul Operating

SIC code numbers are descriptions which may be found in the Standard Industrial Classification Manual prepared by the Executive Officer of the President, Office of Management and Budget, which is available from the Government Printing Office, Washington, D.C. Use the current edition of the manual.

III. Wastes and Waste Management

A. Waste Generation and Management Activities

Is any hazardous waste [see Title 40, Code of Federal Regulations (CFR), Part 261] presently or proposed to be generated or received at your facility?

☒ Yes ☐ No

If no, go to Section III.B.2 below.

If yes, answer the following question.

1. Are you presently registered with TCEQ as a solid waste generator?

   ☒ Yes ☐ No ☐ Pending

   If no, contact the Industrial and Hazardous Waste Division of TCEQ in Austin, Texas to obtain registration information. Also, continue with the application form (go to Number 2 below).

   If yes, go to Section I of your TCEQ Notice of Registration, determine which of your wastes are hazardous, and list these wastes (and mixtures) in Table III-1 (see Number 2 below).

2. Complete Table III-1, Hazardous Wastes and Management Activities, below, listing all hazardous wastes, all mixtures containing any hazardous wastes, and hazardous debris which were, are presently, or are proposed to be handled at your facility in interim status or permitted units. (see 40 CFR 261 and 268.2), attaching additional copies as necessary.

   Guidelines for the Classification & Coding of Industrial Wastes and Hazardous Wastes, TCEQ publication RG-22, contains guidance on how to properly classify and code industrial waste and hazardous waste in accordance with 30 TAC 335.501-335.515 (Subchapter R).

   If you are not registered with TCEQ, enter "NA" for TCEQ Waste Code Number.

   For the EPA Hazardous Waste Numbers, see 40 CFR 261.20-33. For annual quantity, provide the amount in units of pounds (as generated and/or received) for each waste and/or waste mixture.

B. Waste Management Units Summary

1. For each waste and waste mixture listed in Table III-1 that is stored, processed, and/or disposed on-site (except where such storage and/or processing is excluded from permit requirements in accordance with Texas Administrative Code (TAC) Section 335), complete Table III-2, Hazardous Waste Management Unit Checklist, and enter the name of each hazardous waste management unit (Note: Please make copies of Table III-2 if necessary).

Give the design capacity of each hazardous waste management unit in any of the units of measure shown. In the case of inactive or closed units for which design details are unavailable, an estimate of the design capacity is sufficient.

Please provide a description for each waste management unit described in your own words on the line provided for "Waste Management Unit."

2. Has the applicant at any time conducted the on-site disposal of industrial solid waste now identified or listed as hazardous waste?

   ☒ Yes ☐ No

   If yes, complete Table III-2 indicating the hazardous waste management units which were once utilized at your plant site but are no longer in service (i.e., inactive or closed facility units).

   If no, and if no hazardous waste is presently or proposed to be stored [for longer than 90 days (see 30 TAC Section 335.69)], processed, or disposed of at your facility, then you need not file this permit application. Otherwise proceed with the application form.

3. Provide an estimate of the total weight (lbs) of hazardous waste material that has been disposed of and/or stored within your site boundaries and not removed to another site.

C. Location of Waste Management Units

1. Submit as "Attachment C" a drawn-to-scale topographic map (or other map if a topographic map is unavailable) extending one mile beyond the facility boundaries, depicting the following:

   a. The approximate boundaries of the facility (described in Section II.B) and within these boundaries, the location and boundaries of the areas occupied by each active, inactive, and proposed hazardous waste management unit (see Table III-2). Each depicted area should be labeled to identify the unit(s), unit status (i.e., active, inactive, or proposed), and areal size in acres.

   b. The overall facility and all surface intake and discharge structures;

   c. All on-site injection wells where liquids are injected underground;

   d. All known monitor wells and boreholes within the property boundaries of the facility; and

   e. All wells, springs, other surface water bodies, and drinking water wells listed in public records or otherwise known to the applicant within the map area and the purpose for which each water well is used (e.g., domestic, livestock, agricultural, industrial, etc.).

2. Submit as "Attachment D" photographs which clearly delineate all hazardous waste

management storage, processing, and disposal units, as well as sites of future storage, processing and disposal units.

D. Flow Diagram/Description

Show as "Attachment E" process flow diagrams and step-by-step word descriptions of the process flow, depicting the handling, collection, storage, processing, and/or disposal of each of the hazardous wastes previously listed in this application.

The flow diagrams or descriptions should include the following information:

1. Originating point of each waste and waste classification code;

2. Means of conveyance utilized in every step of the process flow;

3. Name and function of each facility component through which the waste passes;

4. The ultimate disposition of all wastes (if off-site, specify "off-site") and waste residues.

IV. Index Of Attachments

List and index below all attachments to this application and indicate if included or not included:

Item	Attachments	Attachment	Included	Not Included
I.D.2.a	Lease/Option to buy	A		X
II.B	Site legal description	B	X	
III.C.1	Facility boundaries and adjacent waters map	C	X	
III.C.2	Photographs	D	X	
III.D	Process flow diagram/description	E		X

Table III-1 Hazardous Wastes and Management Activities

Verbal Description of Waste	TCEQ Waste for Code and Classification Code	EPA Hazardous Waste Number	Storage[1] of Wastes Received from Off-Site	Processing[2] of Wastes Received from Off-Site	Disposal of Wastes Received from Off-Site	Storage[1] of Wastes Generated On-Site	Processing[2] of Wastes Generated On-Site	Disposal of Wastes Generated On-Site	Annual Quantity Generated and/or Received
Soil generated primarily by the boring of monitor wells around the clean-closed wood preserving operation surface impoundment.	0001301H	F034 K001				X			0
Aqueous Waste with low surfactants. Groundwater generated from drilling activities for investigative purposes.	0909101H	F034 K001				X			0
Creosote sludge, soil mixture generated as part of corrective action performed on-site.	0912489H	F034 K001				X			0
Groundwater generated from purging of various monitor wells for investigative purposes.	0914101H	F034 K001				X			1020 lbs
Soil derived from the boring of monitor wells for investigative purposes.	0915301H	F034 K001				X			0
Plastic and used personal protective equipment generated as a result of monitor well and/or soil sampling.	0917406H	F034 K001				X			0
Spent Solvent	0501203H	D001 D018 D039				X			0
Recovered creosote NAPL from groundwater monitoring wells	0918219H	F034 K001 U051				X			750 lb

Table III-1 Hazardous Wastes and Management Activities (continued)

Verbal Description of Waste	TCEQ Waste for Code and Classification Code	EPA Hazardous Waste Number	Storage[1] of Wastes Received from Off-Site	Processing[2] of Wastes Received from Off-Site	Disposal of Wastes Received from Off-Site	Storage[1] of Wastes Generated On-Site	Processing[2] of Wastes Generated On-Site	Disposal of Wastes Generated On-Site	Annual Quantity Generated and/or Received
Drilling mud from boring monitor wells for investigative purposes	1481514H	D002				X			0
Purge water generated as part of groundwater monitoring and investigation	1482110H	D002				X			0
Wood treatment (creosote) related wastes	488, 609	U188				X			0

[1]"Storage" means the holding of solid waste for a temporary period, at the end of which the waste is processed, disposed of, or stored elsewhere.

[2]"Processing" means the extraction of materials, transfer, volume reduction, conversion to energy, or other separation and preparation of solid waste for reuse or disposal, including the treatment or neutralization of hazardous waste, designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize such waste, or so as to recover energy or material from the waste or so as to render such waste non-hazardous or less hazardous; safer for transport, store or dispose of; or amenable for recovery, amenable for storage, or reduced in volume. The "transfer" of solid waste for reuse or disposal as used above, does not include the actions of a transporter in conveying or transporting solid waste by truck, ship, pipeline, or other means. Unless the Executive Director determines that regulation of such activity is necessary to protect human health or the environment, the definition of "processing" does not include activities relating to those materials exempted by the Resource Conservation and Recovery Act, 42 U.S.C. 6901 **et seq.**, as amended.

Table III-2 Hazardous Waste Management Unit Checklist

Waste Management Unit	TCEQ N.O.R. Unit #	Status[1]	Design Capacity[2]	Number of Years Utilized	Date in Service
Surface Impoundment Area which is a closed RCRA-regulated surface impoundment	001/SWMU 1	Closed (requesting NFA)	5,065 yd^3	3	1979-1982
Tank Car	002/SWMU 7	Inactive	12,500 gal	Unknown	Unknown
Sub-surface Tank	003/SWMU 7	Inactive	NA	Unknown	Unknown
Container Storage Area	004	Active (<90 day unit)	450 ft^2	19	1995-Present
Waste Pile	005	Inactive	NA		1907-2010
Miscellaneous Storage Containers	006	Inactive	NA		
Northern and Southern Drainage Ditches	SWMU 2	Closed	Unknown	Unknown	Unknown
Recent Process Area	SWMU 4	Closed	Unknown	22-30	Started sometime between 1955 and 1962 until mid-1980s
Original Process Area	SWMU 5	Closed	Unknown	44-51	1911 through sometime between 1955 and 1962
Water Treatment and Boiler System	SWMU 6	Closed	Unknown	24-30	Started between 1955 and 1965 through mid-1980s
Tank Car Storage Area	SWMU 7/NOR 002 and 003	Closed	Unknown	~26	Late 1950s through 1984
Aboveground Storage Tank Area	SWMU 8	Closed	Unknown	24-30	Started between 1955 and 1965 through 1984
Location of Former UST No. 44-023-05	SWMU 9	Closed	2,000 gal	26	1966 through June 1992
Location of Former Sap Water Treatment Tank	SWMU 10	Closed	Unknown	5	1979 - 1984
Oil Water Separators	SWMU 11	Closed	Unknown	10	1979 – 1989
Railroad Tie Storage Area	SWMU 12	Closed	Unknown	70-75	1911 through mid-1980s

[1]Indicate only one of the following: Active, Inactive, Closed, or Proposed
[2]Cubic yards, gallons, pounds, gallons/minute, pounds/hour, BTUs/hour, etc.

Attachment B

LEGAL LAND DESCRIPTION

Union Pacific Houston Wood Preserving Works
Part A Hazardous Waste Permit Application Item II.B

ATTACHMENT B

Legal Description
Union Pacific Railroad Company
Houston Wood Preserving Works
And
Closed Surface Impoundment

Entire Site

The following descriptions were obtained from Harris County Appraisal District website (www.hcad.org) and in accordance with Part A, Section II.B, in lieu of a meets and bounds survey, the appropriate lot descriptions are provided for the facility.

4910 Liberty Rd.

HCAD ID 0402600000040
Tracts 11, 12, 13 & 14, Abstract 32 Harris & Wilson Survey

HCAD ID 0040600000001 (partial)
Tracts R100 in blocks 54, 55, 56 & 58, 59 & 60 & 62 thru 70, Augusta Survey

1st Street Properties

HCAD ID 0082430000002
Lot 2 Block 1, Busch & Kyle U/R Survey

HCAD ID 0082430000003
Lots 3 & 4 Block 1, Busch & Kyle U/R Survey

2nd Street Properties

HCAD ID 0082430000005
Lot 5 Block 1, Busch & Kyle U/R Survey

HCAD ID 0082430000007
Lot 7 Block 1, Busch & Kyle U/R Survey

HCAD ID 0082430000008
Lot 8 Block 1, Busch & Kyle U/R Survey

HCAD ID 0082440000001
Lot 1 Block 2, Busch & Kyle U/R Survey

HCAD ID 0082440000002
Lots 2 & 3 Block 2, Busch & Kyle U/R Survey

HCAD ID 0082440000004
Lot 4 Block 2, Busch & Kyle U/R Survey

HCAD ID 0082440000005
Lot 5 Block 2, Busch & Kyle U/R Survey

HCAD ID 0082440000007
Lot 7 Block 2, Busch & Kyle U/R Survey

HCAD ID 0082440000008
Lot 8 Block 2, Busch & Kyle U/R Survey

HCAD ID 0082440000009
Lot 6 Block 2, Busch & Kyle U/R Survey

Kirk Alley Properties

HCAD ID 0402530000186
Tracts 31A, 31B, 31G & 31H-1, Abstract 32 Harris & Wilson Survey

HCAD ID 0402530000187
Tract 31F, Abstract 32 Harris & Wilson Survey

HCAD ID 0402530000188
Tract 31E, Abstract 32 Harris & Wilson Survey

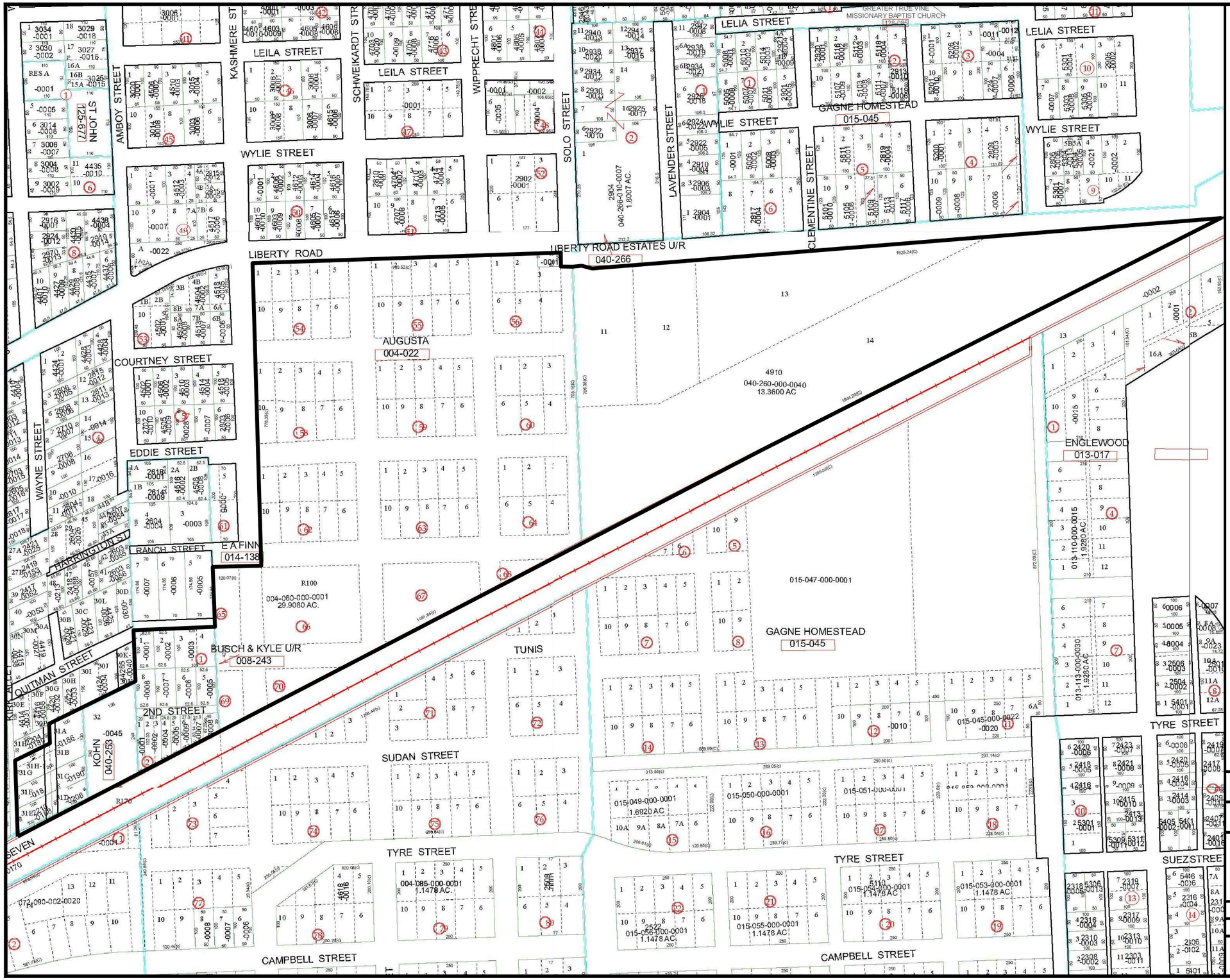
HCAD ID 0402530000190
Tract 31C, Abstract 32 Harris & Wilson Survey

HCAD ID 0402530000206
Tract 31D, Abstract 32 Harris & Wilson Survey

HCAD ID 0402530000045
Tract 32, Kohn, Abstract 32 Harris & Wilson Survey

Closed Surface Impoundment

Being a parcel of land out of the Harris and Wilson Survey, Abstract 32, Harris County, Texas, same being all of fractional Block 65lying east of and adjoining the east line of the E.A. Finn Addition recorded in Volume 73, Page 317 of the Harris County Deed Records (H.C.D.R.) and the east line of the Busch and Kyle Subdivision recorded in Volume 183, Page 69 H.C.D.R. and the adjoining closed and abandoned street between and adjoining Block 65 and Block 66 out of the Augusta Addition to the City of Houston per the map recorded in Volume 56,Page 139 of the Harris County Deed Records.



EXPLANATION

UPRR Facility Boundary

Note:
Please see Attachment B for the lot descriptions.

N

Approx. Scale in Feet

0 125 250

SOURCE:
Base map from hcad.org, facet 5558A.

UNION PACIFIC RAILROAD CO.

HOUSTON WOOD PRESERVING WORKS

Attachment B Figure 1

FACILITY PLAN

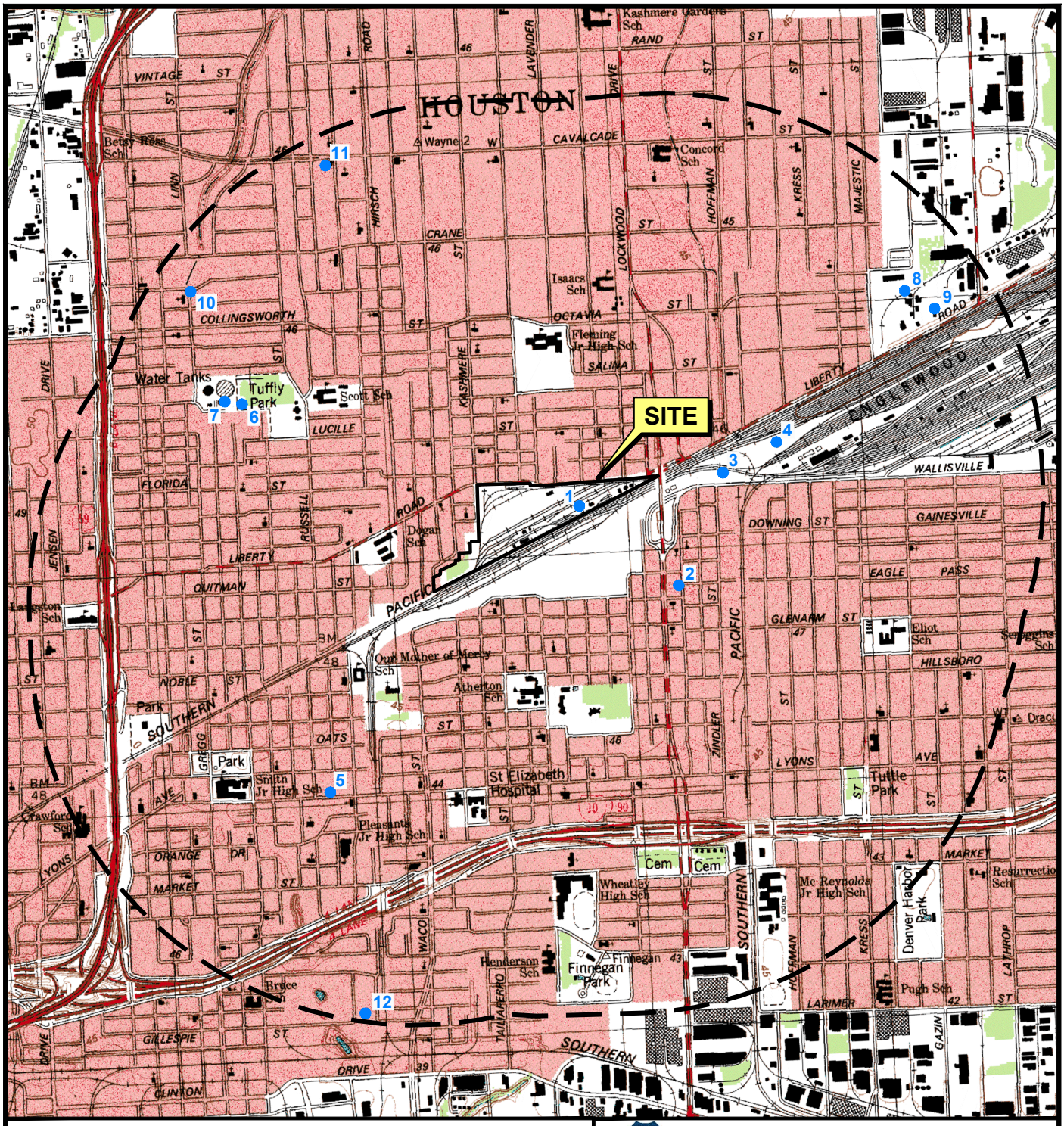
PROJECT: 1358	BY: AJD	REVISIONS
DATE: NOV., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Attachment C

SITE INFORMATION MAPS

Union Pacific Houston Wood Preserving Works
Part A Hazardous Waste Permit Application Item III.C.1



EXPLANATION

1● Water Well Location

Note:
Water well inventory within 1 mile of Site (Banks, 2014).

QUADRANGLE LOCATION

N

Scale in Feet

0 1000 2000

SOURCE:
Base map from www.tnris.gov, Settegast, TX 7.5 min. USGS quadrangle dated 1982.

UNION PACIFIC RAILROAD CO.

HOUSTON WOOD PRESERVING WORKS

Figure C-1
Item III.C.1

WATER WELL MAP

PROJECT: 1358	BY: AJD	REVISIONS
DATE: NOV., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

ATTACHMENT C
LIST OF WELL OWNERS AND USES WITHIN 1-MILE RADUS
UNION PACIFIC HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

PBW Map ID	Well ID	Well Owner	Current Water Use	Depth Drilled	Completion Date	Reported Aquifer
1	65-14-809	Southern Pacific Railroad	Destroyed	947	01/01/1925	Evangeline
2	65-14-8A	Houston Lighting & Power	Industrial	1550	01/19/1982	Evangeline
3	HGSDHG1968	Southern Pacific Trans. Co.	Irrigation	1200	01/01/1954	Evangeline
	65-14-802	Southern Pacific Railroad	Industrial	1201	01/01/1954	Evangeline
	65-14-801	Southern Pacific Railroad	Industrial	1206	01/01/1954	Evangeline
	HGSDHG1967	Southern Pacific Trans. Co.	Irrigation	1200	01/01/1981	Evangeline
4	65-14-814	Southen Pacific Railroad	Destroyed	919	01/01/1941	Evangeline
5	65-14-7	Dr. Carroll	Other	530	12/06/1984	Chicot
	65-14-8F	Dr. Carroll	Other	223	08/28/1984	Chicot
6	65-14-759, G1010013HH, USGS-294728095200101	City of Houston Northeast #2	Plugged	1291	01/01/1938	Evangeline
	USGS-294728095200102	USGS	Observation	1596	02/01/1980	Evangeline
	USGS-294728095200103	USGS	Observation	487	02/15/1980	Chicot
	USGS-294728095200104	USGS	Observation	1035	02/15/1980	Evangeline
	USGS-294728095200105	USGS	Observation	298	02/01/1980	Chicot
	USGS-294728095200106	USGS	Observation	2170	04/25/1980	Evangeline
	65-14-7	Williams Brothers Const.	Plugged	280	6/5/1992	NA
7	65-14-727, G1010013HG	City of Houston Northeast #1	Plugged	1876	01/01/1931	Evangeline
8	65-14-517, 65-06-8D	Corbett Fabricating Co	Industrial	344	03/04/1966	Chicot
9	65-14-508	General Metals Corp.	Unused	912	01/01/1938	Evangeline
	65-14-505	General Metals Corp.	Unused	217	01/01/1943	Chicot
10	HGSDHG1084, 65-14-406, USGS-294745095201001	City of Houston Northeast #3	Plugged	1993	05/15/1944	Evangeline
11	65-14-507, G1010013ND	City of Houston Kashmere Gardens	Plugged	544	01/01/1940	Chicot
	65-14-501, G1010013NC	City of Houston Kashmere Gardens	Plugged	1035	07/01/1948	Evangeline
12	65-14-823, 65-14-8, USGS-294609095194601	National Vinegar Co.	Industrial	506	04/14/1987	Chicot
	HGSDHG4117	National Vinegar Company	Industrial	350	01/01/1990	Chicot
	65-14-4	National Vinegar	Plugged	200	04/14/1998	Chicot

EXPLANATION

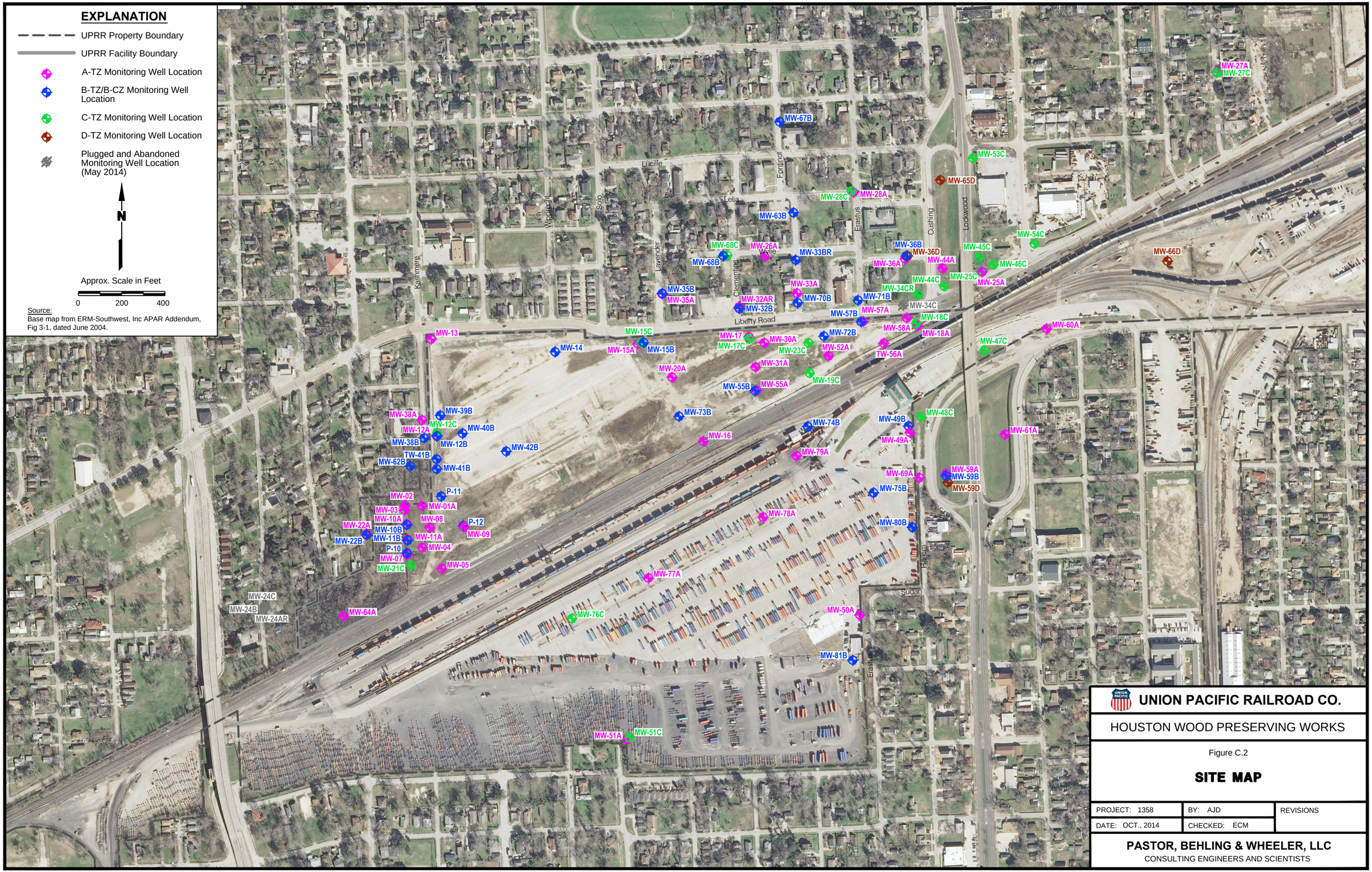
- UPRR Property Boundary
- UPRR Facility Boundary
- A-TZ Monitoring Well Location
- B-TZ/B-CZ Monitoring Well Location
- C-TZ Monitoring Well Location
- D-TZ Monitoring Well Location
- Plugged and Abandoned Monitoring Well Location (May 2014)

N

Approx. Scale in Feet

0 200 400

Source:
Base map from ERM-Southwest, Inc APAR Addendum, Fig 3-1, dated June 2004.



UNION PACIFIC RAILROAD CO.

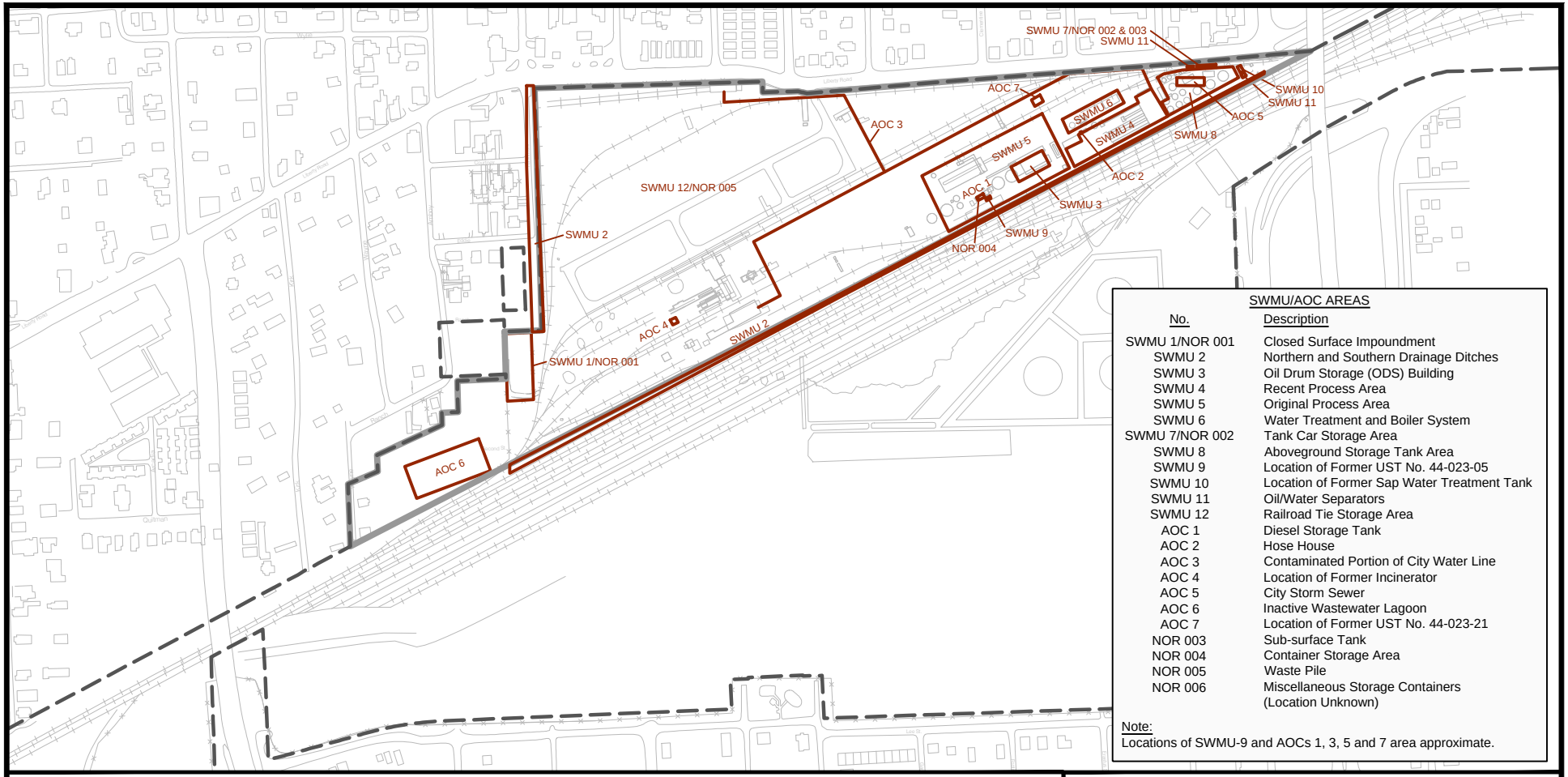
HOUSTON WOOD PRESERVING WORKS

Figure C.2

SITE MAP

PROJECT: 1358	BY: AJD	REVISIONS
DATE: OCT., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



SWMU/AOC AREAS

No.	Description
SWMU 1/NOR 001	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 3	Oil Drum Storage (ODS) Building
SWMU 4	Recent Process Area
SWMU 5	Original Process Area
SWMU 6	Water Treatment and Boiler System
SWMU 7/NOR 002	Tank Car Storage Area
SWMU 8	Aboveground Storage Tank Area
SWMU 9	Location of Former UST No. 44-023-05
SWMU 10	Location of Former Sap Water Treatment Tank
SWMU 11	Oil/Water Separators
SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
AOC 2	Hose House
AOC 3	Contaminated Portion of City Water Line
AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21
NOR 003	Sub-surface Tank
NOR 004	Container Storage Area
NOR 005	Waste Pile
NOR 006	Miscellaneous Storage Containers (Location Unknown)

Note:
Locations of SWMU-9 and AOCs 1, 3, 5 and 7 area approximate.

EXPLANATION

- UPRR Property Boundary
- UPRR Facility Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad

N

Approx. Scale in Feet

0 250 500

SOURCE:
Base map from ERM-Southwest, Inc APAR Addendum, Fig 3-1, dated June 2004.

UNION PACIFIC RAILROAD CO.

HOUSTON WOOD PRESERVING WORKS

Figure C.3

LOCATIONS OF FORMER WASTE MANAGEMENT UNITS

PROJECT: 1358	BY: AJD	REVISIONS
DATE: NOV., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Attachment D

PHOTOGRAPHS OF HAZARDOUS WASTE MANAGEMENT AREAS

Union Pacific Houston Wood Preserving Works
Part A Hazardous Waste Permit Application Item III.C.2

SWMU No. 1
UNION PACIFIC HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Photo 1: View of SWMU No. 1, looking north.

Photo 2: View of signage at SWMU No. 1, looking southwest.

Texas Commission on Environmental Quality
Industrial & Hazardous Waste Part B Permit Application

I. General Information

A. Applicant Name: [Facility Operator (or Facility Owner & Operator, if same)]

Union Pacific Railroad Company

(Individual, Corporation, or Other Legal Entity Name – must match the Secretary of State's database records for the Facility)

Previous or former names of the facility, if applicable: Houston Tie Plant

Address: 4910 Liberty Road

City: Houston State: TX Zip Code: 77026

Telephone Number: 414-267-4164

TCEQ Solid Waste Registration No.: 31547 EPA I.D. No.: TXD000820266

Permit No.: 50343 County: Harris

Regulated Entity Name: Union Pacific Railroad Company Houston Wood Preserving Works

Regulated Entity Reference Number: RN100674613

Customer Name: Union Pacific Railroad Company

Customer Reference Number: CN600131098

If the application is submitted on behalf of a corporation, please identify the Charter Number as recorded with the Office of the Secretary of State for Texas.

800725939
(Charter Number)

B. Facility Owner : Identify the Facility Owner if different than the Facility Operator

Union Pacific Railroad Company

Address: 1400 Douglas St., STOP 1030

City: Omaha, NE , Zip Code: 68179

Telephone Number: 402-544-5000

The operator has the duty to submit an application if the facility is owned by one person and operated by another [30 TAC 305.43(b)]. The permit will specify the operator and the owner who is listed on Part A of this application [Section 361.087, Texas Health and Safety Code].

C. Facility Contact

1. List those persons or firms, including a complete mailing address and telephone number, who will act as primary contact for the applicant during the processing of the permit application.

   Kevin Peterburs
   Manager, Environmental Site Remediation
   Union Pacific Railroad Company
   4823 N 119th Street
   Milwaukee, WI 53225
   Phone: 414-267-4164
   kjpeterb@up.com

2. If the application is submitted by a corporation or by a person residing out of state, the applicant must register an Agent in Service or Agent of Service with the Texas Secretary of State's office and provide a complete mailing address for the agent. The agent must be a Texas resident.

   C T Corporation System
   1999 Bryan Street, Suite 900
   Dallas, TX 75201-3136
   Phone: 214-979-1172

3. List the individual who will be responsible for causing notice to be published in the newspaper and his/her mailing address, telephone number and fax number. If e-mail is available please provide an e-mail address.

   Kevin Peterburs
   Manager, Environmental Site Remediation
   Union Pacific Railroad Company
   4823 N 119th Street
   Milwaukee, WI 53225
   Phone: 414-267-4164
   kjpeterb@up.com

4. For applications for new permits, renewals, major amendments and Class 3 modifications a copy of the administratively complete application must be made available at a public place in the county where the facility is, or will be, located for review and copying by the public. Identify the public place in the county (e.g., public library, county court house, city hall), including the address, where the application will be made available for review and copying by the public.

   Tuttle Branch Library
   702 Kress
   Houston, TX 77020

5. If an applicant proposes a new industrial or hazardous waste facility that would accept municipal solid waste, the applicant shall hold a public meeting in the county in which the facility is proposed to be located. This meeting must be held before the 45th day after the date the application is filed. In addition, the applicant shall publish notice of the public meeting in accordance with 30 TAC 39.503(e)(5).

   Not applicable

Contact: Kevin Peterburs Title: Manager, Environmental Site Remediation

Address: 4823 N 119th Street

City: Milwaukee State: WI Zip Code: 53225

Telephone Number(s): Office 414-267-4164 Other _____

E-mail: kjpeterb@up.com FAX _____

D. Application Type and Facility Status

1.

☒permit	☒amendment	☐modification
☐new	☐major	☐Class 3
☐ interim status	☒minor	☐Class 2
☐renewal		☐Class 1[1]
☐RD&D		☐Class 1
☐Compliance Plan		

2. Is this submittal part of a Consolidated Permit Processing request, in accordance with 30 TAC Chapter 33?
☐Yes ☒No

If Yes, state the other TCEQ program authorizations requested.

3. Does the application contain confidential material? ☐ Yes ☒ No

If Yes, cross-reference the confidential material throughout the application to Section XIII: Confidential Material, and submit as a separate Section XIII document or binder conspicuously marked "CONFIDENTIAL".

4. In either column, check all that apply.

☐Proposed hazardous waste management facility	☒Existing hazardous waste management facility
☐On-site	☒On-site
☐Off-site	☐Off-site
☐Commercial	☐Commercial
☐Recycle	☐Recycle
☐Land Disposal	☐Land Disposal
	☐Areal or capacity expansion
	☒Compliance plan

5. Is the facility within the Coastal Management Program boundary (for Class 3 Modifications, Permit Renewals, and New Permit applications only)?

☐ Yes ☒ No

6. Provide a brief description of the portion of the facility covered by this application in the table below, including the changes for which an amendment or modification is

requested: *[**Note:** List all changes requested in the table below. Unlisted requests risk remaining unaddressed or possibly denied if brought to the permit application reviewer's attention at a later time.]*

Permit/Compliance Plan Application Section	Brief Description of Proposed Change	Modification or Amendment Type	Supporting Regulatory Citation
Part A - Permit Provision I.C	Facility Contact Updated	Minor Ammendment	30 TAC §305.69(k)(A)(1)
Part B - Permit Provision I.C	Facility Contact Updated	Minor Ammendment	30 TAC §305.69(k)(A)(1)

7. Total acreage of the facility being permitted: 128 acres

8. Identify the name of the drainage basin and segment where the facility is located: San Jacinto River basin, Segment No. 1007

E. Facility Siting Summary

Is the facility located or proposed to be located:

1. within a 100-year floodplain?
☐Yes ☒ No

2. in wetlands?
☐Yes ☒No

3. in the critical habitat of an endangered species of plant or animal?
☐Yes ☒No

4. on the recharge zone of a sole-source aquifer?
☐Yes ☒ No

5. in an area overlying a regional aquifer?
☒Yes ☐ No

6. Within 0.5 mile (2,640 feet) of an established residence, church, school, day care center, surface water body used for a public drinking water supply, or dedicated public park? (Use only for a new commercial hazardous waste management facility or areal expansion of an existing commercial hazardous waste management facility or unit of that facility as defined in 30 TAC 335.202)
☐Yes ☐No ☒Not Applicable

If Yes: the TCEQ shall not issue a permit for this facility.

7. In an area in which the governing body of the county or municipality has prohibited the processing or disposal of municipal hazardous waste or industrial solid waste?
☐Yes ☒No

If Yes: provide a copy of the ordinance or order.

F. Wastewater and Stormwater Disposition

1. Is the disposal of any waste to be accomplished by a waste disposal well at this facility?

☒ No ☐Yes (**If Yes**: List WDW Permit No(s):_____).

2. Will any point source discharge of effluent or rainfall runoff occur as a result of the proposed activities?
☐ Yes ☒No

3. If Yes, is this discharge regulated by a TPDES or TCEQ permit?
☐ Yes Permit No._____(TCEQ)
Permit No._____(TPDES)

4. ☐No Date TCEQ discharge permit application filed: _____
Date TPDES discharge permit application filed:_____

G. Information Required to Provide Notice

State Officials List

Provide the name and mailing address for the State Senator and State Representative in the district in which the facility is or will be located. Either local district addresses or capitol addresses are acceptable. This list should not be included in the Adjacent Landowners List required below. [30 TAC 39.103(b)]

State Senator, District 13
Borris L. Miles, P.O. Box 12068, Capitol Station, Austin, TX 78711

State Representative, District 142
Harold Dutton, P.O. Box 2910, Austin, Texas 78768

Local Officials List

Provide the name and mailing address of the mayor and health authority of the municipality in whose territorial limits or extraterritorial jurisdiction the facility is or will be located. In addition, please provide the county judge and health authority of the county in which the facility is located. This list should not be included in the Adjacent Landowners List required below. [30 TAC 39.103(c)]

Mayor, City of Houston
Sylvester Turner, P.O. Box 1562, Houston, Texas 77251

Municipal Health Authority
Stephen L. Williams, Director, Houston Department of Health and Human Services (HDHHS),
8000 North Stadium Drive, Houston, TX 77054

Harris County Judge
Honorable Ed Emmett, 1001 Preston, Suite 911, Houston, TX 77002

County Health Authority
Umair A. Shah, Harris County Public Health & Environmental Services,
2223 West Loop South, Houston, TX 77027

Regional Health Authority
Texas Department of State Health Services, Health Service Region 6/5 South,
Carlos Plasencia, MD, MSPH, Regional Medical Director,
5425 Polk, Suite J, Houston, Texas 77023

Adjacent Landowners List – No Changes

Submit a map indicating the boundaries of all adjacent parcels of land, and a list (see samples in the instructions) of the names and mailing addresses of all adjacent landowners and other nearby landowners who might consider themselves affected by the activities described by this application. Cross-reference this list to the map through the use of appropriate keying techniques. The map should be a USGS map, a city or county plat, or another map, sketch, or drawing with a scale adequate enough to show the cross-referenced affected landowners. The list should be updated prior to any required public notice. It is the applicant's responsibility to ensure that the list is up-to-date for any required public notice. For all applications (with the exception of Class 1 and Class 1[1] modifications) this mailing list should be submitted on:

1. a Compact Disk (CD) using software compatible with MS Word [30 TAC 39.5(b)]; or
2. four sets of printed labels.

If the adjacent landowners list is submitted on a compact disk (CD), please label the disk with the applicant's name and permit number. Within the file stored on the disk, type the permit number and applicant's name on the top line before typing the addresses. Names and addresses must be typed in the format indicated below. This is the format required by the U.S. Postal Service for machine readability. Each letter in the name and address must be capitalized, contain no punctuation, and the appropriate two-character abbreviation must be used for the state. Each entity listed must be blocked and spaced consecutively as shown below. The list is to be 30 names, addresses, etc. (10 per column) per page (MS WORD Avery Standard 5160 – ADDRESS template).

Example:

Industrial Hazardous Waste Permit No. 50000, Texas Chemical Plant

HEAVY METALS LP
PO BOX 85624
PUMPKIN PARK TX 79998-5624

MR AND MRS W R NEIGHBOURLY
1405 ACROSSTHE WAY
GREATER METRO CITY TX 79199

A list submitted on compact disk (CD) should be the only item on that disk. Please do not submit a list on a disk that includes maps or other materials submitted with your application.

If you wish to provide the list on printed labels, please use sheets of labels that have 30 labels to a page (10 labels per column) (for example: Avery® Easy Peel® White Address Labels for Laser Printers 5160). Please provide four complete sets of labels of the adjacent landowners list.

Based on the questions in the Bilingual Notice Instructions for this form, are you required to make alternate (Bilingual) notice for this application?

☐Yes ☐No

Bilingual Language(s):_____

H. TCEQ Core Data Form – **See Attached**

The TCEQ requires that a Core Data Form CDF (Form 10400) be submitted on all incoming applications. Please ensure that the submitted CDF does not show a change for any information that will remain the same as previously submitted. For more information regarding the Core Data Form, call (512) 239 1575 or go to the TCEQ Web site at http://www.tceq.texas.gov/permitting/central_registry/guidance.html

I. Signature on Application

It is the duty of the operator to submit an application for a permit. The person who signs the application form will often be the operator himself; when another person signs on behalf of the applicant, his title or relationship to the applicant will be shown. In all cases, the person signing the form must be authorized to do so by the applicant. An application submitted by a corporation must be signed by a responsible corporate officer such as a president, secretary, treasurer, vice president, or by his duly authorized representative, if such representative is responsible for the overall operation of the facility from which the activity described in the form originates. In the case of a partnership or a sole proprietorship, the application must be signed by a general partner or the proprietor, respectively. In the case of a municipal, state, federal, or other public facility, the application must be signed by a principal executive officer, a ranking elected official, or another duly authorized employee. A person signing an application on behalf of an applicant must provide notarized proof of authorization.

Signature Page

I, Bob Grimaila, VP Safety,
(Operator) (Title)

certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: RMGrimaila Date: 1-16-2015

To Be Completed By The Operator If The Application Is Signed By An Authorized Representative For The Operator

I, _____, hereby designate _____
(Print or Type Name) (Print or Type Name)

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

_____
Printed or Typed Name of Operator or Principal Executive Officer

_____
Signature

SUBSCRIBED AND SWORN to before me by the said Bob Grimaila

On this 16th day of January, 2015

My commission expires on the 12 day of 7, 2017

Julie A Zabrowski
Notary Public in and for Douglas County, Nebraska

GENERAL NOTARY - State of Nebraska
JULIE A. ZABROWSKI
My Comm. Exp. December 7, 2017

(**Note:** Application Must Bear Signature & Seal of Notary Public)

Signature Page

JOEL STRAFELDA
GENERAL MANAGER
ENVIRONMENTAL MANAGEMENT

I, Joel Strafelda, _____,
(Operator) (Title)

certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: _____ Date: 11-13-2015

To Be Completed By The Operator If The Application Is Signed By An Authorized Representative For The Operator

I, _____, hereby designate _____
(Print or Type Name) (Print or Type Name)

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

_____
Printed or Typed Name of Operator or Principal Executive Officer

_____
Signature

SUBSCRIBED AND SWORN to before me by the said Joel Strafelda

On this 13th day of November, 2015

My commission expires on the 7th day of December, 2017

Julie A Zabrowski
Notary Public in and for Douglas County, Nebraska

GENERAL NOTARY - State of Nebraska
JULIE A. ZABROWSKI
My Comm. Exp. December 7, 2017

(**Note:** Application Must Bear Signature & Seal of Notary Public)

Signature Page

I, Reed Doerr, VP Safety,
(Operator) (Title)

certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: _____ Date: 6/21/2017

To Be Completed By The Operator If The Application Is Signed By An Authorized Representative For The Operator

I, Reed Doerr, hereby designate _____
(Print or Type Name) (Print or Type Name)

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

_____
Printed or Typed Name of Operator or Principal Executive Officer

_____
Signature

SUBSCRIBED AND SWORN to before me by the said TONY L. PAULSEN

On this 21st day of June 2017,

My commission expires on the 3rd day of June, 2020

Notary Public in and for Douglas County, Nebraska

(**Note:** Application Must Bear Signature & Seal of Notary Public)

GENERAL NOTARY - State of Nebraska
TONY L. PAULSEN
My Comm. Exp. June 3, 2020

Signature Page

I, Rodney W. Dorn, VP Safety, + CSO,
(Operator) *(Title)*

certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: _____ Date: 2/2/2018

To be completed by the Operator if the application is signed by an Authorized Representative for the Operator

I, _____, hereby designate _____
[Print or Type Name] *[Print or Type Name]*

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

Rodney W. Dorn
Printed or Typed Name of Operator or Principal Executive Officer

_____
Signature

SUBSCRIBED AND SWORN to before me by the said

On this 2nd day of February, 2018

My commission expires on the 3rd day of June, 2020

Notary Public in and for Tony L. Paulsen County, Texas ~~NEBRASKA~~
*[**Note**: Application Must Bear Signature & Seal of Notary Public]*

GENERAL NOTARY - State of Nebraska
TONY L. PAULSEN
My Comm. Exp. June 3, 2020

Signature Page

I, Mark Lutz, AVP Fuel & Environmental
(Operator) *(Title)*

certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: Mark Lutz Date: 8/24/2020

To be completed by the Operator if the application is signed by an Authorized Representative for the Operator

I, _____, hereby designate _____
[Print or Type Name] *[Print or Type Name]*

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

Mark Lutz
Printed or Typed Name of Operator or Principal Executive Officer

Mark Lutz
Signature

SUBSCRIBED AND SWORN to before me by the said

On this 24th day of August, 2020

My commission expires on the 28th day of June, 2021

GENERAL NOTARY - State of Nebraska
MICKI ZOUCHA
My Comm. Exp. June 28, 2021

Notary Public in and for Micki Zoucha Douglas County, Texas Nebraska
*[**Note:** Application Must Bear Signature & Seal of Notary Public]*

Signature Page

I, Mark Lutz, AVP Fuel & Environmental,

(Operator) *(Title)*

certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: [signature] Date: 10/16/2020

- -

To be completed by the Operator if the application is signed by an Authorized Representative for the Operator

I,________________________, hereby designate ________________________

[Print or Type Name] *[Print or Type Name]*

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

____

Printed or Typed Name of Operator or Principal Executive Officer

____

Signature

- -

SUBSCRIBED AND SWORN to before me by the said

On this 16th day of October, 2020

My commission expires on the ~~June~~ 28th day of June, 2021

Notary Public in and for Douglas County, ~~Texas~~ Nebraska

*[**Note***: Application Must Bear Signature & Seal of Notary Public]*

GENERAL NOTARY - State of Nebraska
MICKI ZOUCHA
My Comm. Exp. June 28, 2021

Micki Zoucha

Signature Page

I, Mark Lutz, AVP Fuel & Environmental,
(Operator) *(Title)*

certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: _____ Date: 1/8/2021

To be completed by the Operator if the application is signed by an Authorized Representative for the Operator

I, _____, hereby designate _____
[Print or Type Name] *[Print or Type Name]*

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

_____
Printed or Typed Name of Operator or Principal Executive Officer

_____
Signature

SUBSCRIBED AND SWORN to before me by the said

On this 8th day of January, 2021

My commission expires on the 28th day of June, 2021

Notary Public in and for Douglas County, ~~Texas~~ Nebraska

*[**Note**: Application Must Bear Signature & Seal of Notary Public]*

GENERAL NOTARY - State of Nebraska
MICKI ZOUCHA
My Comm. Exp. June 28, 2021

Micki Zoucha

Micki Zoucha

I. GENERAL INFORMATION

Attachment I.G

NOTIFICATION LIST AND MAP

Union Pacific Houston Wood Preserving Works
Houston, Texas

TABLE I-1
LANDOWNERS CROSS REFERENCED TO ADJACENT LANDOWNER MAP
UNION PACIFIC HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

MAP ID[1]	HCAD ID[2]	PARCEL ADDRESS	PARCEL OWNER	OWNER MAILING ADDRESS		
				Street/PO #	City, State	Zip Code
1	0140410000022	5311 Liberty Rd	CRAWFORD PROPERTIES & STATES	6725 FAIRMOUNT PWKY UNIT 122	PASADENA, TX	77505
2	0140410000007	5301 Liberty Rd	SEAN JEFFERSON	3116 NANCE ST	HOUSTON, TX	77020
3	0141420000006	2809 Erastus St. #1	CHARITY BAPTIST CHURCH	2809 ERASTUS ST. #1	HOUSTON, TX	77026
4	0141420000008	5201 Liberty Rd	FULL GOSPEL CHRISTIAN ASSN	5201 LIBERTY RD.	HOUSTON, TX	77026
5	0141420000009	5201 Liberty Rd	FULL GOSPEL CHRISTIAN ASSN	5201 LIBERTY RD.	HOUSTON, TX	77026
6	0141430000006	5117 Liberty Rd	JORGE D RIVERA	5117 LIBERTY RD.	HOUSTON, TX	77026
7	0141430000011	5113 Liberty Rd	CLAUDIA ELIZABETH DELAPORTIL MEDINA	5117 LIBERTY RD.	HOUSTON, TX	77026
8	0141430000007	5109 Liberty Rd	JOE H MARTINEZ	5109 LIBERTY RD.	HOUSTON, TX	77026
9	0141430000008	5105 Liberty Rd	ALEJANDRO GONZALEZ	4088 PAMELA WAY	MONTGOMERY, T	77316
10	0141430000010	5101 Liberty Rd	WALLACE R & JANIE LONGORIA	6023 W 34TH ST	HOUSTON, TX	77092
11	0141440000004	5005 Liberty Rd.	GREATER MOUNT NEBO BAPTIST CHURCH	4511 EDDIE ST.	HOUSTON, TX	77026
12	0402660100001	2904 Lavender St.	GREATER MOUNT NEBO MISSIONARY BAPTIST	5005 LIBERTY RD.	HOUSTON, TX	77026
13	0402660100007	2909 Lavender St.	2013 COTTAGE LLC	PO BOX 74109	HOUSTON, TX	77274
14	0040580000001	2902 Wipprecht St. #18	2902 WIPPRECHT LLC	4110 RAND ST.	HOUSTON, TX	77026
15	0040570000005	4713 Liberty Rd.	EVAN HOWELL	9219 KATY FWY STE 155	HOUSTON, TX	77024
16	0040570000008	4705 Liberty Rd.	JOANNETTA HALL	12502 RIVER TRAIL DR.	HOUSTON, TX	77050
17	0040560000006	4615 Liberty Rd.	SHARON ANN BOLDEN	4102 KRESS ST	HOUSTON, TX	77026
18	0040560000007	4605 Liberty Rd.	ROY ONTIVEROS	4606 WYLIE ST.	HOUSTON, TX	77026
19	0040560000008	0 Liberty St.	ROY ONTIVEROS	4606 WYLIE ST.	HOUSTON, TX	77026
20	0040560000009	4603 Liberty Rd.	ROY ONTIVEROS	4606 WYLIE ST.	HOUSTON, TX	77026
21	0040560000010	4601 Liberty Rd.	OSCAR ZEPEDA	320 W. 34TH ST.	HOUSTON, TX	77018
22	0040550000006	4517 Liberty Rd. #1	ROBERTO REYES	4517 LIBERTY RD.	HOUSTON, TX	77026
23	0040590000022	0 Liberty Rd.	FIRST MACEDONIA MISSIONARY CHURCH	4511 EDDIE ST.	HOUSTON, TX	77026
24	0040590000005	4518 Liberty Rd.	CHAK R HSUI	2619 FORTUNA DR.	KATY, TX	77079
25	0040590000006	4519 Courtney St.	WILLIE MAE BOOKER	4519 COURTNEY ST.	HOUSTON, TX	77026
26	0040630000005	4518 Courtney St.	ANTHONY TYRONE ROSIGNON	4518 COURTNEY ST.	HOUSTON, TX	77026
27	0040630000006	2803 Kashmere St.	SHIRLEY A WHITEHEAD	PO BOX 51	THOMPSONS, TX	77481

TABLE I-1
LANDOWNERS CROSS REFERENCED TO ADJACENT LANDOWNER MAP
UNION PACIFIC HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

MAP ID[1]	HCAD ID[2]	PARCEL ADDRESS	PARCEL OWNER	OWNER MAILING ADDRESS		
				Street/PO #	City, State	Zip Code
28	0141380000008	4508 Eddie St.	HESTER HENDERSON	4508 EDDIE ST.	HOUSTON, TX	77026
29	0141380000003	0 Ranch St.	JAMES A. PRINCE	2141 W. GOVERNORS CIR.	HOUSTON, TX	77092
30	0141380000004	2604 Amboy St.	JOEED DANIELS	2604 AMBOY ST.	HOUSTON, TX	77026
31	0402530000055	2603 Amboy St.	KATHY DANIELS	2617 AMBOY ST.	HOUSTON, TX	77026
32	0402530000056	2603 Amboy St.	ISRAEL VELEZ	8002 BURMAN ST.	HOUSTON, TX	77029
33	0402530000030	0 Quitman St.	MICHAEL L PROLER	4401 CLINTON DR.	HOUSTON, TX	77020
34	0082430000001	0 1st St.	CENTERPOINT ENERGY INTRASTATE PIPELINE INC. ATTN:	PO BOX 1475	HOUSTON, TX	77251
35	0402530000040	4428 Quitman St.	JUAN C ALLENDE-MOLINA	4428 QUITMAN ST.	HOUSTON, TX	77026
36	0402530000034	4424 Quitman St.	JAIME M LOPEZ	4424 QUITMAN ST.	HOUSTON, TX	77026
37	0402530000033	4422 Quitman St.	WALDIR ESTRADA	7918 PRESTWOOD DR.	HOUSTON, TX	77036
38	0402530000032	4420 Quitman St.	DIANE V. WILLIAMS	4420 QUITMAN ST.	HOUSTON, TX	77026
39	0402530000058	4416 Quitman St.	URVECO LLC	3422 BUSINESS CENTER DR. 1	PEARLAND, TX	77584
40	0402530000031	4414 Quitman St.	BETTY LOUISE WILLIAMS	4414 QUITMAN ST.	HOUSTON, TX	77026
41	0402530000189	2204 Kirk Aly	BENJAMIN JIMENEZ	2718 MULBERRY LN. APT. 4	PASADENA, TX	77502
42	0402530000020	2202 Kirk St.	HILDA MAE JENKINS	2202 KIRK ST.	HOUSTON, TX	77026
43	0402530000021	2200 Kirk St.	IFRAN A. CHOWDHURY	20314 ASPENWILDE DR.	CYPRESS, TX	77433
44	0402530000023	2120 Kirk St.	SIDNEY WILLIAMS	549 S. LUCERNE BLVD.	LOS ANGELES, CA	90020
45	0402530000022	2118 Kirk St.	LIGHT OF THE WORLD CDC	PO BOX 416	HUMBLE, TX	77347
46	0402530000024	2114 Kirk St.	UNDER FROM THE LEFT LLC	PO BOX 841009	HOUSTON, TX	77284
47	0402530000039	2114 Kirk St.	BEHZAD NASIZADEH	615 KELLEY ST.	HOUSTON, TX	77009
48	0402530000059	2115 Kirk St.	TUNG THANH MAI	12819 BONNIE LN.	STAFFORD, TX	77477
49	0402530000009	2316 Altoona St.	MRS. NANETTE C. LIPPER	735 E. 19TH ST.	HOUSTON, TX	77008
50	0720900040019	2316 Waco St.	ESTHER L. JONES	10618 WOODWICK ST.	HOUSTON, TX	77016
51	0720900040002	0 Lee	53 5TH WARD INVESTMENTS	14623 LISCOMB	HOUSTON, TX	77084
52	0720900040003	4410 Lee St.	ANTONIO HERNANDEZ	4410 LEE ST.	HOUSTON, TX	77020
53	0720900040004	4414 Lee St.	WELDON R. THOMAS JR.	5207 KINGSBURY ST.	HOUSTON, TX	77021
54	0720900040005	4418 Lee St.	RONY C AND GUADALUPE G RODR	4515 OATS ST	HOUSTON, TX	77020
55	0720900040006	4422 Lee St.	ESTATE OF IVORY J MCALPIN	4422 LEE ST.	HOUSTON, TX	77020
56	0720900040007	4434 Lee St.	JAMES AND DORIS MURPHY	8747 COWART ST.	HOUSTON, TX	77029

TABLE I-1
LANDOWNERS CROSS REFERENCED TO ADJACENT LANDOWNER MAP
UNION PACIFIC HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

MAP ID[1]	HCAD ID[2]	PARCEL ADDRESS	PARCEL OWNER	OWNER MAILING ADDRESS		
				Street/PO #	City, State	Zip Code
57	0720900040008	4438 Lee St.	SOUTH BY NORTHWEST LIMITED PARTNERSHIP	1529 MARYLAND ST.	HOUSTON, TX	77006
58	0720900040009	4440 Lee St.	SOUTH BY NORTHWEST LTD	1529 MARYLAND ST.	HOUSTON, TX	77006
59	0720900040020	4448 Lee St.	SOUTH BY NORTHWEST LTD	1529 MARYLAND ST.	HOUSTON, TX	77006
60	0040910000001	2318 Dan St.	DANN HOOEY	24206 PARK GABLE DR.	SPRING, TX	77373
61	0040910000002	4506 Lee St.	DAVID SANCHEZ	2316 ERASTUS ST.	HOUSTON, TX	77020
62	0040910000003	4512 Lee St.	SOUTH BY NORTHWEST LP	1529 MARYLAND ST.	HOUSTON, TX	77006
63	0040910000004	4520 Lee St.	HOUSTON HABITAT FOR HUMANITY INC.	3750 N. MCCARTY ST.	HOUSTON, TX	77029
64	0040910000011	0 Lee St.	HOUSTON HABITAT FOR HUMANITY INC.	3750 N. MCCARTY ST.	HOUSTON, TX	77029
65	1408200010001	0 LeetSt.	SINGH REAL ESTATE MANAGEMEN	12515 SOUTH NANAKSAR DR.	HOUSTON, TX	77041
66	1408200010003	0 Lee St.	SINGH REAL ESTATE MANAGEMEN	12515 SOUTH NANAKSAR DR.	HOUSTON, TX	77041
67	1408200010004	0 Lee St.	SINGH REAL ESTATE MANAGEMEN	12515 SOUTH NANAKSAR DR.	HOUSTON, TX	77041
68	1408200010005	0 Lee St.	SINGH REAL ESTATE MANAGEMEN	12515 SOUTH NANAKSAR DR.	HOUSTON, TX	77041
69	1408200010006	0 Lee St.	SINGH REAL ESTATE MANAGEMEN	12515 SOUTH NANAKSAR DR.	HOUSTON, TX	77041
70	0040920000004	0 Lee	LYNN BOLING	410 AVENUE OF OAKS ST.	HOUSTON, TX	77009
71	1284110010001	2311 Schweikhardt St.	KINGDOM CAPITAL INVESTMENTS	11911 CHURCHILL COURT LN	HOUSTON, TX	77024
72	0040930000001	4700 Lee St.	SOUTH BY NORTHWEST LTD	1529 MARYLAND ST.	HOUSTON, TX	77006
73	0040930000002	4702 Lee St.	SOUTH BY NORTHWEST LIMITED P	1529 MARYLAND ST.	HOUSTON, TX	77006
74	0040930000003	4710 Lee St.	SOUTH BY NORTHWEST LTD	1529 MARYLAND ST.	HOUSTON, TX	77006
75	0040930000005	4722 Lee St.	GREAT MT. SHARON MISSIONARY BAPTIST CHURCH	4722 LEE ST.	HOUSTON, TX	77020
76	0040940000001	4800 Lee St.	GREGORY K. & KAREN D. RICHARD	4800 LEE ST.	HOUSTON, TX	77020
77	0040940000002	4806 Lee St.	SOUTH BY NORTHWEST LTD	1529 MARYLAND ST.	HOUSTON, TX	77006
78	1403450010003	0 Solo St.	FIFTH WARD URBAN HOMES	9 SANDLILIY CT SUITE 100	SPRING, TX	77380
79	0150640000011	4902 Lee St.	3 STRIPES MANAGEMENT LLC	9815 WILLOW CROSSING DR.	HOUSTON, TX	77064
80	0150640000012	4904 Lee St.	3 STRIPES MANAGEMENT LLC	9815 WILLOW CROSSING DR.	HOUSTON, TX	77064
81	0150640000014	4906 Lee St.	3 STRIPES MANAGEMENT LLC	9815 WILLOW CROSSING DR.	HOUSTON, TX	77064
82	0150640000015	4908 Lee St.	3 STRIPES MANAGEMENT LLC	9815 WILLOW CROSSING DR.	HOUSTON, TX	77064

TABLE I-1
LANDOWNERS CROSS REFERENCED TO ADJACENT LANDOWNER MAP
UNION PACIFIC HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

MAP ID[1]	HCAD ID[2]	PARCEL ADDRESS	PARCEL OWNER	OWNER MAILING ADDRESS		
				Street/PO #	City, State	Zip Code
83	0150640000016	4910 Lee St.	3 STRIPES MANAGEMENT LLC	9815 WILLOW CROSSING DR.	HOUSTON, TX	77064
84	0150640000017	4912 Lee St.	3 STRIPES MANAGEMENT LLC	9815 WILLOW CROSSING DR.	HOUSTON, TX	77064
85	0150640000018	4914 Lee St.	3 STRIPES MANAGEMENT LLC	9815 WILLOW CROSSING DR.	HOUSTON, TX	77064
86	0150640000019	4916 Lee St.	3 STRIPES MANAGEMENT LLC	9815 WILLOW CROSSING DR.	HOUSTON, TX	77064
87	0150640000020	4918 Lee St.	3 STRIPES MANAGEMENT LLC	9815 WILLOW CROSSING DR.	HOUSTON, TX	77064
88	0150640000021	4920 Lee St.	3 STRIPES MANAGEMENT LLC	9815 WILLOW CROSSING DR.	HOUSTON, TX	77064
89	0150630000001	5002 Lee St.	SOUTH BY NORTHWEST LTD	1529 MARYLAND ST.	HOUSTON, TX	77006
90	0150630000002	5006 Lee St.	SOUTH BY NORTHWEST LTD	1529 MARYLAND ST.	HOUSTON, TX	77006
91	0150630000003	5010 Lee St.	ESTATE OF RENDIE EDWARDS ESTATE OF JEFF EDWARDS	5010 LEE ST.	HOUSTON, TX	77020
92	0150630000005	2111 Clementine St.	CORNELL HARRIS	6210 DARLINGHURST DR.	HOUSTON, TX	77085
93	0150620000001	5102 Lee St.	L. WHITAKER JR.	5102 LEE ST.	HOUSTON, TX	77020
94	0150620000003	5114 Lee St.	WILLIAM E. JOHNSON	4903 LEFFINGWELL ST.	HOUSTON, TX	77026
95	0150620000004	5118 Lee St.	RAMOS DEVELOPMENT LLC	1411 STORY ST	HOUSTON, TX	77055
96	0150620000005	5120 Lee St.	GEORGE ABDELMESSIH	4307 DELHI ST	HOUSTON, TX	77022
97	0150610000001	0 Lee St.	SOUTH BY NORTHWEST LTD	1529 MARYLAND ST.	HOUSTON, TX	77006
98	0150610000002	0 Lee St.	SOUTH BY NORTHWEST LTD	1529 MARYLAND ST.	HOUSTON, TX	77006
99	0150610000003	5210 Lee St.	DAVID SANCHEZ	2316 ERASTUS ST.	HOUSTON, TX	77020
100	1391030010001	0 Lee St.	SOUTH BY NORTHWEST LTD	1529 MARYLAND ST.	HOUSTON, TX	77006
101	1391030010002	0 Lee St.	SOUTH BY NORTHWEST LTD	1529 MARYLAND ST.	HOUSTON, TX	77006
102	0150610000005	2215 Erastus St.	SOUTH BY NORTHWEST LIMITED P	1529 MARYLAND ST.	HOUSTON, TX	77006
103	0131220000004	2222 Erastus St. #7	ALBERT J. ZARZANA	12322 KIMBERLEY LN.	HOUSTON, TX	77024
104	0131190000001	5301 Lee St.	GLORIA EATMON	5301 LEE ST.	HOUSTON, TX	77020
105	0131190000002	2308 Erastus St.	SOUTH BY NORTHWEST LIMITED P	1529 MARYLAND ST.	HOUSTON, TX	77006
106	0131190000003	2310 Erastus St.	EDISON A. BROOKS	7727 MILEY ST.	HOUSTON, TX	77028
107	0131190000004	2316 Erastus St.	FORTINO AND M. CONSUELO SALDANA	2316 ERASTUS ST.	HOUSTON, TX	77020
108	1403870010001	5302 Suez St.	MARISA S. KREITZ	5302 SUEZ ST.	HOUSTON, TX	77020
109	0131160000001	5301 Suez St.	SOUTH BY NORTHWEST LIMITED P	1529 MARYLAND ST.	HOUSTON, TX	77006

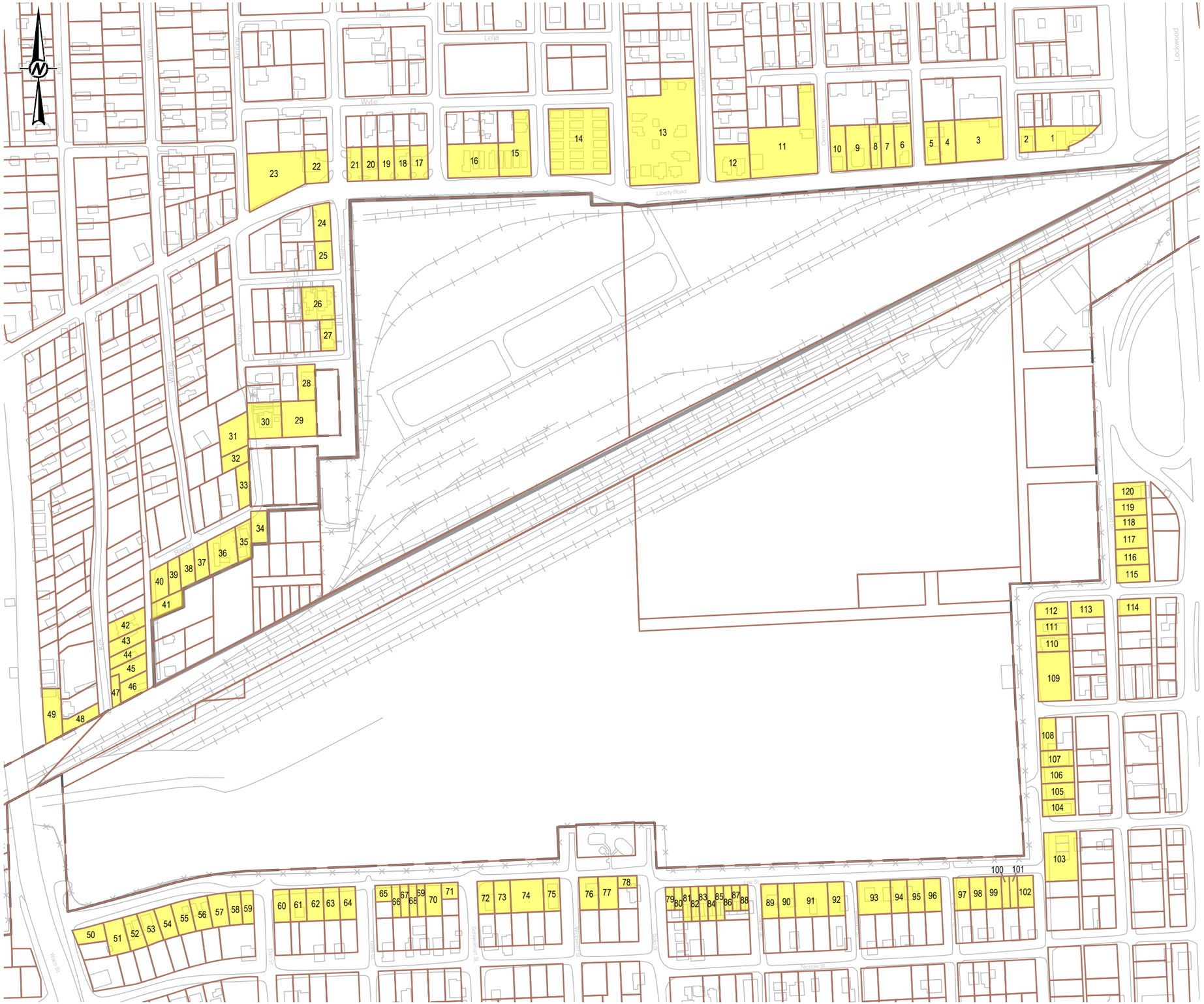
TABLE I-1
LANDOWNERS CROSS REFERENCED TO ADJACENT LANDOWNER MAP
UNION PACIFIC HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

MAP ID[1]	HCAD ID[2]	PARCEL ADDRESS	PARCEL OWNER	OWNER MAILING ADDRESS		
				Street/PO #	City, State	Zip Code
110	0131160000004	2416 Erastus St.	LYRIC ENTERPRISES LLC	17515 SPRING CYPRESS RD ST	CYPRESS, TX	77429
111	0131160000005	2418 Erastus St.	MARCOS AND MIREYRA REYES	2418 ERASTUS ST.	HOUSTON, TX	77020
112	0131160000006	2420 Erastus St.	ISAAC CARTER REV ESTATE	5938 HYACINTH PATH WAY	HOUSTON, TX	77049
113	0131160000007	2423 Harlem St.	SOUTH BY NORTHWEST LTD	1529 MARYLAND ST.	HOUSTON, TX	77006
114	0131170000006	2426 Harlem St.	MANUEL ALFARO JR	2419 LOCKWOOD DR	HOUSTON, TX	77020
115	0131140000001	5401 Sudan St.	JOYCE M. BRYAN	10910 BRIDLEPARK CIR.	HOUSTON, TX	77016
116	0131140000002	2504 Harlem St.	SOUTH BY NORTHWEST LIMITED P	1529 MARYLAND ST.	HOUSTON, TX	77006
117	0131140000003	2506 Harlem St.	FELICITA RUBIO	119 JENKINS ST	HOUSTON, TX	77020
118	0131140000004	0 Harlem	GEORGE SAMUEL	4614 WIPPRECHT ST.	HOUSTON, TX	77026
119	0131140000005	2510 Harlem St.	HAROLD J HENRY	PO BOX 11715	HOUSTON, TX	77293
120	0131140000006	2522 Harlem St.	GEORGE SAMUEL	2522 HARLEM ST.	HOUSTON, TX	77020

Notes:

[1]Map ID numbers as shown on Figure I-1.

[2]Parcel locations, descriptions, addresses and owner information from Houston Central Appraisal District (http://www.hcad.org/records/default.asp), August 2020.



LEGEND

- UPRR PROPERTY BOUNDARY
- UPRR FACILITY BOUNDARY
- ROAD, PARKING LOT, SIDEWALK
- FENCE
- RAILROAD
- ADJACENT LANDOWNER PARCEL (SEE TABLE I-1 FOR PARCEL AND LANDOWNER INFORMATION)

REFERENCE(S)

BASE MAP FROM ERM-SOUTHWEST, INC APAR ADDENDUM, FIG 3-1. DATED JUNE 2004.

0 150 300
1" = 300' FEET

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
ADJACENT LANDOWNERS MAP

CONSULTANT
GOLDER

YYYY-MM-DD	2020-08-26
DESIGNED	RS
PREPARED	RS
REVIEWED	MH
APPROVED	ECM

PROJECT NO. 19119232 | REV. 0 | FIGURE I-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

Path: \\excanlanadata\Projects - Round Rock\ 19119119232 - HWPW\2020-8 RAP Revision\ | File Name: FIG I1 - Adjacent Landowners Map.dwg | Last Edited By: rsalazar Date: 2020-08-26 Time:3:46:49 PM | Printed By: RSalazar Date: 2020-08-26 Time:4:00:49 PM

CRAWFORD PROPERTIES & STATES
6725 FAIRMOUNT PWKY UNIT 122
PASADENA, TX 77505

SEAN JEFFERSON
3116 NANCE ST
HOUSTON, TX 77020

CHARITY BAPTIST CHURCH
2809 ERASTUS ST. #1
HOUSTON, TX 77026

FULL GOSPEL CHRISTIAN ASSN
5201 LIBERTY RD.
HOUSTON, TX 77026

FULL GOSPEL CHRISTIAN ASSN
5201 LIBERTY RD.
HOUSTON, TX 77026

JORGE D RIVERA
5117 LIBERTY RD.
HOUSTON, TX 77026

CLAUDIA ELIZABETH DELAPORTIL MEDINA
5117 LIBERTY RD.
HOUSTON, TX 77026

JOE H MARTINEZ
5109 LIBERTY RD.
HOUSTON, TX 77026

ALEJANDRO GONZALEZ
4088 PAMELA WAY
MONTGOMERY, TX 77316

WALLACE R & JANIE LONGORIA
6023 W 34TH ST
HOUSTON, TX 77092

GREATER MOUNT NEBO BAPTIST CHURCH
4511 EDDIE ST.
HOUSTON, TX 77026

GREATER MOUNT NEBO MISSIONARY BAPTIST
5005 LIBERTY RD.
HOUSTON, TX 77026

2013 COTTAGE LLC
PO BOX 74109
HOUSTON, TX 77274

2902 WIPPRECHT LLC
4110 RAND ST.
HOUSTON, TX 77026

EVAN HOWELL
9219 KATY FWY STE 155
HOUSTON, TX 77024

JOANNETTA HALL
12502 RIVER TRAIL DR.
HOUSTON, TX 77050

SHARON ANN BOLDEN
4102 KRESS ST
HOUSTON, TX 77026

ROY ONTIVEROS
4606 WYLIE ST.
HOUSTON, TX 77026

ROY ONTIVEROS
4606 WYLIE ST.
HOUSTON, TX 77026

ROY ONTIVEROS
4606 WYLIE ST.
HOUSTON, TX 77026

OSCAR ZEPEDA
320 W. 34TH ST.
HOUSTON, TX 77018

ROBERTO REYES
4517 LIBERTY RD.
HOUSTON, TX 77026

FIRST MACEDONIA MISSIONARY CHURCH
4511 EDDIE ST.
HOUSTON, TX 77026

CHAK R HSUI
2619 FORTUNA DR.
KATY, TX 77079

WILLIE MAE BOOKER
4519 COURTNEY ST.
HOUSTON, TX 77026

ANTHONY TYRONE ROSIGNON
4518 COURTNEY ST.
HOUSTON, TX 77026

SHIRLEY A WHITEHEAD
PO BOX 51
THOMPSONS, TX 77481

HESTER HENDERSON
4508 EDDIE ST.
HOUSTON, TX 77026

JAMES A. PRINCE
2141 W. GOVERNORS CIR.
HOUSTON, TX 77092

JOEED DANIELS
2604 AMBOY ST.
HOUSTON, TX 77026

KATHY DANIELS
2617 AMBOY ST.
HOUSTON, TX 77026

CENTERPOINT ENERGY ATTN: AD VALOREM TAX DEPT.
PO BOX 1475
HOUSTON, TX 77251

WALDIR ESTRADA
7918 PRESTWOOD DR.
HOUSTON, TX 77036

BETTY LOUISE WILLIAMS
4414 QUITMAN ST.
HOUSTON, TX 77026

IFRAN A. CHOWDHURY
20314 ASPENWILDE DR.
CYPRESS, TX 77433

UNDER FROM THE LEFT LLC
PO BOX 841009
HOUSTON, TX 77284

MRS. NANETTE C. LIPPER
735 E. 19TH ST.
HOUSTON, TX 77008

ANTONIO HERNANDEZ
4410 LEE ST.
HOUSTON, TX 77020

ESTATE OF IVORY J MCALPIN
4422 LEE ST.
HOUSTON, TX 77020

SOUTH BY NORTHWEST LTD
1529 MARYLAND ST.
HOUSTON, TX 77006

ISRAEL VELEZ
8002 BURMAN ST.
HOUSTON, TX 77029

JUAN C ALLENDE-MOLINA
4428 QUITMAN ST.
HOUSTON, TX 77026

DIANE V. WILLIAMS
4420 QUITMAN ST.
HOUSTON, TX 77026

BENJAMIN JIMENEZ
2718 MULBERRY LN. APT. 4
PASADENA, TX 77502

SIDNEY WILLIAMS
549 S. LUCERNE BLVD.
LOS ANGELES, CA 90020

BEHZAD NASIZADEH
615 KELLEY ST.
HOUSTON, TX 77009

ESTHER L. JONES
10618 WOODWICK ST.
HOUSTON, TX 77016

WELDON R. THOMAS JR.
5207 KINGSBURY ST.
HOUSTON, TX 77021

JAMES AND DORIS MURPHY
8747 COWART ST.
HOUSTON, TX 77029

SOUTH BY NORTHWEST LTD
1529 MARYLAND ST.
HOUSTON, TX 77006

MICHAEL L PROLER
4401 CLINTON DR.
HOUSTON, TX 77020

JAIME M LOPEZ
4424 QUITMAN ST.
HOUSTON, TX 77026

URVECO LLC
3422 BUSINESS CENTER DR. 1007
PEARLAND, TX 77584

HILDA MAE JENKINS
2202 KIRK ST.
HOUSTON, TX 77026

LIGHT OF THE WORLD CDC
PO BOX 416
HUMBLE, TX 77347

TUNG THANH MAI
12819 BONNIE LN.
STAFFORD, TX 77477

53 5TH WARD INVESTMENTS
14623 LISCOMB
HOUSTON, TX 77084

RONY C AND GUADALUPE G RODRIGUEZ
4515 OATS ST
HOUSTON, TX 77020

SOUTH BY NORTHWEST LIMITED PARTNERSHIP
1529 MARYLAND ST.
HOUSTON, TX 77006

DANN HOOEY
24206 PARK GABLE DR.
SPRING, TX 77373

DAVID SANCHEZ 2316 ERASTUS ST. HOUSTON, TX 77020	SOUTH BY NORTHWEST LP 1529 MARYLAND ST. HOUSTON, TX 77006	HOUSTON HABITAT FOR HUMANITY INC. 3750 N. MCCARTY ST. HOUSTON, TX 77029
HOUSTON HABITAT FOR HUMANITY INC. 3750 N. MCCARTY ST. HOUSTON, TX 77029	SINGH REAL ESTATE MANAGEMENT LLC 12515 SOUTH NANAKSAR DR. HOUSTON, TX 77041	SINGH REAL ESTATE MANAGEMENT LLC 12515 SOUTH NANAKSAR DR. HOUSTON, TX 77041
SINGH REAL ESTATE MANAGEMENT LLC 12515 SOUTH NANAKSAR DR. HOUSTON, TX 77041	SINGH REAL ESTATE MANAGEMENT LLC 12515 SOUTH NANAKSAR DR. HOUSTON, TX 77041	SINGH REAL ESTATE MANAGEMENT LLC 12515 SOUTH NANAKSAR DR. HOUSTON, TX 77041
LYNN BOLING 410 AVENUE OF OAKS ST. HOUSTON, TX 77009	KINGDOM CAPITAL INVESTMENTS LLC 11911 CHURCHILL COURT LN. HOUSTON, TX 77024	SOUTH BY NORTHWEST LTD 1529 MARYLAND ST. HOUSTON, TX 77006
SOUTH BY NORTHWEST LIMITED PARTNERSHIP 1529 MARYLAND ST. HOUSTON, TX 77006	SOUTH BY NORTHWEST LTD 1529 MARYLAND ST. HOUSTON, TX 77006	GREAT MT. SHARON MISSIONARY BAPTIST CHURCH 4722 LEE ST. HOUSTON, TX 77020
GREGORY K. & KAREN D. RICHARD 4800 LEE ST. HOUSTON, TX 77020	SOUTH BY NORTHWEST LTD 1529 MARYLAND ST. HOUSTON, TX 77006	FIFTH WARD URBAN HOMES 9 SANDLILIY CT SUITE 100 SPRING, TX 77380
3 STRIPES MANAGEMENT LLC 9815 WILLOW CROSSING DR. HOUSTON, TX 77064	3 STRIPES MANAGEMENT LLC 9815 WILLOW CROSSING DR. HOUSTON, TX 77064	3 STRIPES MANAGEMENT LLC 9815 WILLOW CROSSING DR. HOUSTON, TX 77064
3 STRIPES MANAGEMENT LLC 9815 WILLOW CROSSING DR. HOUSTON, TX 77064	3 STRIPES MANAGEMENT LLC 9815 WILLOW CROSSING DR. HOUSTON, TX 77064	3 STRIPES MANAGEMENT LLC 9815 WILLOW CROSSING DR. HOUSTON, TX 77064
3 STRIPES MANAGEMENT LLC 9815 WILLOW CROSSING DR. HOUSTON, TX 77064	3 STRIPES MANAGEMENT LLC 9815 WILLOW CROSSING DR. HOUSTON, TX 77064	3 STRIPES MANAGEMENT LLC 9815 WILLOW CROSSING DR. HOUSTON, TX 77064
3 STRIPES MANAGEMENT LLC 9815 WILLOW CROSSING DR. HOUSTON, TX 77064	SOUTH BY NORTHWEST LTD 1529 MARYLAND ST. HOUSTON, TX 77006	SOUTH BY NORTHWEST LTD 1529 MARYLAND ST. HOUSTON, TX 77006

ESTATE OF RENDIE EDWARDS
ESTATE OF JEFF EDWARDS
5010 LEE ST.
HOUSTON, TX 77020

CORNELL HARRIS
6210 DARLINGHURST DR.
HOUSTON, TX 77085

L. WHITAKER JR.
5102 LEE ST.
HOUSTON, TX 77020

WILLIAM E. JOHNSON
4903 LEFFINGWELL ST.
HOUSTON, TX 77026

RAMOS DEVELOPMENT LLC
1411 STORY ST
HOUSTON, TX 77055

GEORGE ABDELMESSIH
4307 DELHI ST
HOUSTON, TX 77022

SOUTH BY NORTHWEST LTD
1529 MARYLAND ST.
HOUSTON, TX 77006

SOUTH BY NORTHWEST LTD
1529 MARYLAND ST.
HOUSTON, TX 77006

DAVID SANCHEZ
2316 ERASTUS ST.
HOUSTON, TX 77020

SOUTH BY NORTHWEST LTD
1529 MARYLAND ST.
HOUSTON, TX 77006

SOUTH BY NORTHWEST LTD
1529 MARYLAND ST.
HOUSTON, TX 77006

SOUTH BY NORTHWEST LIMITED PARTNERSHIP
1529 MARYLAND ST.
HOUSTON, TX 77006

ALBERT J. ZARZANA
12322 KIMBERLEY LN.
HOUSTON, TX 77024

GLORIA EATMON
5301 LEE ST.
HOUSTON, TX 77020

SOUTH BY NORTHWEST LIMITED PARTNERSHIP
1529 MARYLAND ST.
HOUSTON, TX 77006

EDISON A. BROOKS
7727 MILEY ST.
HOUSTON, TX 77028

FORTINO AND M. CONSUELO SALDANA
2316 ERASTUS ST.
HOUSTON, TX 77020

MARISA S. KREITZ
5302 SUEZ ST.
HOUSTON, TX 77020

SOUTH BY NORTHWEST LIMITED PARTNERSHIP
1529 MARYLAND ST.
HOUSTON, TX 77006

LYRIC ENTERPRISES LLC
17515 SPRING CYPRESS RD STE C702
CYPRESS, TX 77429

MARCOS AND MIREYRA REYES
2418 ERASTUS ST.
HOUSTON, TX 77020

ISAAC CARTER REV ESTATE
5938 HYACINTH PATH WAY
HOUSTON, TX 77049

SOUTH BY NORTHWEST LTD
1529 MARYLAND ST.
HOUSTON, TX 77006

MANUEL ALFARO JR
2419 LOCKWOOD DR
HOUSTON, TX 77020

JOYCE M. BRYAN
10910 BRIDLEPARK CIR.
HOUSTON, TX 77016

SOUTH BY NORTHWEST LIMITED PARTNERSHIP
1529 MARYLAND ST.
HOUSTON, TX 77006

FELICITA RUBIO
119 JENKINS ST
HOUSTON, TX 77020

GEORGE SAMUEL
4614 WIPPRECHT ST.
HOUSTON, TX 77026

HAROLD J HENRY
PO BOX 11715
HOUSTON, TX 77293

GEORGE SAMUEL
2522 HARLEM ST.
HOUSTON, TX 77020

recordation of the removal of the wastes from the surface impoundment in accordance with the closure plan approved by the Texas Department of Water Resources in 1984. A copy of that Deed Notice is included as Attachment II.G.6.

7. If a surface impoundment or landfill (including post-closure) is to be permitted, provide exposure information to accompany this application and in accordance with 30 TAC 305.50(a)(8) and 40 CFR 270.10(j). This information will be considered separately from the TCEQ application completeness determination.

   Not Applicable – Hazardous waste is not stored, treated or disposed in the closed surface impoundment. In 1984 surface impoundment was closed by excavating the soils and materials contained within. Groundwater at the SWMU No. 1 is in corrective action monitoring.

8. For a requested capacity expansion of an existing hazardous waste management facility, please provide in Section VI.A.1.a the requested fault delineation information. [30 TAC 305.50(a)(4)(F)]

   Not Applicable

Attachment I.H

UPDATED CORE DATA FORM

Union Pacific Houston Wood Preserving Works
Houston, Texas

TCEQ Core Data Form

TCEQ Use Only

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission (If other is checked please describe in space provided.)

☐ New Permit, Registration or Authorization (Core Data Form should be submitted with the program application.)

☐ Renewal (Core Data Form should be submitted with the renewal form) ☒ Other Updating Regulated Entity Contact Info

2. Customer Reference Number (if issued)	Follow this link to search for CN or RN numbers in Central Registry**	3. Regulated Entity Reference Number (if issued)
CN 600131098		RN 100674613

SECTION II: Customer Information

4. General Customer Information	5. Effective Date for Customer Information Updates (mm/dd/yyyy)	

☐ New Customer ☐ Update to Customer Information ☐ Change in Regulated Entity Ownership

☐ Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)

The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).

6. Customer Legal Name (If an individual, print last name first: e.g.: Doe, John)	If new Customer, enter previous Customer below:

7. TX SOS/CPA Filing Number	8. TX State Tax ID (11 digits)	9. Federal Tax ID (9 digits)	10. DUNS Number (if applicable)

11. Type of Customer:	☐ Corporation	☐ Individual	Partnership: ☐ General ☐ Limited
Government: ☐ City ☐ County ☐ Federal ☐ State ☐ Other		☐ Sole Proprietorship	☐ Other:

12. Number of Employees	13. Independently Owned and Operated?
☐ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ☐ 501 and higher	☐ Yes ☐ No

14. Customer Role (Proposed or Actual) - as it relates to the Regulated Entity listed on this form. Please check one of the following:

☐ Owner ☐ Operator ☐ Owner & Operator

☐ Occupational Licensee ☐ Responsible Party ☐ Voluntary Cleanup Applicant ☐ Other:

15. Mailing Address:							
	City		State		ZIP		ZIP + 4

16. Country Mailing Information (if outside USA)	17. E-Mail Address (if applicable)

18. Telephone Number	19. Extension or Code	20. Fax Number (if applicable)
( ) -		( ) -

SECTION III: Regulated Entity Information

21. General Regulated Entity Information (If "New Regulated Entity" is selected below this form should be accompanied by a permit application)

☐ New Regulated Entity ☐ Update to Regulated Entity Name ☒ Update to Regulated Entity Information

The Regulated Entity Name submitted may be updated in order to meet TCEQ Agency Data Standards (removal of organizational endings such as Inc, LP, or LLC).

22. Regulated Entity Name (Enter name of the site where the regulated action is taking place.)

23. Street Address of the Regulated Entity: (No PO Boxes)							
	City		State		ZIP		ZIP + 4	
24. County							

Enter Physical Location Description if no street address is provided.

25. Description to Physical Location:							
26. Nearest City				State		Nearest ZIP Code	

27. Latitude (N) In Decimal:			28. Longitude (W) In Decimal:		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds

29. Primary SIC Code (4 digits)	30. Secondary SIC Code (4 digits)	31. Primary NAICS Code (5 or 6 digits)	32. Secondary NAICS Code (5 or 6 digits)

33. What is the Primary Business of this entity? (Do not repeat the SIC or NAICS description.)

34. Mailing Address:	4823 N. 119th Street						
	City	Milwaukee	State	WI	ZIP	53225	ZIP + 4	
35. E-Mail Address:							

36. Telephone Number	37. Extension or Code	38. Fax Number (if applicable)
(414) 267 - 4164		( ) -

39. **TCEQ Programs and ID Numbers** Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Emissions Inventory Air	☒ Industrial Hazardous Waste
				31547
☐ Municipal Solid Waste	☐ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS
☐ Sludge	☐ Storm Water	☐ Title V Air	☐ Tires	☐ Used Oil
☐ Voluntary Cleanup	☐ Waste Water	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name:	Kevin Peterburs		41. Title: Manager, Env Site Remediation
42. Telephone Number	43. Ext./Code	44. Fax Number	45. E-Mail Address
(414) 267 - 4164		( ) -	kjpeterb@up.com

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	Union Pacific Railroad	Job Title:	Manager, Env Site Remediation
Name(*In Print*):	Kevin Peterburs	Phone:	(414)267-4164
Signature:	Kevin Peterburs	Date:	2-20-18

II. Facility Siting Criteria

For all new hazardous waste management facilities or areal expansions of existing hazardous waste management facilities provide a Site Selection Report for the facility which includes all information regarding Unsuitable Site Characteristics found in 30 TAC 335 Subchapter G. The report must address each requirement applicable to the type of activity submitted in the application. Reference specific rule numbers whenever possible. Supporting information may be cross-referenced to other parts of this application such as Section V - Engineering Report or Section VI - Geology Report, but information submitted in previous applications must be fully reproduced herein. In addition, provide the information in Sections II.A through II.G below.

For permit renewals provide a Site Selection Report for the facility which includes all information regarding Unsuitable Site Characteristics found in 30 TAC 335 Subchapter G. In addition, provide the information in Sections II.A through II.B below. The applicant may resubmit the information submitted with the original permit application provided this information has not changed. For a renewal this information is necessary to ensure a complete application is received.

Not Applicable – Closed Surface Impoundment was closed.

Existing hazardous waste management facilities and capacity expansions of existing facilities need only complete Section II.F. and the applicable portions of II.G. Please note however, that additional technical information may be requested to address any facility siting characteristics noted in Section I.E.

A. Requirements for Storage or Processing Facilities, Land Treatment Facilities, Waste Piles, Storage Surface Impoundments, and Landfills.

Is the facility located or proposed to be located:

1. in wetlands? [as applicable: 30 TAC 335.204(a)(2), (b)(2), (c)(2), (d)(2), and/or (e)(2)]
☐ Yes ☒ No

   Provide the source of information.

   According to the US Fish and Wildlife Service Wetlands Mapper (http://www.fws.gov/wetlands/Data/Mapper.html), no wetlands are located on or near the Site.

If Yes, the TCEQ shall not issue a permit for a new hazardous waste management facility or areal expansion of an existing facility into wetlands, pursuant to 30 TAC 335.205(a)(1).

2. in the critical habitat of an endangered species of plant or animal? [as applicable: 30 TAC 335.204(a)(8), (b)(10), (c)(9), (d)(9), and/or (e)(11)]
☐ Yes ☒ No

   Provide the source of information.

   No appreciable ecological habitat is located at the Site.

If Yes, then submit in Section V information demonstrating that design, construction, and operational features will prevent adverse effects on such critical habitat.

3. on the recharge zone of a sole-source aquifer? [30 TAC 335.204(a)(3), (b)(3), (c)(3), (d)(3), and/or (e)(3)]
☐ Yes ☒ No

Provide the source of the information.

According the EPA Region 6, the Site does not overlie a sole-source aquifer (http://www.epa.gov/region6/water/swp/ssa/index.htm).

If Yes, then for storage and processing facilities (excluding storage surface impoundments), submit in Section V information demonstrating that secondary containment is provided to preclude migration to groundwater from spills, leaks, or discharges.

Note: Land treatment facilities, waste piles, storage surface impoundments, and landfills may not be located on the recharge zone of a sole-source aquifer.

4. in an area overlying a regional aquifer? [as applicable: 30 TAC 335.204(a)(4), (b)(4), (c)(4), (d)(4), and/or (e)(4)]
☒ Yes ☐ No

Provide the source of information.

See Section VI of the Permit Renewal Application.

If Yes, then submit site-specific information in Section V and/or Section VI demonstrating compliance with 30 TAC 335.205(a)(1).

5. in areas where soil unit(s) are within five feet of the containment structure, or treatment zone, as applicable, that have a Unified Soil Classification of GW, GP, GM, GC, SW, SP, or SM, or a hydraulic conductivity greater than 10-5 cm/sec? [as applicable: 30 TAC 335.204(a)(5), (b)(5), (c)(5), (d)(5), and/or (e)(5)]
☐ Yes ☒ No

Provide information to verify the above.

According to the United States Department of Agriculture Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx), the Site is underlain by Urban Land.

If Yes, then provide additional information in Sections V and/or Section VI demonstrating compliance with 30 TAC 335.205(a)(1)

6. in areas of direct drainage within one mile of a lake at its maximum conservation pool level, if the lake is used to supply public drinking water through a public water system? [as applicable: 30 TAC 335.204 (a)(6), (b)(7), (c)(6), and/or (e)(8)].
☐ Yes ☒ No

Provide information to verify the above.

The nearest surface water body to the Site is Buffalo Bayou, located approximately 1.6 miles to the southwest. See Section VI of the Permit Renewal Application for more information.

If Yes, then provide information in Section V demonstrating compliance with 30 TAC 335.205(a)(1).

7. in areas of active geologic processes, including but not limited to erosion, submergence, subsidence, faulting, karst formation, flooding in alluvial flood wash zones, meandering river bank cuttings, or earthquakes? [as applicable: 30 TAC 335.204(a)(7), (b)(8) ,(c)(7), (d)(7),

and/or (e)(9)]
☐ Yes ☒ No

Provide the source of the information.

See Section VI of the Permit Renewal Application.

If Yes, then specify in Section V the design, construction, and operational features of the facility that will prevent adverse effects resulting from the geologic processes.

8. within 30 feet of the upthrown side or 50 feet of the downthrown side of the actual or inferred surface expression of a fault that has reasonably been shown to have caused displacement of shallow Quaternary sediments or of man-made structures? [as applicable: 30 TAC 335.204(a)(9), (b)(12) ,(c)(11), (d)(11), and/or (e)(13)]
☐ Yes ☒ No

Provide the source of information.

See Section VI of the Permit Renewal Application.

If Yes, then specify in Section V the design, construction, and operational features that will prevent adverse effects resulting from any fault movement.

If a fault is found to be present, the width and location of the actual or inferred surface expression of the fault, including both the identified zone of deformation and the combined uncertainties in locating a fault trace, must be determined by a qualified geologist or geotechnical engineer and reported in Section VI.

B. Additional Requirements for Land Treatment Facilities [30 TAC 335.204(b)]

Not Applicable

Is the land treatment facility located or proposed to be located:

1. Within 1000 feet of an established residence, church, school, day care center, surface water body used for a public drinking water supply, or dedicated public park which is in use at the time the notice of intent to file a permit application is filed with the commission, or which is in use at the time the permit application is filed with the commission?
☐ Yes ☐ No

If Yes, the TCEQ shall not issue a permit for a new hazardous waste land treatment unit or an areal expansion of an existing land treatment unit, pursuant to 30 TAC 335.204(b)(6) and 335.205(a).

2. either
   a. within 1000 feet of an area subject to active coastal shoreline erosion even though the area is protected by a barrier island or peninsula?
   ☐ Yes ☐ No

If Yes, then submit in Section V.F design, construction, and operational features which will prevent adverse effects resulting from storm surge and erosion or scouring by water.

   b. within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barrier island or peninsula.
   ☐ Yes ☐ No

If Yes, then submit Section V.F design, construction and operational features, which will prevent adverse effects resulting from storm surge and erosion or scouring by water.

3. on a barrier island or peninsula?
☐ Yes ☐ No

If Yes, the TCEQ shall not issue a permit for a new hazardous waste land treatment unit or an areal expansion of an existing land treatment unit, pursuant to 30 TAC 335.204(b)(11) and 335.205(a)(1).

C. Additional Requirements for Waste Piles [30 TAC 335.204(c)]

Not Applicable

Is the waste pile located or proposed to be located:

1. either
   a. within 1000 feet of an area subject to active coastal shoreline erosion even though the area is protected by a barrier island or peninsula?
   ☐ Yes ☐ No

If Yes, then submit in Section V.E design, construction, and operational features on the facility which will prevent adverse effects resulting from storm surge and erosion or scouring by water.

   b. within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barrier island or peninsula.
   ☐ Yes ☐ No

If Yes, then submit Section V.E design, construction, and operational features which will prevent adverse effects resulting from storm surge and erosion or scouring by water.

2. on a barrier island or peninsula?
☐ Yes ☐ No

If Yes, the TCEQ shall not issue a permit for a new hazardous waste pile or an areal expansion of an existing waste pile, pursuant to 30 TAC 335.204(c)(10) and 335.205(a)(1).

D. Additional Requirements for Storage Surface Impoundments [30 TAC 335.204(d)]

Is the storage surface impoundment located or proposed to be located:

1. either
   c. within 1000 feet of an area of active coastal shoreline erosion even though the area is protected by a barrier island or peninsula?
   ☐ Yes ☒ No

If Yes, then submit in Section V.D design, construction and operational features of the facility which will prevent adverse effects resulting from storm surge and erosion or scouring by water.

   d. within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barrier island or peninsula?
   ☐ Yes ☒ No

If Yes, then submit in Section V.D design, construction and operational features which will prevent adverse effects resulting from storm surge and erosion or scouring by water.

2. on a barrier island or peninsula?
☐ Yes ☒ No

If Yes, the TCEQ shall not issue a permit for a new hazardous waste storage surface impoundment or an areal expansion of an existing storage surface impoundment, pursuant to 30 TAC 335.204(d)(10) and 335.205(a)(1).

E. Additional Requirements for Landfills (and Surface Impoundments Closed as Landfills with Wastes in Place)

Not Applicable

Is the landfill located or proposed to the located:

1. within 1000 feet of an established residence, church, school, day care center, surface water body used for a public drinking water supply, or dedicated public park which is in use at the time the notice of intent to file a permit application is filed with the commission, or which is in use at the time the permit application is filed with the commission?
☐ Yes ☐ No

If Yes, the TCEQ shall not issue a permit for a new hazardous waste landfill or an areal expansion of an existing landfill, pursuant to 30 TAC 335.204(e)(6) and 335.205(a)(1).

2. (*for commercial hazardous waste landfills*) in the 100-year flood plain of a perennial stream that is delineated on a flood map adopted by the Federal Emergency Management Agency after September 1, 1985, as zone A1-99, VO, or V1-30?
☐ Yes ☐ No

If Yes, the TCEQ shall not issue a permit for a new hazardous waste landfill or an areal expansion of an existing landfill, pursuant to 30 TAC 335.204(e)(7) and 335.205(a)(1).

3. Either
   a. Within 1000 feet of an area subject to active coastal shoreline erosion even though the area is protected by a barrier island or peninsula?
   ☐ Yes ☐ No

If Yes, then submit in Section V.G design, construction, and operational features which will prevent adverse effects resulting from storm surge and erosion or scouring by water.

   b. Within 5000 feet of a coastal shoreline subject to active shoreline erosion and which is unprotected by a barriers island or peninsula.
   ☐ Yes ☐ No

If Yes, then submit in Section V.G design, construction, and operational features which will prevent adverse effects resulting from storm surge and erosion or scouring by water.

4. On a barrier island or peninsula?
☐ Yes ☐ No

If Yes, the TCEQ shall not issue a permit for a new hazardous waste landfill or an areal expansion of an existing landfill, pursuant to 30 TAC 335.204(e)(12) and 335.205(a)(1).

F. Flooding

1. Identify whether the facility is located within a 100-year flood plain [40 CFR 270.14(b)(11)(iii)]. This identification must indicate the source of data for such determination and include a copy of relevant documentation (e.g., flood maps, if used and/or calculations). The boundaries of the hazardous waste management facility must be shown on the flood plain map. If the facility is not subject to inundation as a result of a 100-year flood event, do not complete F.2. through F.4. below. An applicant for a proposed hazardous waste landfill, areal expansion of a hazardous waste landfill, or a commercial hazardous waste land disposal unit may not rely solely on flood plain maps prepared by the Federal Emergency Management Agency (FEMA) or a successor agency for this determination.

According to the June 9, 2014 Federal Emergency Management Agency Flood Insurance Rate Map (Map Number 48201C0690M), the facility is not located within the 100-year flood plain. The northern portion of the facility is identified as being located in an area with 0.2% chance of flooding annually. The southern portion of the Site is in an area of minimal flood hazard. Figure II.F.1 included in the attached Section II.F shows the boundaries of the facility within the flood plain map.

2. If the facility is located within the 100-year flood plain the applicant must provide information detailing the specific flooding levels and other events (e.g., Design Hurricane projected by Corps of Engineers) which impact the flood protection of the facility. Information shall also be provided identifying the 100-year flood level and any other special flooding factors (e.g., wave action) which must be considered in designing, construction, operating, or maintaining the facility to withstand washout from a 100-year flood.

   Not Applicable

3. State whether any flood protection devices exist at the facility (e.g., flood walls, dikes, etc.), designed to prevent washout from the 100-year flood.
   a. ***If Yes***, provide in Section V an engineering analysis to indicate the various hydrodynamic and hydrostatic forces expected to result at the facility as a consequence of a 100-year flood. [40 CFR 270.14(b)(11)(iv)(A)]

      Include structural or other engineering studies showing the design of operational units (e.g., tanks, incinerators) and flood protection devices (e.g., flood walls, dikes) at the facility and how these will prevent washout. [40 CFR 270.14(b)(11)(iv)(B)]

   b. ***If No***, the applicant shall provide in Section V a plan for constructing flood protection devices and a schedule including specific time frames for completion. Provide engineering analyses to indicate the various hydrodynamic and hydrostatic forces expected to result at the facility as a consequence of a 100-year flood. [40 CFR 270.14(b)(11)(iv)(A)]

      Include structural or other engineering studies showing the design of operational units (e.g., tanks, incinerators) and flood protection devices (e.g., flood walls, dikes) at the facility and how these will prevent washout. [40 CFR 270.14(b)(11)(iv)(B)]

   Not Applicable

4. If applicable, and in lieu of the flood protection devices from above, provide a detailed description of the procedures to be followed to remove hazardous waste to safety before the facility is flooded. [40 CFR 270.14(b)(11)(iv)(c)] The procedures should include:
   a. Timing of such movement relative of flood levels, including estimated time to move the waste, to show that such movement can be completed before flood waters reach the facility. Indicate which specific events shall be use to begin waste movement (e.g., Hurricane warning, Flash Flood watch, etc.);
   b. A description of the location(s) to which the waste will be moved and a demonstration that these facilities will be eligible to receive hazardous waste in accordance with appropriate regulations (i.e., a permitted facility);
   c. The planned procedures, equipment, and personnel to be used and the means to ensure that such resources will be available in time for use; and

d. The potential for accidental discharges of the waste during movement and precautions taken to preclude accidental discharges.

Not Applicable

G. Additional Information Requirements

1. For a new hazardous waste management facility, include a map of relevant local land-use plans and descriptions of the major routes of travel in the vicinity of the facility to be used for the transportation of hazardous waste to and from the facility covering at least a five (5)-mile radius from the boundaries of the facility. [30 TAC 305.50(a)(10)(A)&(D)]

   Not Applicable

2. For a new commercial hazardous waste management facility as defined in 30 TAC 335.202 or the subsequent areal expansion of such a facility or unit of that facility, indicate on the map the nearest established residence, church, school, day care center, surface water body used for a public drinking water supply, and dedicated public park.

   Not Applicable

3. For new commercial hazardous waste management facilities, submit the following: [30 TAC 305.50(a)(12)(A)]
   a. the average number, gross weight, type, and size of vehicles used to transport hazardous waste;
   b. the major highways nearest the facility irrespective of distance; and
   c. the public roadways used by vehicles traveling to and from the facility within a minimum radius of 2.5 miles from the facility.

   Not Applicable

4. Include the names and locations of industrial and other waste-generating facilities within 0.5 miles for a new on-site hazardous waste management facility and the approximate quantity of hazardous waste generated or received annually at those facilities. [30 TAC 305.50(a)(10)(B)&(C)]

   Not Applicable

5. Include the names and locations of industrial and other waste-generating facilities within 1.0 miles for a new commercial hazardous waste management facility and the approximate quantity of hazardous waste generated or received annually at those facilities. [30 TAC 305.50(a)(10)(B)&(C)]

   Not Applicable

6. For existing land disposal facility units provide documentation that the information required by 30 TAC 335.5 has been placed in the county deed records. If previously submitted, please reference the submittal by date and registration number.

   Submitted as part of the original Permit Application in May 1991 was the deed

recordation of the removal of the wastes from the surface impoundment in accordance with the closure plan approved by the Texas Department of Water Resources in 1984. A copy of that Deed Notice is included as Attachment II.G.6.

7. If a surface impoundment or landfill (including post-closure) is to be permitted, provide exposure information to accompany this application and in accordance with 30 TAC 305.50(a)(8) and 40 CFR 270.10(j). This information will be considered separately from the TCEQ application completeness determination.

   Not Applicable – Hazardous waste is not stored, treated or disposed in the closed surface impoundment. In 1984 surface impoundment was closed by excavating the soils and materials contained within. Groundwater at the SWMU No. 1 has achieved TCEQ Remedy Standard A response action objectives. Based on the removal of the wastes from the unit, including the clay liner, and groundwater that meets Remedy Standard A, there are no potential pathways of human exposure to hazardous wastes or constituents resulting from documented releases related to SWMU No. 1.

8. For a requested capacity expansion of an existing hazardous waste management facility, please provide in Section VI.A.1.a the requested fault delineation information. [30 TAC 305.50(a)(4)(F)]

   Not Applicable

II. FACILITY SITING CRITERIA

FACILITIY SITING CRITERIA
PART B PERMIT APPLICATION
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

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II.F. FLOODING

According to the June 9, 2014 Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (Map Number 48201C0690M), the facility is not located within the 100-year flood plain. The northern portion of the facility is identified as being located in an area with 0.2% chance of flooding annually. The southern portion of the Site is in an area of minimal flood hazard. Figure II.F.1 shows the boundaries of the facility within the flood plain map (FEMA, 2014).

II.G. ADDITIONAL INFORMATION REQUIREMENTS

II.G.7. Exposure Information

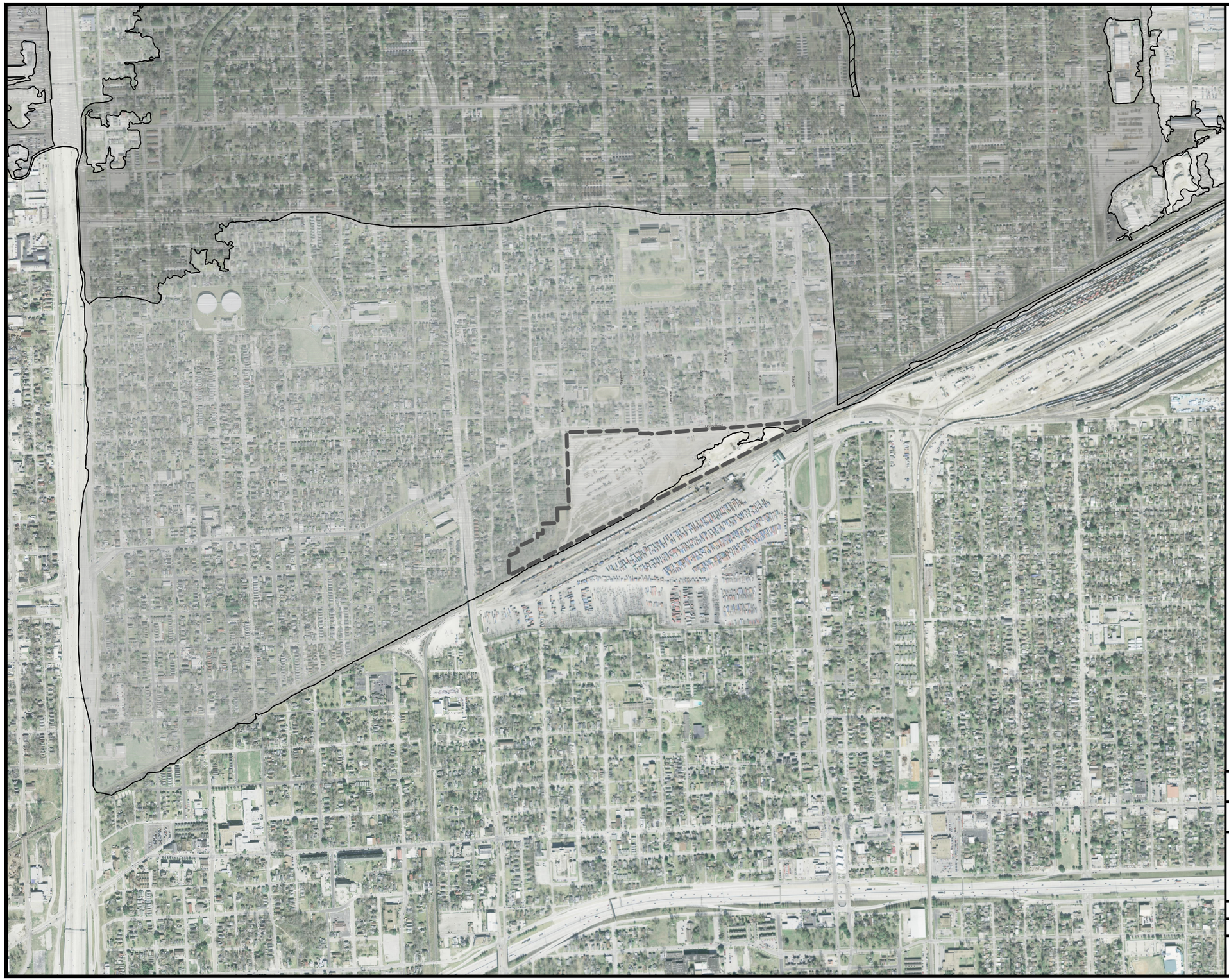
Hazardous waste is not stored, treated or disposed in the closed surface impoundment. In 1984 the surface impoundment was closed by excavating the soils and materials previously placed in the unit. The facility then began investigating and monitoring the shallow ground water in the vicinity of the surface impoundment. Between 1984 and 1991, nine groundwater monitoring wells were installed in the upper zone, and three piezometers were installed in the lower permeable zone. Hydrogeological data collected from these wells and piezometers indicate hydraulic conductivity between the zones. Analytical data compiled from 1984 until 1991 indicated that benzene, toluene, naphthalene, 2,4-dimethylphenol, and phenol were the most frequently detected parameters and that naphthalene was the parameter detected at the highest concentrations.

The facility entered into post-closure care in 1994, updated in 2005, and groundwater monitoring has taken place on a semi-annual basis since that time. Constituent concentrations in groundwater at RCRA-Regulated Waste Management Unit 001 (SWMU 1) were below their respective groundwater protective standards (GWPS) between 2006 and 2019, compliant with the TCEQ Remedy Standard A requirements for groundwater protection. Naphthalene was detected above the GWPS at one of the point of compliance (POC) wells in July 2019 and verified in October 2019, but returned to below GWPS in January 2020. RCRA-Regulated Waste Management Unit 001 (SWMU 1) will remain in the corrective action program until concentrations in the POC wells are below respective GWPS for three consecutive years in accordance with Section IV.F.3 of the Compliance Plan.

II.H. REFERENCES

Federal Emergency Management Agency (FEMA), 2014. *Flood Insurance Rate Map, Harris County, Texas and Incorporated Areas, Panel 690 of 1150*. Map No. 48201C0960M. June 9.

FIGURES



EXPLANATION

- UPRR Facility Boundary
- 100 Yr Flood Plain - Zone AE (1% Annual Chance Flood Event)
- Floodway Areas in Zone AE
- Other Flood Areas - Zone X (0.2% Annual Chance Flood)

Note:
Source of Flood Plain Area, http://www.fema.gov, FIRM map # 48201C0690M, Harris County, 2014.

N

Approx. Scale in Feet

0 500 1000

Source:
Base map from ERM-Southwest, Inc APAR Addendum, Fig 3-1, dated June 2004.

UNION PACIFIC RAILROAD CO.

HOUSTON WOOD PRESERVING WORKS

Figure II.F.1

FLOODPLAIN MAP

PROJECT: 1358	BY: AJD	REVISIONS
DATE: NOV., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

ATTACHMENT II.G.6

DEED RECORDATION

J601672

C88-87-1494

Pat
A. P. Campbell
P.O Box 1319
Houston, Tx. 77251

NOTICE

COUNTY OF HARRIS

STATE OF TEXAS

07/16/84 9027672 J601672 1 3.00

Notice is hereby given that the environmental project of removal of hazardous wastes, clean up of the waste pond's clay lining and backfill of clean material and all necessary soil analyses on the following described premises:

Waste material pond in the most southwesterly corner of the Southern Pacific Wood Preserving Works property at 4918 Liberty Road

Has in accordance with certain contract between Rollins Environmental Services and Southern Pacific Transportation Company has been completed on the 26th day of April, 1984.

Dated: July 9, 1984
Owner: SOUTHERN PACIFIC TRANSPORTATION COMPANY
By: A. P. Campbell
Title: Asst. Eng. Engr.

A. P. Campbell

State of Texas
County of Harris

This instrument was acknowledged before me on July 9, 1984 (date)
by A. P. Campbell (name or names of person or persons acknowledging).

SEAL

R. B. SPRINGER, Notary Public
State of Texas
Comm. Expires 3/31/88

Notary Public in and for
The State of Texas

R. B. SPRINGER, Notary Public
State of Texas

Printed name of Notary

My Commission expires:

C88-87-1432

III. Facility Management

A. Compliance History and Applicant Experience

See the attached report for specific information regarding the Compliance History and Applicant Experience.

Provide listings of all solid waste management sites in Texas owned, operated, or controlled by the applicant as required by 30 TAC 305.50(a)(2).

For a new commercial hazardous waste management facility, provide a summary of the applicant's experience in hazardous waste management as required by 30 TAC 305.50(a)(12)(F).

B. Personnel Training Plan

Not Applicable – This application is a renewal of a post-closure application for a closed unit.

Provide an outline of the facility training plan which includes all the information required by 40 CFR 264.16. Indicate which training will be repeated annually.

C. Security

See the attached report for specific information regarding the plan for Site security.

Describe how the facility complies with the security requirements of 40 CFR 264.14 or submit a justification demonstrating the reasons for requesting a waiver of these requirements.

D. Inspection Schedule

See the attached report for specific information regarding the Site inspection schedule.

Provide an inspection schedule summary for the facility which reflects the requirements of 40 CFR 264.15(b), 264.33 and, where applicable, the specific requirements in 40 CFR 264.174, 264.193(i), 264.195, 264.226, 264.254, 264.273, 264.303, 264.347, 264.552, 264.574, 264.602, 264.1033(f), 264.1034, 264.1052, 264.1053(e), 264.1057, 264.1058, 264.1063, 264.1084, 264.1085, 264.1086, 264.1088, 264.1101(c)(4) and 270.14(b)(5). The inspection schedule should reflect the requirements described below. The schedule should encompass each type of hazardous waste management (HWM) unit (i.e., facility component) and its inspection requirements. For incorporation into a permit, complete Table III.D. - Inspection Schedule for all units to be permitted.

The owner or operator must inspect the facility for malfunctions and deterioration, operator errors, and discharges which may be causing or may lead to the release of hazardous waste constituents to the environment or which may pose a threat to human health. The owner or operator must conduct these inspections often enough to identify problems in time to correct them before they harm human health or the environment.

The owner or operator must develop and follow a written schedule for inspecting other basic elements such as monitoring equipment, safety and emergency equipment, security devices, the presence of liquids in leak detection systems, where installed, and operating and structural equipment (such as dikes and sump pumps) that are important to preventing, detecting, or responding to environmental or human health hazards.

If the owner or operator of a facility which contains a waste pile wishes to pursue an exemption from the groundwater monitoring requirements for that waste management unit, the inspection schedule must

include examination of the base for cracking, deterioration, or other conditions that may result in leaks. The frequency of inspection must be based on the potential for the liner (base) to crack or otherwise deteriorate under the conditions of operation (e.g., waste type, rainfall, loading rates, and subsurface stability).

E. Contingency Plan

Not Applicable – This application is a renewal of a post-closure application for a closed unit at an inactive facility.

(This portion of the application does not apply to post closure applications.) If the owner or operator has already prepared a Spill Prevention, Control, and Countermeasures (SPCC) Plan or some other emergency or contingency plan, he need only amend that plan to incorporate hazardous waste management provisions that are sufficient to comply with the requirements of this section. Provide a Contingency Plan which includes all the information required by 40 CFR Part 264 Subparts C and D, except for 40 CFR 264.56(d)(1) and 30 TAC 335.153(2). This plan must also include a drawing of the facility which shows the location of all emergency equipment. In addition, complete the following tables to summarize information expressed in more detail in the plan.

1. Arrangements with Local Authorities

   Complete Table III.E.1. - Arrangements With Local Authorities to indicate arrangements (if made) with local authorities to familiarize local fire and police departments, local hospitals, equipment suppliers, and local and State emergency response teams with the layout of the facility, properties of hazardous waste handled at the facility and associated hazards, places where facility personnel would normally be working, entrances to and roads inside the facility, and possible evacuation routes. Provide documentation of the attempts and any arrangements made with local authorities and emergency response teams.

2. Emergency Coordinator's List

   For inclusion into a permit, list in Table III.E.2. - Emergency Coordinators the persons qualified to act as emergency coordinator. List the alternates in the order in which they will assume responsibility.

3. Emergency Equipment List

   For inclusion into a permit, list in Table III.E.3. - Emergency Equipment all types of emergency equipment at the facility [such as fire-extinguishing systems, spill-control equipment, communications and alarm systems (internal and external), and decontamination equipment], if this equipment is required. Briefly outline the equipment capabilities.

4. Waiver from Preparedness and Prevention Requirements

   If the owner or operator wishes to request a waiver from any of the preparedness and prevention requirements, he must submit a justification demonstrating the reasons for requesting the waiver, as discussed below.

F. Emergency Response Plan

Not Applicable – This application is a renewal of a post-closure application for a closed unit at an inactive facility.

For a new commercial hazardous waste management facility, the application shall contain evidence sufficient to demonstrate that emergency response capabilities are available or will be available before the facility first receives waste. An emergency response plan must be provided which satisfies the requirements of 30 TAC 305.50(a)(12)(C) and (D). This plan must show that the proposed facility has sufficient emergency response capabilities for managing a reasonable worst-case emergency condition associated with the operation of the facility. (For financial assurance requirements associated with the emergency response activities, please see Section VIII.C.3.)

1. Practice Drills

   In addition to the contingency plan required under 40 Code of Federal Regulations Part 270.14(b)(7), provisions specifying procedures and timing of practice facility evacuation drills are required. Provide a description and a frequency for facility evacuation drills.

2. If a private corporation, municipality or county group will provide emergency response actions at the proposed facility, include a copy of the contract for this type of agreement with this application or state that documentation will be submitted before the facility accepts wastes.

3. Historical weather data for the area should be documented and submitted. Information regarding how emergency response operations may be affected by weather conditions should be included. (Local rainfall extremes, average rainfall amounts, average wind speeds and directions, potential for major weather events such as hurricanes, tornados, icy conditions, flash flooding etc., should be addressed.)

4. A definition of a worst-case emergency for the proposed facility should be described in the application. This worst-case emergency should take into account the possible complications involved with a facility emergency compounded by adverse weather conditions. It should also detail spills, fires, explosions, etc. This worst case scenario should be developed with the help of local governmental entities where possible. Emergency planning should include both unexpected emergencies and emergencies occurring as a result of a predictable event such as a flood or hurricane. For areas which are prone to hurricanes and flash flooding, the worst case which allows for a realistic situation should be used. For example, response teams should be well versed in reacting to events such as a 100-year flood.

5. A training program for personnel who will respond to these types of emergencies must be provided and must include the requirements described in OSHA Federal Register 1910 and EPA Federal Register 311, the Texas Hazard Communication Act, SARA Title III 302, 304, 311, 312, and 313. If emergency response actions are contracted out, the contracted employees must be properly trained and documentation of this training must be maintained on-site. All responders to emergencies at the proposed facility must be involved in training and drills at the facility in order to be thoroughly familiar with the facility and its operations.

6. The application must include a description and identification of first-responders (i.e. all pertinent facility personnel, local responders, and contractors). The duties of the facility employee who is to be the on-scene coordinator (OSC) must be described. Additional information must be provided detailing the OSC's role in the emergency response activities. This person must have the authority to commit the resources needed to carry out the Emergency Response Plan. His duties must be thoroughly described so that it is clear whether he will remain in control once the emergency response team arrives or whether he will relinquish control to another incident commander upon that person's arrival on the scene. Additionally, there must be a qualified OSC on-site or on call 24 hours a day. The name, address and phone numbers (home and work) of the OSC(s) must be listed in the Emergency

Response Plan. Where more than one person is listed, one must be named as the primary OSC and others must be listed in the order in which they will assume responsibility as alternates.

7. Local or regional emergency medical services or hospitals which have experience in hazardous materials training must be identified in the application. The names, addresses and phone numbers of the hospitals or medical centers should be listed here and updated as necessary. Additionally, maps showing the quickest routes to the medical services must be provided. A description of decontamination procedures for injured personnel prior to transport to medical services must also be provided. The decontamination and transport of injured people to appropriate medical centers must be included in the emergency evacuation training and drills.

8. A pre-disaster plan which includes training drills must be included in the application. This plan should include a schedule for staging evacuations of the facility and for emergency response training drills. At least two evacuations and two emergency response drills should occur annually. The plan should also include additional drills for responding to "predictable" emergencies such as floods and hurricanes. The plan must include the following (or must reference applicable sections of the Contingency Plan): a description of arrangements already in place with local authorities; emergency phone numbers; internal communication or alarm systems and proper alarm codes; a list of all types of emergency equipment at the facility, including a physical description and the capabilities of each item on the list, and the location of each item (a map would be useful here); a description of decontamination equipment; an evacuation plan including signals, evacuation routes and alternate evacuation routes; listing of pertinent first responder emergency phone numbers, and codes for other types of communication devices; and a description of actions that will be performed in the event that a "predictable" emergency occurs.

9. Describe the mechanism which will be used to notify first responders and appropriate local governmental entities that an emergency has occurred. Also describe the mechanism which will be used to notify all applicable governmental agencies when an incident occurs (i.e., TCEQ, Texas Parks and Wildlife, General Land Office, TCEQ Office of Air Quality, Texas Department of Health, and the Texas Railroad Commission).

10. Evidence must be provided that shows coordination with the Local Emergency Planning Committee (LEPC) and any local comprehensive emergency management plan. The applicants should be able to show compliance with SARA Title III.

11. Any medical response capabilities proposed for the facility property must be detailed in the application.

ATTACHMENT III.D
POST·CLOSURE INSPECTION SCHEDULE RECORD FORM
UNION PACIFIC RAILROAD HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS SWR NO. 31547, EPA ID TXD000820266

Inspection Date and Time: _____

Inspector's Name: _____

Inspector's Signature: _____

Facility Units(s) and Basic Elements	Possible Error, Malfunction, or Deterioration	Frequency of Inspection	Status	
			Acceptable	Unacceptable
Security Fencing	Damaged, broken/loose fencepost	Semi-annually & after storm/flood event		
	Loose or broken barbed wire			
	Damaged fence			
	Damaged gate			
	Inoperable gate locks			
Warning Signs	Missing, damaged or illegible signs	Same as above		
Surveyed Benchmarks	Benchmarks missing or damaged	Same as above		
Groundwater Monitor Wells	Well cap condition poor, broken, poor seal	Same as above		
	Lock function sticks, inoperable			
	Casing condition bent, torn, missing			
	Concrete pad cracked, broken, missing			
Final Cover and Cap	Settlement or subsidence	Same as above		
	Damage or erosion to clay cap			
	Erosion/undercutting at cap perimeters			
	Shrubs/trees with long root systems present			
Drainage Structures	Grass requires mowing, treatment or repairs	Same as above		
	Debris or sediment restrict flow			
	Erosion or undercutting			
	Inadequate drainage away from landfill cap			
Comments:				

Note: In accordance with 40 CFR 264.15(b) and (d), copies of the inspetion records will be maintained for at least three years from the date of inspection. Place of sotrage will be PBW, Round Rock, Texas.

III. FACILITY MANAGEMENT

FACILITY MANAGEMENT
PART B PERMIT APPLICATION
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

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LIST OF PART B APPLICATION FORM TABLES

III.A. COMPLIANCE HISTORY AND APPLICANT EXPERIENCE

Title 30 of the Texas Administrative Code (TAC) Chapter 305.50(2), and renewal application instructions require a listing of all solid waste management sites in Texas owned, operated or controlled by the applicant. The following is the only site owned by Union Pacific Railroad (UPRR) Company:

SWR #	Site Name	Location
31547	Union Pacific Railroad Houston Tie Plant	4910 Liberty Road, Houston, TX 77026

III.C. SECURITY

As required by 40 CFR 264.14, site access to the former Houston Wood Preserving Works (HWPW) facility is controlled by chain link fences approximately 6 feet in height with a 1-foot high top guard of barbed wire (3 horizontal wire lines). Warning signs of sufficient size to be legible from 25 feet were posted in sufficient number to be seen from any approach. The signs are labeled "Danger: Unauthorized Personnel Keep Out" and alternate between English and Spanish. Access is gained by an entry gate. The gate is locked and keys are held by UPRR personnel.

III.D. INSPECTION SCHEDULE

Specific components will be inspected and maintained at the facility during corrective action monitoring activities. Components to be inspected and maintained include the vegetative cover, the groundwater monitoring wells, and the fences surrounding the facility. No safety or emergency equipment is stored at the HWPW facility since it is not an active site. Inspections will occur semi-annually or following a major storm or flood event. The schedule of inspections is included in Table III.D.

III.D.1. Vegetative Cover

The cover of the closed unit will be inspected semi-annually for proper drainage, signs of erosion, and loss of vegetative cover.

III.D.2. Groundwater Monitoring Wells

Monitoring wells will be inspected semi-annually for surface damage to casings, missing or damaged locks, and bent casings which result in an inability to sample the well. Malfunctions will be promptly repaired.

III.D.3. Fencing

The integrity of the fencing will be inspected semi-annually. The base of the fenced areas will be inspected for erosion which may result in space beneath the fence large enough for passage of animals or people. Hinges and locks on gates will be checked for signs of wear or breakage. Warning signs will be checked for fading or vandalism.

TABLE III.D. - INSPECTION SCHEDULE

Facility Unit(s) and Basic Elements	***Possible Error, Malfunction, or Deterioration***	***Frequency of Inspection***
Security Fencing	Damaged, broken/loose fencepost	Semi-annually & after major storm/flood event
Security Fencing	Loose or broken barbed wire	Semi-annually & after major storm/flood event
Security Fencing	Damaged fence	Semi-annually & after major storm/flood event
Security Fencing	Damaged gate	Semi-annually & after major storm/flood event
Security Fencing	Inoperable gate locks	Semi-annually & after major storm/flood event
Warning Signs	Missing, damaged or illegible signs	Semi-annually & after major storm/flood event
Surveyed Benchmarks	Benchmarks missing or damaged	Semi-annually & after major storm/flood event
Groundwater Monitor Wells	Well cap condition poor, broken, poor seal	Semi-annually & after major storm/flood event
Groundwater Monitor Wells	Lock function sticks, inoperable	Semi-annually & after major storm/flood event
Groundwater Monitor Wells	Casing condition bent, torn, missing	Semi-annually & after major storm/flood event
Groundwater Monitor Wells	Concrete pad cracked, broken, missing	Semi-annually & after major storm/flood event
Final Cover and Cap	Settlement or subsidence	Semi-annually & after major storm/flood event
Final Cover and Cap	Damage or erosion to clay cap	Semi-annually & after major storm/flood event
Final Cover and Cap	Erosion/undercutting at cap perimeters	Semi-annually & after major storm/flood event
Final Cover and Cap	Shrubs/trees with long root systems present	Semi-annually & after major storm/flood event
Drainage Structures	Grass requires mowing, treatment or repairs	Semi-annually & after major storm/flood event
Drainage Structures	Debris or sediment restrict flow	Semi-annually & after major storm/flood event
Drainage Structures	Erosion or undercutting	Semi-annually & after major storm/flood event
Drainage Structures	Inadequate drainage away from clay cap	Semi-annually & after major storm/flood event

IV. Wastes and Waste Analysis

(Sections IV.A, IV.C, and IV.D of the application do not apply to post closure applications.)

A. Waste Management Information

For a new hazardous waste management facility or for a facility hazardous waste management capacity expansion, complete Table IV.A. - Waste Management Information for each waste, source, and volume of waste to be stored, processed, or disposed of in the facility units to be permitted as required by 30 TAC 305.50(a)(9). For on-site facilities, list "on-site" for the waste source. For off-site facilities, list the source of the waste. If unknown, identify potential sources (e.g., industries/processes to be serviced).

Not Applicable. This facility is not a new commercial hazardous waste management facility or expansion of hazardous waste management facility. Table IV.A is not applicable.

B. Waste Managed In Permitted Units

For all hazardous waste management facilities and for inclusion into a permit, complete Table IV.B. - Wastes Managed In Permitted Units for each waste and debris to be managed in a permitted unit. Provide a description, EPA waste codes, and TCEQ waste form codes and classification codes. Guidelines for the Classification & Coding of Industrial Wastes and Hazardous Wastes, TCEQ publication RG-22, contains guidance for how to properly classify and code industrial waste and hazardous waste in accordance with 30 TAC 335.501-335.515 (Subchapter R).

Applicants need not specify the complete 8-digit waste code formulas for their wastes but only the 3-digit form codes and 1-digit classification codes. This allows the applicant to specify major categories of wastes in an overall manner without having to list all the specific waste streams as generated.

Not Applicable. The unit is closed. Table IV.B is attached.

C. Sampling and Analytical Methods

For inclusion into a permit, complete Table IV.C. - Sampling and Analytical Methods for each waste and debris proposed to be sampled and analyzed and include sampling location, sampling method, sample frequency, analytical method, and desired accuracy level for each waste and debris to be managed in a permitted, storage, processing, or disposal unit at the facility.

Not Applicable. The unit is closed. No waste management will be performed. Table IV.A is not applicable.

D. Waste Analysis Plan

The Waste Analysis Plan must address the requirements of 40 CFR 264.13 and 268.7. The Plan should include supplemental and coordinating information on how the facility will analyze wastes and debris (as listed in Table IV.B) to be managed in permitted units. The plan must address the determination of land disposal restrictions. Generators must determine and certify with the manifest the land disposal restriction status of a waste, even if the waste or debris is not intended for land disposal. Land disposal treatment facilities must identify the treatment process and analytical procedures to be used, and include them in the waste analysis plan. Land disposal restriction records must be maintained at the facility until closure of the facility [40 CFR 264.73(b)]. Landfill facilities must determine through the Paint Filter Liquids Test (SW-846 Method 9095) if there is free liquid in a bulk or containerized waste to be landfilled. If so, it must be stabilized; adding adsorbents alone is not acceptable, even for containerized waste.

For off-site facilities the waste analysis plan must specify procedures which will be used to inspect and, if necessary, analyze each movement of industrial and hazardous waste or hazardous debris received at the facility to ensure it matches the identity of the waste designated on the accompanying shipping ticket. The plan must describe methods which will be used to determine the identity of each movement of waste and debris managed at the facility and sampling method used if the identification method includes sampling in order to store, process, or dispose of the wastes and debris in accordance with 40 CFR Parts 264 and 268 and any abnormal characteristics which may upset further treatment or processing operations. Include rejection criteria for shipments of waste and debris received at the facility

For on-site facilities the waste analysis plan must specify the normal characteristics of the waste (including EPA hazardous waste codes, EPA hazard codes, and 40 CFR 261 Appendix VIII Hazardous Constituents) which must be known to store, process, or dispose of the wastes and debris in accordance with 40 CFR Parts 264 and 268 and any abnormal characteristics which may upset further treatment or processing operations.

The methods and equipment used for sampling waste materials will vary with the form and consistency of the waste materials to be sampled. Those sampling methods listed in 40 CFR 261 Appendix I, for sampling waste with properties similar to the indicated materials, or equivalent sampling methods approved by EPA under 40 CFR 260.20 and 260.22, will be considered by the TCEQ to be acceptable.

Not Applicable. The unit is closed. No waste management will be performed.

IV. WASTES AND WASTE ANALYSIS

WASTES AND WASTE ANALYSIS
PART B PERMIT APPLICATION
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

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LIST OF PART B APPLICATION FORM TABLES

IV. WASTES AND WASTE ANALYSIS

NOR 001 is entering post-closure care with one unit in year 20 of 30 in post closure care. However, with clean closure of the surface impoundment in 1984 and groundwater achieving Remedy Standard A response action objectives for the last three year, no further action is requested for this unit. As a result, Waste Management Information, Sampling and Analytical Methods and a Waste Analysis Plan are not required.

IV.B. Waste Managed in Permitted Units

Table IV.B. includes a complete list of the historical wastes that were managed in the solid waste management unit (SWMU) No. 1.

Table IV.A. - Waste Management Information

Waste	Source	Volume (tons/year)

Table IV.B. - Wastes Managed In Permitted Units

No.	Waste	EPA Hazardous Waste Numbers	TCEQ Waste Form Codes and Classification Codes
001/SWMU 1	Wood treatment (creosote) related wastes*	K001, F034, U051, U188	219, 301, 488, 609

*Historical Wastes Managed, unit was closed in 1984 with releases to groundwater

Table IV.C. - Sampling and Analytical Methods

Waste No.[1]	Sampling Location	Sampling Method	Frequency	Parameter	Test Method	Desired Accuracy Level

[1]from Table IV.B, first column

V. Engineering Reports

The engineering report represents the conceptual basis for the storage, processing, or disposal units at the hazardous waste management (HWM) facility. It should include calculations and other such engineering information as may be necessary to follow the logical development of the facility design. Plans and specifications are an integral part of the report. They should include construction procedures, materials specifications, dimensions, design capacities relative to the volume of wastes (as appropriate), and the information required by 40 CFR 270.14(b)(8), 270.14(b)(10). Since these reports may be incorporated into any issued permit, the report should not include trade names, manufacturers, or vendors of specific materials, equipment, or services unless such information is critical to the technical adequacy of the material. Technical specifications and required performance standards are sufficient to conduct a technical review. For landfills, surface impoundments, and waste piles, a Construction Quality Assurance Plan, which considers the guidance in EPA publication 530-SW-85-014, Minimum Technology Guidance on Double Liner Systems for Landfills and Surface Impoundments; Design, Construction, and Operation, should be submitted.

For facilities which will receive wastes from off-site sources, the engineering report must also contain information on the units which will manage these off-site wastes in accordance with 30 TAC 335.45(a).

Certain ancillary components or appurtenant devices must be addressed in the Part B application. These include but are not limited to sumps, pipelines, ditches, and canals. The technical information and the level of detail required will vary with the nature, scope, and location of the ancillary component. At a minimum they should be included in descriptions of piping and process flow. More information may be required. A single area containing a large number of ancillary components or a remote appurtenant device in an unusually sensitive location may warrant some specific permit requirements. All ancillary components must be included in calculating closure cost estimates.

In each of the unit-specific sections, describe precautions taken to prevent accidental commingling of incompatible wastes. If reactive or ignitable wastes are to be managed, or if incompatible wastes are deliberately commingled, provide information to ensure that precautions are taken to avoid danger due to:

- generation of extreme heat or pressure, fire, explosion, or violent reaction;
- production of uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health;
- production of uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosion;
- damaging the structural integrity of the device or facility containing the waste; or
- threatening human health or the environment by any other means.

Comprehensive consideration should be given to ensure that the facility is designed in accordance with good public health and hazardous waste management practices. The application will be evaluated primarily for the aspects of design covered by the regulations. Nothing in any approval is intended to relieve the facility owner or operator of any liabilities or responsibilities with respect to the design, construction, or operation of the project.

A. General Engineering Reports

1. General Information

Provide an overall plan view of the entire facility. Identify each hazardous or industrial solid waste management unit (container storage area, tank, incinerator, etc.) to be permitted in relation to its location and the type of waste managed in that unit. Also provide a plan view at an appropriate scale to clearly show the location of all hazardous waste management units to be permitted on one or more 8.5" x 11" sheets. Indicate on this plan view how the design or operation provides for buffer zones or waste segregation as appropriate for incompatible,

ignitable, or reactive wastes.

Figure V.A.1 provides and overall plan view of the facility. Figure V.A.2 illustrates the location of the unit on an 8.5 x11 sheet. No buffer is needed because no waste is stored.

Submit a topographic map or maps of the facility which clearly shows the information specified in 40 CFR 270.14(b)(19), 270.14(c)(3), and 270.14(d)(1)(i) (for large HWM facilities, the TCEQ will allow the use of other scales on a case-by-case basis). Please note that the term "facility" includes all contiguous land, structures, other appurtenances, and improvements on the land for storing, processing, or disposing of hazardous and industrial solid waste.

Figure V.A.2 provides a topographic map with the information specified above.

2. Features to Mitigate Unsuitable Site Characteristics

   For all new hazardous waste management storage and/or processing facilities or areal expansions of existing hazardous waste management storage and/or processing facilities, include in the engineering report design, construction, and operational information specified in 30 TAC 335.204(a)(1) and (a)(3) through (9).

   Not applicable. The facility is not a new hazardous waste management facility nor an areal expansion to an existing facility.

3. Construction Schedules
   a. In order to meet the required design standards, extensive retrofitting of some facilities may be required. In the worst case, the applicant may elect to close certain operations rather than comply with the RCRA standards. Thus, the permit may specify a schedule of compliance requiring the accomplishment of given tasks within specific time frames. As required, indicate an appropriate schedule(s) of compliance in this application. The schedule should provide for facility compliance as soon as possible and in accordance with 40 CFR 270.33(a)(2) and 270.33(b).
   b. For commercial hazardous waste management facilities, permit applications (new, renewal, or interim status applications), major amendments, and Class 3 modifications submitted after 11/23/94, must include a construction schedule. A construction schedule must be submitted even if the application does not include an addition of units or a revision to permitted units. This schedule should comply with the requirements of 30 TAC 305.149.

   Not Applicable. There is no planned construction for the permitted unit.

4. Provide detailed plans and specifications which when, accompanied by the engineering report, will be sufficiently detailed and complete to allow the Executive Director to ascertain whether the facility will be constructed and operated in compliance with all pertinent permitting requirements. Engineering plans and specifications must be prepared under the supervision of and sealed by a licensed Professional Engineer, with current license, along with the Registered Engineering Firm's name and Registration Number as required by the Texas Engineering Practice Act. For some facilities, plans in the form of a standard piping and instrumentation diagram will be sufficient. Overall dimensions and materials of construction must be shown.

   Not Applicable. There is no planned construction for the permitted unit.

B. Container Storage Areas

Not Applicable. This permit renewal application is for the closed surface impoundment.

1. Provide an engineering report which includes all of the information specified in 40 CFR 264.170-264.173, 264.175-264.177, and 270.15.

   Complete Table V.B - Container Storage Areas and list the container storage areas covered by this application to be permitted. List the N.O.R. unit number, the rated capacity or size of each unit (including the maximum number of each type of container to be stored at each unit), the areal dimensions, containment volume, whether ignitable, reactive, or incompatible waste will be stored in each unit, and whether processing will occur within the unit.

2. Container storage areas must have a containment system that is capable of collecting and holding spills, leaks, and precipitation. In addition to the requirements of 40 CFR 270.15, the design report should include the following:
   a. Capacity of the containment relative to the number and volume of containers to be stored; in addition, for unenclosed areas, the amount of rainfall collected prior to removal. The TCEQ recommends using a 25-year, 24-hour rainfall event for this extra capacity; and
   b. Run-on into the containment system must be prevented, or a collection system with sufficient excess capacity must be provided. If run-on is collected within the containment system, delineate the area(s) from which run-on is collected. The 25-year, 24-hour rainfall event should be used to calculate the excess capacity.

3. Wastes Containing No Free Liquids

   With the exception of 40 CFR 264.175(d), storage areas that hold only wastes that do not contain free liquids need not have a containment system, , provided that compliance with 40 CFR 264.175(c) is demonstrated. This demonstration must be submitted as part of the application and must include:
   a. test procedures and results or other documentation or information to show that the wastes do not contain free liquids; and
   b. a description of how the storage area is designed or operated to drain and remove liquids or how containers are kept from contact with standing liquids.

4. Managing Ignitable or Reactive Wastes

   If a container storage area will manage ignitable or reactive waste, as indicated on Table V.B, provide in the engineering report drawings demonstrating compliance with the buffer zone requirement of 40 CFR 264.17 and 264.176.

5. Managing Incompatible Wastes

   If a container storage area will manage incompatible waste, as indicated on Table V.B, provide in the engineering report a description of the procedures used to ensure compliance with 40 CFR 264.17 and 264.177.

C. Tanks and Tank Systems

Not Applicable. This permit renewal application is for the closed surface impoundment.

Provide an engineering report which includes all of the information specified in 40 CFR 264.190-264.194, 264.196, 264.198-264.199, and 270.16.

processing, the waste managed in each unit, the rated capacity of each unit, overall dimensions of each unit, containment volume, and whether ignitable, reactive, or incompatible waste will be stored in each unit.

If a tank will manage ignitable or reactive waste, as indicated on Table V.C, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.198 and provide drawings demonstrating compliance with any applicable buffer zone requirements and 40 CFR 264.17.

If a tank will manage incompatible waste, as indicated on Table V.C, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.199.

Submit written assessments that were reviewed and certified by an independent, qualified licensed Professional Engineer that attests to the structural integrity and suitability of handling the hazardous waste for each tank system, as required under 40 CFR 264.191-264.192 for existing tanks which do not have secondary containment meeting the standards of 40 CFR 264.193. The engineer signing the written assessment must make the certification specified in 40 CFR 270.11(d). The certification must be sealed by a licensed Professional Engineer, with current license, along with the Registered Engineering Firm's name and Registration Number as required by the Texas Engineering Practice Act.

If a tank has been de-rated or if the permitted capacity is otherwise different from the design capacity, specify in the engineering report.

D. Surface Impoundments

See the attached report for specific information regarding the closed surface impoundment.

Provide an engineering report which includes all of the information specified in 30 TAC 305.50(a)(6), 335.168, 335.169, and 40 CFR 264.19, 264.220, 264.221, 264.222, 264.223, 264.226(a) and (c), 264.227, 264.229-264.231, and 270.17.

For storage surface impoundments at a new hazardous waste management facility or which are part of an areal expansion of an existing hazardous waste management facility, include in the engineering report design, construction, and operational information specified in 30 TAC 335.204(d). For any surface impoundment to be closed as a landfill (where wastes will remain after closure of the impoundment) at a new hazardous waste management facility or which are part of an areal expansion of an existing hazardous waste management facility, include in the engineering report design, construction, and operational information specified in 30 TAC 335.204(e).

For all impoundments, include in the report the following information.

1. Complete Table V.D.1 - Surface Impoundments and list the surface impoundments, covered by this application, to be permitted. List the waste(s) managed in each unit and the rated capacity or size of each unit.

   Table V.D.1 is attached.

2. If a surface impoundment will manage ignitable or reactive waste, as indicated on Table V.D.1., describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.229.

   Not Applicable. The wastes stored in the surface impoundment have been removed and the unit was closed in 1984.

3. If a surface impoundment will manage incompatible waste, as indicated on Table V.D.1., describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.230.

Not Applicable. The wastes stored in the surface impoundment have been removed and the unit was closed in 1984.

4. If a surface impoundment will manage F020, F021, F022, F023, F026, and F027 waste, as indicated on Table V.D.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.231.

   Not Applicable. The wastes stored in the surface impoundment have been removed and the unit was closed in 1984.

5. Describe the surface impoundment. A plan view and cross-section of the surface impoundment should be included with the engineering report.

   The surface impoundment SWMU No. 1 was not an engineered structure, nor was it designated to serve as a landfill. It was used from 1979 to 1982 for the disposal of contaminated surface soils containing K001 type wastes.

   SWMU No. 1 is bordered on the southern side by an earthen berm, which is about 2 feet by 3 feet by about 80 to 100 feet long. The berm extends about 100 feet south of the southwest corner of the SWMU No. 1. A chain-link security fence is located along the northern and western margins of SWMU No. 1. The original dimensions of the unit were about 180 feet by 106 feet at the surface, extending to a depth of about 7 feet bgs (SPTCo, 1991). Based on these dimensions, SWMU No. 1 would have a capacity of 133,560 cubic feet (about 4,950 cubic yards). According to SPTCo facility representatives, a clay liner was installed during the original construction of SWMU No. 1. No information was available concerning the thickness and engineering properties of the liner.

   The cross-sections prepared by Geo Associates and included in the original 1991 permit application are included in the Figures section as Exhibits 5, 6 and 7 (SPTCo, 1991).

6. Freeboard
   Not Applicable. The wastes stored in the surface impoundment have been removed and the unit was closed in 1984.

   Specify the minimum freeboard to be maintained and the basis of the design to prevent overtopping resulting from normal or abnormal operations; overfilling; wind and wave action; rainfall; run-on; malfunctions of level controllers, alarms, and other equipment; and human error. [40 CFR 264.221(g)] Show that adequate freeboard will be available to prevent overtopping from a 100-year, 24-hour storm.

   If the impoundment is inflow sensitive, it should be equipped with a high-level alarm based on a different level sensor than that used for automatic control.

7. Waste Flow
   Not Applicable. The wastes stored in the surface impoundment have been removed and the unit was closed in 1984.

   Describe the means that will be used to immediately shut off the flow of waste to the impoundment to prevent overtopping or in the event of liner failure, and include appropriate detailed drawings.

   If the surface impoundment is a flow-through facility describe the flow of waste, including a hydraulic profile.

If the surface impoundment is a flow-through facility describe the flow of waste, including a hydraulic profile.

8. Dike Construction
Not Applicable. The wastes stored in the surface impoundment have been removed and the unit was clean closed in 1984.

a. If dikes are used, include the following certification as part of the engineering report:

"I, *(qualified licensed Professional Engineer)* , Texas P.E. License Number , of Registered Firm *(Name)* Registered Firm No. *(Registration Number)* certify under penalty of law that I have personally examined and am familiar with the design and construction of the dikes that are a portion of *(surface impoundment unit name)* .

I further certify that I have evaluated the dike design and materials of construction using accepted engineering procedures, and have determined that the dike, including the portion of the dike providing freeboard, has structural integrity, and:

(1) Will withstand the stress of the pressure exerted by the types and amounts of wastes to be placed in the impoundment; and
(2) Will not fail due to scouring or piping, without dependence on any liner system included in the impoundment construction.

Date: _____"
(Signature)

"(Seal)"

b. The structural integrity of the dike system must be certified by a qualified Professional Engineer before a permit is issued. If the impoundment is not being used, the dike licensed system must be certified before it can be put into use. The certification must be sealed by a licensed Professional Engineer, with current license, along with the Registered Engineering Firm's name and Registration Number as required by the Texas Engineering Practice Act.

c. A report shall accompany the dike certification which summarizes the activities, calculations, and laboratory and field analyses performed in support of the dike certification. Describe the design basis used in construction of the dikes. Provide the following analyses as attachments to the engineering report (A Quality Assurance Project Plan <QAPP> should be included in the report to ensure that each analysis is performed appropriately):

(1) Slope Stability Analysis
(2) Hydrostatic and Hydrodynamic Analysis
(3) Storm Loading
(4) Rapid Drawdown

d. Earthen dikes should have a protective cover to minimize wind and water erosion and to preserve the structural integrity of the dike. Describe the protective cover used and describe its installation and maintenance.

9. Containment System

Not Applicable. The wastes stored in the surface impoundment have been removed and the unit was clean closed in 1984.

TCEQ Technical Guideline No. 6, Monitoring Systems and Leachate Collection, which can be obtained from the I&HW Permits Section, contains suggested methods of leak detection system construction and EPA publication 530-SW-85-014 provides design guidance for liner systems. The applicant is strongly encouraged to test each synthetic liner after installation by an electrical leak location test, such as the electric field method described in EPA Technical Guidance Document EPA/600/R-93/182, Quality Assurance and Quality Control for Waste Containment Facilities , or an equivalent method approved by the Executive Director. Construction above the liner may not proceed until any detected leaks are sealed.

a. Complete Table V.D. 6. - Surface Impoundment Liner System for each surface impoundment to be permitted.

b. In the engineering report, describe the design, installation and operation of liner and leak detection components. The description must demonstrate that the liner and leak detection system will prevent discharge to the land, and ground and surface water. Include the following analyses as attachments to the engineering report (A QAPP should be included in the report to ensure that each analysis is performed appropriately):

For artificial liners:

(1) Seaming method
(2) Surface preparation method
(3) Tensile Strength
(4) Impact Resistance
(5) Compatibility Demonstration
(6) Foundation Design (including Settlement Potential, Bearing Capacity and Stability, and Potential for Bottom Heave Blow-out)

For soil liners:

(7) Waste Migration Analysis (based on head, porosity, and permeability) for the most mobile and least attenuated waste constituents
(8) Atterberg Limits, % passing a #200 sieve, and Permeability
(9) Moisture Content
(10) Standard Proctor Density, Compaction Data

For leachate collection systems:

(11) Pipe Material and Strength
(12) Pipe Network Spacing and Grading
(13) Collection Sump(s) Material and Strength
(14) Drainage Media Specifications and Performance
(15) Analyses showing that pipe and pipe perforation size will prevent clogging and allow free liquid access to the pipe.
(16) Compatibility Demonstration
    (a) Capacity of System
    (b) rate of leachate removal
    (c) capacity of sumps
    (d) thickness of mounding and maximum hydraulic head

c. Specify the liner system installation date and expected lifetime of liner system (years).

d. Specify whether the liner is chemically resistant to the waste and how this resistance was determined. Attach any tests or documentation to the engineering report.

e. Submit a quality assurance/quality control plan for all components to demonstrate that all components will be properly installed and will perform to design specifications.

the Commission. Plans and specifications for both new and existing surface impoundments must demonstrate conformity with 30 TAC 335.168 and 40 CFR 264.221.

Not Applicable. The surface impoundment was closed in 1984.

11. Run-on Diversion

    Describe in detail how the surface impoundment system will manage stormwater run-on away from the surface impoundment. Stormwater run-on must be diverted away from a surface impoundment. Use at least a 100-year, 24-hour rainfall event in the design and analysis of diversion structures. Where dikes are used to divert run-on, they must be protected from erosion. Include all analyses used to calculate run-on volumes.

    Not Applicable. The wastes stored in the surface impoundment were removed and the unit closed in 1984. Because no wastes are stored or managed at SWMU No. 1, no stormwater management is necessary at the unit.

12. The Commission may approve an alternate design or operating practice for a surface impoundment if the owner or operator demonstrates that such design or operating practices, together with location characteristics [40 CFR 264.221(d)]:
    a. Will prevent the migration of hazardous constituents into the groundwater or surface water at least as effectively as the liners and leachate collection and removal system required by 40 CFR 264.221; and
    b. Will allow detection leaks of hazardous constituents through the top liner at least as effectively.

    Not Applicable. The wastes stored in the surface impoundment have been removed and the unit was closed in 1984.

13. Exemption from Double-Liner Requirements for Monofills [264.221(e)]

    Owners or operators of hazardous waste surface impoundment monofills will be exempted from the double-liner requirements if the Commission finds, based on a demonstration by the owner or operator, that alternative design and operating practices, together with location characteristics are at least as effective as a double liner in preventing migration of hazardous constituents to the groundwater or surface water. If an exemption is sought, submit detailed plans and engineering and hydrogeologic reports, as appropriate, describing alternate design and operating practices that will, in conjunction with location aspects, prevent the migration of any hazardous constituents into the groundwater or surface water at any future time.

    Not Applicable. The wastes stored in the surface impoundment have been removed and the unit was closed in 1984.

E. Waste Piles

Not Applicable. This permit renewal application is for the closed surface impoundment.

This section applies to owners or operators of industrial solid waste facilities that store or process hazardous waste in piles. A hazardous waste pile that will be closed with wastes left in place must be managed as a landfill. Existing portions of waste piles are those areas that were listed on the original Part A and on which wastes have been lawfully placed.

managed as a landfill. Existing portions of waste piles are those areas that were listed on the original Part A and on which wastes have been lawfully placed.

Provide an engineering report which includes all of the information specified in 30 TAC 335.170 and 40 CFR 264.19, 264.250, 264.251, 264.252-264.253, 264.254(a) and (c), 264.256, 264.257, 264.259, and 270.18.

For waste piles at a new hazardous waste management facility or which are part of any areal expansion of an existing hazardous waste management facility, include in the engineering report design, construction, and operational information specified in 30 TAC 335.204(c).

For all waste piles, include in the report the following information.

1. For inclusion into a permit, complete Table V.E.1 - Waste Piles and list the waste piles covered by this application. List the waste managed in each unit and the rated capacity or size of the unit.

   If a waste pile will manage ignitable or reactive waste, as indicated on Table V.E.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.256.

   If a waste pile will manage incompatible waste, as indicated on Table V.E.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.257.

   If a waste pile will manage F020, F021, F022, F023, F026, and F027 waste, as indicated on Table V.E.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.259.

2. Describe the waste pile, including any structure surrounding or enclosing the waste pile.

3. Containment System

   TCEQ Technical Guideline No. 6, Monitoring Systems and Leachate Collection, which can be obtained from the I&HW Permits Section, contains suggested methods of leak detection system construction and EPA publication 530-SW-85-014 provides design guidance for liner systems. The applicant is strongly encouraged to test each synthetic liner after installation by an electrical leak location test, such as the electric field method described in EPA Technical Guidance Document EPA/600/R-93/182, Quality Assurance and Quality Control for Waste Containment Facilities , or an equivalent method approved by the Executive Director. Construction above the liner may not proceed until any detected leaks are sealed.

   a. For inclusion into a permit, complete Table V.E. 3 - Waste Pile Liner System and specify the type of containment/liner system.
   b. In the engineering report, describe the design, installation, construction, and operation of the liner and leachate collection system. The description must demonstrate that containment systems will prevent discharge to the land, surface water, or groundwater. Include the following analyses as attachments to the engineering report, when applicable to the containment system being described (A QAPP should be included in the report to ensure that each analysis is performed appropriately):

   For artificial liners:

   (1) Seaming method
   (2) Surface preparation method
   (3) Tensile Strength
   (4) Impact Resistance
   (5) Compatibility Demonstration

(6) Foundation Design (including Settlement Potential, Bearing Capacity and Stability, and Potential for Bottom Heave Blow-out)

For soil liners:

(7) Waste Migration Analysis (based on head, porosity, and permeability) for the most mobile and least attenuated constituents.
(8) Atterberg Limits, % passing a #200 sieve, and Permeability
(9) Moisture Content
(10) Standard Proctor Density, Compaction Data

For leachate detection, collection, and removal system:

(11) Capacity of system
  (a) rate of leachate removal
  (b) capacity of sumps
  (c) thickness of mounding and maximum hydraulic head
(12) Pipe Material and Strength
(13) Pipe Network Spacing and Grading
(14) Collection Sump(s) Material and Strength
(15) Drainage Media Specifications and Performance
(16) Analysis showing that pipe and perforation size will prevent clogging and allow free liquid access to the pipe.
(17) Compatibility Demonstration

c. Containment/liner system installation date and expected lifetime of liner system (years).
d. Specify whether the containment/liner system is chemically resistant to the waste and how this resistance was determined. Attach any tests or documentation to the engineering report.
e. Submit a quality assurance/quality control plan for all components to demonstrate that all components will be properly installed and will perform to design specifications.

4. Wind Dispersal [30 TAC 335.170(j)]

Waste piles containing hazardous waste which could be subject to dispersal by wind must be covered or otherwise managed so that wind dispersal is minimized. Describe practices to control wind dispersal (e.g., cover or frequent wetting) of the hazardous waste.

5. Run-on Diversion [30 TAC 335.170(g)]

Describe in detail the measures used to control and divert run-on from the unit. The owner or operator must design, construct, operate, and maintain a run-on control system capable of preventing flow onto the active portion of the pile during peak discharge from at least a 100-year, 24-hour storm.

Include all analyses used to calculate: rates of flow; run-on volume and depth; and back-water calculations for the ditches on plant property.

Any tanks or basins associated with the run-on control systems must be emptied or otherwise managed expeditiously after a storm to maintain the design capacity of the system. [30 TAC 335.170(i)]

6. Run-off Control [30 TAC 335.170(h)]

Describe in detail the measures used to control run-off from the unit. Include all analyses used to calculate the run-off volumes.

The owner or operator must design, construct, operate, and maintain a run-off management system to collect and control at least the water volume resulting from a 100-year, 24-hour storm.

Collection and holding facilities (e.g., tanks or basins) associated with the run-off control systems must be emptied or otherwise managed expeditiously after storms to maintain the design capacity of the system. [30 TAC 335.170(i)]

7. Give a description of design and operating procedures to properly manage and/or dispose of any residuals (e.g., leachate) that may be generated during waste management. Describe the management process and any equipment used.

8. Provide a description and list of all equipment and procedures used to place the waste in or on the waste pile, and how the liner surface will be exposed for inspection, if necessary. A containment system must be protected from plant growth which could puncture any component of the system.

9. Exemption from Liner and Leachate Collection Requirements

   The Commission may approve an alternate design or operating practice for a waste pile if the owner or operator demonstrates that such design or operating practices, together with location characteristics [40 CFR 264.251(d)]:

   a. Will prevent the migration of hazardous constituents into the groundwater or surface water at least as effectively as the liners and leachate collection and removal system; and
   b. Will allow detection leaks of hazardous constituents through the top liner at least as effectively.

10. Exemption from Groundwater Monitoring

    A waste pile may be exempt from groundwater monitoring if the following standards are met:

    a. The waste pile (including its underlying liners) must be located entirely above the seasonal high water table; and
    b. The waste pile is inside or under a structure that provides protection from precipitation so that neither run-off nor leachate is generated, provided that:
       (1) Liquids or materials containing free liquids are not placed in the pile;
       (2) The waste pile is protected from surface water run-on by the structure or in some other manner;
       (3) The waste pile is designed and operated to control dispersal of the waste by wind, where necessary, by means other than wetting; and
       (4) The waste pile will not generate leachate through decomposition or other reactions; or
    c. The waste pile must have a leachate collection and removal system above the top liner; and
    d. underlayment:
       (1) either
          (a) The waste pile must be underlain by two liners, which are designed and constructed in a manner that prevents the migration of liquids into or out of the space between the liners and a leak detection system which must be designed, constructed, maintained, and operated between the liners to detect any migration of liquids into the space between the liners; and

(b) A demonstration must be made that there is a low potential for migration of liquid from the waste pile to the uppermost aquifer during the life of the waste pile (including the closure period). The owner or operator must base any predictions made on assumptions that maximize the rate of liquid migration; ***or***

(2) either

(a) The waste pile must be underlain by a liner (base) that is designed, constructed, and installed in a manner that prevents the migration of liquids or waste beyond the liner; and

(b) The wastes in the waste pile must be removed periodically, and the liner must be inspected for deterioration, cracks, or other conditions that may result in leaks. The frequency of inspection will be specified in the inspection plan and must be based on the potential for the liner (base) to crack or otherwise deteriorate under the conditions of operation (e.g., waste type, rainfall, loading rates and subsurface stability).

The liner(s) used to satisfy V.D.13.d. must be of sufficient strength and thickness to prevent failure due to puncture, cracking, tearing, or other physical damage from equipment used to place waste in or on the pile or to clean and expose the liner surface for inspection.

F. Land Treatment Units

Not Applicable. This permit renewal application is for the closed surface impoundment.

Provide an engineering report which includes all of the information specified in 30 TAC 305.50(a)(6), 335.171, 335.172, 40 CFR 264.270-264.272, 264.273, 264.276, 264.278, 264.279, 264.281-264.283, and 270.20 for each land treatment unit.

For land treatment units at a new hazardous waste management facility or which are part of an areal expansion of an existing hazardous waste management facility, include in the engineering report design, construction, and operational information specified in 30 TAC 335.204(b).

For all land treatment units, include in the report the following information.

1. Complete Tables V.F.1 - Land Treatment Units and V.F.2 - Land Treatment Unit Capacity and list the land treatment units covered by this application. List the waste(s) managed in each unit and the rated capacity or size of the unit. If different wastes are placed on separate portions of the land treatment area, each portion is considered a land treatment unit, and requires a separate summary form and engineering report.

   The treatment zone is defined as the soil area of the unsaturated zone of a land treatment unit within which hazardous constituents are degraded, transformed, or immobilized. In this section, specify the depth of the treatment zone. The maximum depth of the treatment zone for new land treatment units must be [40 CFR 264.271(c)]:

   a. No more than 1.5 meters (5 feet) from the surface; and

   b. More than 1 meter (3 feet) above the seasonal high water table.

   If a land treatment unit will manage ignitable or reactive waste, as indicated on Table V.F.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.281.

   If a land treatment unit will manage incompatible waste, as indicated on Table V.F.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.282.

If a land treatment unit will manage F020, F021, F022, F023, F026 and F027 waste, as indicated on Table V.F.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.283.

2. Describe the land treatment unit. A plan view and cross-section of the unit should be included with the engineering report.

3. Complete Table V.F.3. - Land Treatment Principal Hazardous Constituents and list the wastes for which the treatment demonstration will be made and the principal hazardous constituents in each waste. Specify in the report the data sources to be used to make the demonstration such as laboratory data, field data, operating data, literature, or other.

4. Run-on Diversion

   Describe in detail the measures used to control run-on and divert run-on from the unit. Include all the analyses used to calculate the run-on volumes.

   The owner or operator must design, construct, operate, and maintain a run-on control system capable of preventing flow onto the active portion of the land treatment unit during peak discharge from a 100-year, 24-hour storm. [30 TAC 335.171(3)]

   Any tanks or basins associated with the run-on control system must be emptied or otherwise managed expeditiously after storms to maintain the design capacity of the system. [30 TAC 335.171(5)]

5. Run-off Control

   Describe in detail the measures used to control the run-off from the unit, and minimize hazardous constituents in the run-off, include all the analyses used to calculate the run-off volumes.

   The owner or operator must design, construct, operate and maintain a run-off management system to collect and control at least the water volume resulting from a 100-year, 24-hour storm. [30 TAC 335.171(4)]

   Collection and holding facilities (e.g., tanks or basins) associated with run-off control systems must be emptied or otherwise managed expeditiously after storms to maintain design capacity of the system. [30 TAC 335.171(5)]

6. Wind Dispersal

   The owner or operator of a land treatment unit containing hazardous waste which could be subject to dispersal by wind must cover or otherwise manage the land treatment unit so that wind dispersal is minimized. Describe practices to control wind dispersal (e.g., cover or frequent wetting) of the hazardous waste. [30 TAC 335.171(6)]

7. Treatment Demonstration

   A description of the treatment demonstration required under 40 CFR 264.272 and 270.20(a) shall be included with the engineering report. If the owner or operator intends to conduct field tests or laboratory analyses in order to make the demonstration, he must obtain a treatment or disposal permit.

8. Food Chain Crops [40 CFR 264.276]

   Several conditions must be satisfied if food-chain crops are to be grown in or on the treatment zone. A demonstration must be prepared similar to the one described in the Treatment

Demonstration and submitted at least 90 days prior to the planting of crops. The demonstration need not be submitted with this application. However, a description of the demonstration must be included as part of the engineering report. This demonstration may be combined with the Treatment Demonstration description, as some of the information required is identical.

G. Landfills

Not Applicable. This permit renewal application is for the closed surface impoundment.

Provide an engineering report which includes all of the information specified in 30 TAC 305.50(a)(5), (6), (9), (10), and (12), 335.173, 40 CFR 264.19, 264.300, 264.301, 264.302, 264.303(a), 264.304, 264.309, 264.312, 264.313, 264.315-264.317, and 270.21(with the exception of 270.21(e), (g), (h), and (i)). The text of the report should be written to supplement engineering plans, specifications, and test results necessary to provide a detailed description of how the landfill will comply with these standards.

For landfills at a new hazardous waste management facility or which are part of an areal expansion of an existing hazardous waste management facility, include in the engineering report design, construction, and operational information specified in 30 TAC 335.204(e).

For all landfills, include in the report the following information.

Complete Table V.G.1 - Landfills and list the landfills (and number of cells, if applicable) covered by this application. List the waste(s) managed in each unit and the rated capacity or size of the unit. If wastes are segregated in some manner, list the cell number in which wastes are placed next to each waste type.

If a landfill will manage ignitable or reactive waste, as indicated on Table V.G.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.312.

If a landfill will manage incompatible waste, as indicated on Table V.G.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17 and 264.313.

If a landfill will manage F020, F021, F022, F023, F026, and F027 waste, as indicated on Table V.G.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.317.

1. Describe the landfill. A plan view and cross-section of the landfill should be included with the engineering report.

2. Containment System

   TCEQ Technical Guideline No. 6, Monitoring Systems and Leachate Collection, which can be obtained from the I&HW Permits Section, contains suggested methods of leak detection system construction and EPA publication 530-SW-85-014 provides design guidance for liner systems. The applicant is strongly encouraged to test each synthetic liner after installation by an electrical leak location test, such as the electric field method described in EPA Technical Guidance Document EPA/600/R-93/182, Quality Assurance and Quality Control for Waste Containment Facilities, or an equivalent method approved by the Executive Director. Construction above the liner may not proceed until any detected leaks are sealed.

   a. Complete Table V.G.3. - Landfill Liner System and specify the type of liner used for the landfill.

   b. In the engineering report, describe the design, installation, construction, and operation of the liner and leachate collection system. The description must demonstrate that the liner system will prevent discharge to the land, groundwater, and surface water. The following analyses should be included as attachments to the engineering report (A QAPP should be included in the report to ensure that each analysis is performed appropriately):

      For artificial liners:

(1) Seaming method
(2) Surface preparation method
(3) Tensile Strength
(4) Impact Resistance
(5) Compatibility Demonstration
(6) Foundation Design (including Settlement Potential, Bearing Capacity and Stability, and Potential for Bottom Heave Blow-out)

For soil liners:

(7) Waste Migration Analysis (based on head, porosity, and permeability) for the most mobile and least attenuated waste constituents
(8) Atterberg Limits, % passing a #200 sieve, and Permeability
(9) Moisture Content
(10) Standard Proctor Density, Compaction Data

For Leachate Collection System

For incorporation into the permit, complete Table V.G.4. - Landfill Leachate Collection System used for the landfill.

(11) Capacity of the system:
(a)rate of leachate removal
(b) capacity of sumps
(c) thickness of mounding and maximum hydraulic head
(12) Pipe Material and Strength
(13) Pipe Network Spacing and Grading
(14) Collection Sump(s) Material and Strength
(15) Drainage Media Specifications and Performance
(16) Analyses showing that pipe and pipe perforation size will prevent clogging and allow free liquid access to the pipe.
(17) Compatibility Demonstration

c. State whether the liner system components are chemically resistant to the waste and how this resistance was determined. Attach any tests or documentation to the engineering report.
d. Submit a quality assurance/quality control plan for all components to demonstrate that all components will be properly installed and will perform to design specifications.
e. Whether the leachate collection components are chemically resistant to the waste and how this resistance was determined. Attach any tests or documentation to the engineering report.

3. For Dikes:
   a. Slope Stability Analysis;
   b. Hydrostatic and Hydrodynamic Analyses
   c. Ability to withstand scouring from leaking liner.

4. Landfills that receive waste on or after May 8, 1985 (or for newly-regulated units, the effective date of the new RCRA regulation) into new units and/or lateral expansions or replacements of existing units must meet the minimum technological requirements of the Hazardous and Solid Waste Amendments of 1984, unless an appropriate waiver is granted by the Commission. The minimum technological requirements include the installation of two or more liners and a leachate collection system above and between the liners [40 CFR

264.301(c)]. Plans and specifications for both new and existing landfills must demonstrate conformity with 30 TAC 335.173.

5. Site Development Plan

   Describe the methods used to deposit waste in the landfill. This description should include rate of waste deposition, waste segregation, average lift size, maximum lift, average cell or trench size, maximum cell or trench size, and other information necessary to depict how the landfill will be developed. Do not include liner or leachate collection system information, closure information, or handling of special wastes. This will be included elsewhere in the report.

6. Run-on Control [30 TAC 335.173(g)]

   The owner or operator must design, construct, operate, and maintain a run-on control system capable of preventing flow onto the active portion of the landfill during peak discharge from at least a 100-year, 24-hour storm.

   In the engineering report, include the following analyses:

   a. Run-on volume and depth calculations from the peak discharge of the 100-year, 24-hour storm; and

   b. For ditches on the plant property, back-water calculations.

   Collection and holding facilities associated with the run-on control system must be emptied or otherwise managed expeditiously. [30 TAC 335.173(i)]

7. Run-off Control [30 TAC 335.173(h)]

   The owner or operator must design, construct, operate, and maintain a run-off management system to collect and control the water volume resulting from a 100-year, 24-hour storm.

   Include all analyses used to calculate run-off volumes.

   Collection and holding facilities (e.g., tanks or basins) associated with run-off control systems must be emptied or otherwise managed expeditiously after storms to maintain design capacity of the system. [30 TAC 335.173(i)]

8. Wind Dispersal [30 TAC 335.173(j)]

   If the landfill contains any particulate matter which may be subject to wind dispersal, the owner or operator must cover or otherwise manage the landfill to minimize wind dispersal. Based upon the characteristics of the material to be landfilled describe the likelihood of wind dispersal occurring. Describe in detail any method and/or control mechanism used to prevent wind dispersal.

9. Liquid Waste

   If liquid waste or waste containing free liquids is to be stabilized and then placed in the landfill, the procedures used to stabilize the waste must be described in the engineering report. The waste must be treated prior to landfilling using a treatment technology that does not solely involve the use of a material that functions primarily as a sorbent. Provide supporting documentation to verify that an appropriate stabilization procedure is used to comply with 30 TAC 335.175.

10. The Commission may approve an alternate design or operating practice for a landfill if the owner or operator demonstrates that such design or operating practices, together with location characteristics [40 CFR 264.301(d)]:

a. Will prevent the migration of hazardous constituents into the groundwater or surface water at least as effectively as the liners and leachate collection and removal system; and

b. Will allow detection leaks of hazardous constituents through the top liner at least as effectively.

11. Exemption from Double-Liner Requirements for Monofills [264.301(e)]

Owners or operators of hazardous waste monofills will be exempted from the double-liner requirements if the Commission finds, based on a demonstration by the owner or operator, that alternative design and operating practices, together with location characteristics are at least as effective as a double liner in preventing migration of hazardous constituents to the groundwater or surface water. If an exemption is sought, submit detailed plans and engineering and hydrogeologic reports, as appropriate, describing alternate design and operating practices that will, in conjunction with location aspects, prevent the migration of any hazardous constituents into the groundwater or surface water at any future time.

12. Above-grade Benefits

The engineering report must evaluate the benefits, if any, associated with the construction of the landfill above existing grade at the proposed site, the costs associated with the above-grade construction, and the potential adverse effects, if any, which would be associated with the above-grade construction. [TX. Health and Safety Code 361.108]

H. Incinerators

Provide an engineering report which includes all of the information specified in 30 TAC 305.171-305.175, 40 CFR 264.340, 264.342-264.346, 264.347(a), and 270.19.

Note: A permit is not required prior to conducting a trial burn for existing incinerator operating under 30 TAC 335.2(c). However, without the prior approval of the Executive Director the operator cannot be certain that the trial burn data will be sufficient to demonstrate compliance with regulations. Applicants are encouraged to obtain approval prior to conducting a test burn. For any trial burn plan approved by the TCEQ or EPA, the applicant shall submit a certification that the previously conducted trial burn was conducted in accordance with the approved trial burn plan.

1. Complete Table V.H.1 - Incinerators and list the incinerators covered by this application and list the waste managed in each unit.

Complete Table V.H.2 - Incinerator Permit Conditions, Monitoring, and Automatic Waste Feed Cutoff Systems.

Complete Table V.H.3 - Maximum Constituents Feed Rate.

Complete Table V.H.4 - Maximum Allowable Emission Rates

For use during the shakedown period, the trial burn period and the period after completion of the initial trial burn, complete Table V.H.5 - Incinerator Permit Conditions, Monitoring, and Automatic Waste Feed Cutoff-Short-Term Operation.

If an incinerator will manage reactive or incompatible waste, as indicated on Table V.H.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17.

If an incinerator will manage F020, F021, F022, F023, F026, and F027 waste, as indicated on Table V.H.1, the DRE requirement is 99.9999%.

2. If a trial burn will be performed, designate one or more of the 40 CFR 261 Appendix VIII organic compounds present in the wastes to be incinerated as Principal Organic Hazardous Constituents (POHCs). Selection will be based upon the degree of difficulty of incineration of these compounds and upon their concentration or mass in the waste feed. These POHCs will be used to determine the destruction and removal efficiency (DRE) specified in the performance standards of 40 CFR 264.343. In addition, complete Table V.H.8 - Principal Organic Hazardous Constituents.

3. Submit a Quality Control/Quality Assurance Plan for all sampling, analysis, and monitoring activities which will occur in conjunction with the trial burn.

I. Boilers and Industrial Furnaces

Provide an engineering report which includes all of the information specified in 30 TAC 305.50(13), 305.571-573, 40 CFR 266.100 and 266.102 (as incorporated by reference in 30 TAC 335.221 through 335.225), 266.104-266.112, and 270.22.

1. Complete Table V.I.1 - Boilers and Industrial Furnaces and list the boilers and/or industrial furnaces covered by this application to be permitted and list the waste managed in each unit.

   Complete Table V.I.2 - Boiler and Industrial Furnace Permit Conditions, Monitoring, and Automatic Waste Feed Cutoff Systems.

   Complete Table V.I.3 - Maximum Constituent Feed Rate.

   Complete Table V.I.4 - Maximum Allowable Emission Rates.

   For use during the shakedown period, trial burn period and the period after completion of the initial trial burn, complete Table V.I.5 - Boiler and Industrial Furnace Permit Conditions, Monitoring, and Automatic Waste Feed Cutoff Systems-Short-Term Operation.

   If a boiler or industrial furnace will manage reactive or incompatible waste, as indicated on Table V.I.1, describe in the engineering report the procedures used to ensure compliance with 40 CFR 264.17.

   If a boiler and industrial furnace will manage F020, F021, F022, F023, F026, and F027 waste, as indicated on Table V.I.1, the DRE requirement is 99.9999%.

2. If a trial burn will be performed, designate one or more of the 40 CFR 261 Appendix VIII organic compounds present in the wastes to be incinerated as Principal Organic Hazardous Constituents (POHCs). Selection will be based upon the degree of difficulty of incineration of these compounds and upon their concentration or mass in the waste feed. These POHCs will be used to determine the destruction and removal efficiency (DRE) specified in the performance standards of 40 CFR 266.104. In addition, complete Table V.I.8 - Principal Organic Hazardous Constituents.

3. Submit a Quality Control/Quality Assurance Plan for all sampling, analysis, and monitoring activities.

J. Drip Pads

Provide an engineering report which includes all of the information specified in 40 CFR 264.570-573 and 270.26.

1. Complete Table V.J.1. - Drip Pads and list the drip pads, covered by this application, to be permitted. List the N.O.R. unit number, the waste managed in each unit, the rated capacity of

each unit, and the overall dimensions of the unit (including perimeter curb or berm height) that will be in contact with the waste.

2. For either new drip pads[2] or existing drip pads for which the owner/operator elects to comply with the synthetic liner requirement of 40 CFR 264.573(b), please complete Table V.J.2. - Drip Pad Synthetic Liner System.

3. In the engineering report, describe the design, installation, construction, and operation of the liner and leakage collection system. The description must demonstrate that the liner system will prevent discharge to the land, groundwater, and surface water. The following analyses should be included as attachments to the engineering report (A QAPP should be included in the report to ensure that each analysis is performed appropriately):

   For artificial liners:

   a. Seaming method
   b. Surface preparation method
   c. Tensile Strength
   d. Impact Resistance
   e. Compatibility Demonstration
   f. Foundation Design (including Settlement Potential, Bearing Capacity and Stability, and Potential for Bottom Heave Blow-out)

   For Leakage Collection System

   g. Capacity of the system:
      (1) rate of leachate removal
      (2) capacity of sumps
      (3) thickness of mounding and maximum hydraulic head
   h. Pipe Material and Strength
   i. Pipe Network Spacing and Grading
   j. Collection Sump(s) Material and Strength
   k. Drainage Media Specifications and Performance
   l. Analyses showing that pipe and pipe perforation size will prevent clogging and allow free liquid access to the pipe.
   m. Compatibility Demonstration

K. Miscellaneous Units

A miscellaneous unit is a unit other than a container, tank, incinerator, boiler, industrial furnace, landfill, surface impoundment, waste pile, underground injection well, land treatment area, drip pad, or unit eligible for an R, D & D permit that is used to process, store, or dispose of hazardous waste.

For each miscellaneous unit for which an operating permit is sought, provide an engineering report which includes all of the information specified in 40 CFR 264.600-264.602, and 270.23.

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[2]New drip pads are those drip pads constructed after 12/06/90 and which had no binding contract for construction. If electing to comply with 40 CFR 264.573(b), the requirement to install a leakage collection system of 40 CFR 264.573(b)(3) applies only to those drip pads constructed after 12/24/92 and which had no binding contract for construction.

1. Complete Table V.K - Miscellaneous Units and list the miscellaneous units covered by this application. List the waste managed in each unit and the rated capacity or size of the unit. If the information requested is not applicable, an explanation must be submitted.

2. Provide any other information which is descriptive of the relationship between the miscellaneous unit and the environment. Application information may include design requirements of 30 TAC 305 and 335, 40 CFR Part 264 Subparts I through O, and Part 270 that are appropriate for the miscellaneous unit or portions of the unit being permitted.

3. For a unit which involves combustion, please provide emissions data or a trial burn plan. Tables V.H.1-5 for incinerators or Tables V.I.1-5 for boilers and industrial furnaces may be adapted as appropriate to provide operation, monitoring, and emission information for a miscellaneous combustion unit.

L. Containment Buildings

Provide an engineering report which includes all of the information specified in 40 CFR 264.1100-1101(c)(3), and 264.1101(d)-(e).

Complete Table V.L. - Containment Buildings and list the containment buildings covered by this application to be permitted. List the N.O.R. unit number, whether the unit is for storage and/or processing, the waste or debris managed in each unit, the rated capacity of each unit, and the overall dimensions of the unit (including containment wall height) that will be in contact with the waste or debris.

Table V.B. - Container Storage Areas
Not Applicable

Permit Unit No.	Container Storage Area	N.O.R. No.	Rated Capacity	Dimensions	Containment Volume (including rainfall for unenclosed areas)	Unit will manage Ignitable,[1] Reactive,[1] or Incompatible[2] Waste (state all that apply)

[1]Containers managing ignitable or reactive waste must be located at least 15 meters (50 feet) from the facility's property line.

[2]Incompatible waste must be separated from other waste or materials stored nearby in other containers, piles, open tanks, or surface impoundments by means of a dike, berm, wall, or other device.

Table V.C. - Tanks and Tank Systems
Not Applicable

Permit Unit No.	Tank	N.O.R. No.	Storage and/or Processing	Waste Nos.[1]	Rated Capacity	Dimensions	Containment Volume (including rainfall for unenclosed areas)	Unit will manage Ignitable, Reactive, or Incompatible Waste (state all that apply)

[1]from Table IV.B, first column

Table V.D.1. - Surface Impoundments

Permit Unit No.	Surface Impoundment	N.O.R. No.	Waste Nos.[1]	Rated Capacity	Dimensions	Distance from lowest liner to groundwater	Action Leakage Rate (if required)	Unit will manage Ignitable, Reactive, Incompatible, or F020, F021, F022, F023, F026, and F027 Waste (state all that apply)
1	Closed Surface Impoundment	001	No waste stored.	Closed (rated capacity before closure was 5065 yd^3)[2]	180 ft x 106 ft x 7ft (before closure)	Closed. No waste or liner system in place.	Not Required	No Waste stored. The surface impoundment was closed in 1984.

[1]from Table IV.B, first column

[2]Estimated amount of waste and contaminated soil removed in 1984.

Table V.D.6. - Surface Impoundment Liner System
Not Applicable – Unit was closed in 1984 by removal of waste and liner

Surface Impoundment	Primary Liner			Secondary Liner			Clay Liner		
	Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness

Table V.E.1. - Waste Piles
Not Applicable

Permit Unit No.	Waste Pile	N.O.R. No.	Waste Nos.[1]	Rated Capacity	Dimensions	Distance from lowest liner to groundwater	Action Leakage Rate (if required)	Unit will manage Ignitable, Reactive, Incompatible, or F020, F021, F022, F023, F026, and F027 Waste (state all that apply)

[1]from Table IV.B, first column

Table V.E.3. - Waste Pile Liner System
Not Applicable

Waste Pile	Primary Liner			Secondary Liner			Clay Liner		
	Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness

Table V.F.1. - Land Treatment Units
Not Applicable

List the land treatment units covered by this application. List the waste managed in each unit and the rated capacity or size of the unit.

Permit Unit No.	Land Treatment Unit	N.O.R. No.	Waste Nos.[1,2]	Dimensions	Distance from lowest liner to groundwater	Unit will manage Ignitable, Reactive, Incompatible, or F020, F021, F022, F023, F026, and F027 Waste (state all that apply)

[1]from Table IV.B, first column
[2]If cadmium is present in the waste, state the concentration in the report.

Table V.F.2 - Land Treatment Unit Capacity
Not Applicable

For the land treatment units listed in Table IV.F.1, specify the waste treatment capacity.

Permit Unit No.*	Land Treatment Unit	N.O.R. No.	Rated Capacity				Treatment Zone Depth
			Monthly Hydraulic Loading	Monthly Organic Loading	Monthly Inorganic Loading	Cumulative Lifetime Loading	

* This number should match the Permit Unit No. given on Table V.F.1.

Table V.F.3. - Land Treatment Principal Hazardous Constituents Not Applicable

List the wastes for which the demonstration will be made and the principal hazardous constituents in each waste. Indicate by an (*) asterisk which constituents will be treated and rendered nonhazardous.

Waste	Hazardous Constituents

Table V.G.1. - Landfills
Not Applicable

Permit Unit No.	Landfill	N.O.R. No.	Waste Nos.[1]	Rated Capacity	Dimensions	Distance from lowest liner to groundwater	Action Leakage Rate (if required)	Unit will manage Ignitable, Reactive, Incompatible, or F020, F021, F022, F023, F026, and F027 Waste (state all that apply)

[1]from Table IV.B, first column

Table V.G.3. - Landfill Liner System
Not Applicable

Permit Unit No.*	Landfill	Primary Liner			Secondary Liner			Clay Liner		
		Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness

* This number should match the Permit Unit No. given on Table V.G.1.

Table V.G.4. - Landfill Leachate Collection System
Not Applicable

Landfill	Primary Leachate Collection System					Secondary Leachate Collection System				
	Drainage Media	Collection Pipes (including risers)	Filter Fabric	Geofabric	Sump Material	Drainage Media	Collection Pipes (including risers)	Filter Fabric	Geofabric	Sump Material

Table V.H.1. – Incinerators
Not Applicable

List the incinerators covered by this application to be permitted. List the waste managed in each unit and the rated capacity or size of each unit.

Permit Unit No.*	Incinerators	N.O.R. No.	Waste Nos.[1]	Waste Physical Form (Pumpable or Non-pumpable)	Reactive, Incompatible, or F020, F021, F022, F023, F026, or F027 Waste

[1]From the first column of Table IV.B.

* If the unit is already permitted, use the established "Permit Unit No." If the unit is not yet permitted, the number given here for the unit will become the "Permit Unit No." The numbers should be in an order that will be convenient for the facility operator.

Table V.H.2. - Incinerator Permit Conditions, Monitoring and Automatic Waste Feed Cutoff Systems Not Applicable

[Use a table for each unit and fill in all columns with the appropriate information]

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Permit Limit	Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
Operating Parameters						
Maximum Total Hazardous Waste Feed Rate (Additional hazardous waste feed limits shall be added as determined necessary based upon feed mechanism and/or waste-specific needs)		**[Volumetric Flow Meter[3] or Mass Flow Meter as applicable to the feed mechanism]**	Feed System	lb/hr	Y	Y
Maximum Total Pumpable Hazardous Waste Mass Feed Rate **[Not applicable for Tier I or Tier I adjusted metals control limits]**		Volumetric Flow Meter[3] or Mass Flow Meter	Feed System	lb/hr		
Minimum Primary Combustion Chamber Temperature		Thermocouple **[or other device]**	Primary Chamber Exit	°F	Y	N
Minimum Secondary Combustion Chamber Temperature		Thermocouple **[or other device]**	Secondary Chamber Exit	°F	Y	Y
Maximum Secondary and/or Primary Combustion Chamber Temperature [Include if using Tier II, III metals controls only]		Thermocouple **[or other device]**	Secondary Chamber Exit	°F	Y	Y
Maximum Flue Gas Temperature at PM Control Device Inlet [Tier II and Tier III Metals only as applicable]		Thermocouple **[or other device]**	At entrance to PM Control Device	°F	Y	Y

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Permit Limit	Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
Maximum Combustion Gas Velocity Indicator **[If condition is something other than ▪maximum combustion gas velocity•, write specific name of condition]**					Y	Y
Atomization parameters **[as necessary]**						**[as appropriate]**
Feed Rates: (Metals, Total Chlorine, and Ash)		Volumetric Flow Meter[4] or Mass Flow Meter	Feed Systems	Limits Specified in Table ____ **[•Maximum Constituent Feed Rates•]**	N	N
Secondary Combustion Zone Pressure **[or other method for fugitives monitoring]**				e.g., in. H_2O	[Yes, if neg. pressure is used to control fugitives.]	[Yes, if neg. pressure is used to control fugitives.]
Primary Combustion Zone Pressure **[or other method for fugitives monitoring]**				e.g., in. H_2O	[Yes, if neg. pressure is used to control fugitives.]	[Yes, if neg. pressure is used to control fugitives.]
CEMS Monitoring Parameters						
Stack Oxygen	Continuous	CEMS	Stack	No Limit (for correction to 7% O_2)	N	N
Stack CO	Continuous HRA	CEMS	Stack	100 ppmv HRA, 7% O_2, dry basis	Y	Y

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Permit Limit	Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
Stack THC **[If specified in the permit]**	Continuous HRA	CEMS	Stack	20 ppmv HRA, 7% O_2, dry basis	Y	Y
APCD Parameters						
Pressure drop across Baghouse [or fabric filter]				_____ in. W.C.		
[Wet Scrubbers:]						
Ionizing Wet Scrubber minimum voltage				_____ kilovolts (kV)		
Minimum liquid to flue gas ratio (L/G)				_____ gallons/1000 actual cubic feet (acf)		
Minimum scrubber blowdown				_____ gallons/min		
Minimum scrubber water pH				_____		
[Venturi Scrubbers:]						
Venturi scrubber minimum liquid to gas ratio (L/G)				_____ gallons/1000 actual cubic feet minute (acfm)		
Minimum differential gas pressure across venturi scrubber				____ in. W.C.		
[Dry Scrubbers:]						
Minimum alkaline reagent [insert name of reagent here, such as lime] flow to the dry scrubber				_____ pounds per minute		

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Permit Limit	Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
Maximum flue gas flow rate				_____acfm		
[Absorbers:]						
Absorber minimum pH of incoming liquid				_____		
Absorber minimum liquid to gas ratio (L/G)				_____ gallons/1000 actual cubic feet (acf)		
Other Air Pollution Control Devices permit conditions as necessary						

[1]*Instantaneous* as defined in 40 CFR 266.102(e)(6)(i)(A) shall mean a value which occurs at any time. A value shall be determined by the monitoring device no less than every 15 seconds.
Continuous monitor is one which continuously samples or measures the regulated parameter without interruption, and evaluates the detector response at least once each 15 seconds, and computes and records the average value at least every 60 seconds.
Hourly Rolling Average (HRA) as defined in 40 CFR 266.102(e)(6)(i)(B).
- For carcinogenic metals and lead feed rates: Instantaneous as defined above or, rolling average as defined in 40 CFR 266.102(e)(6)(ii).

[2]AWFCO: Automatic Waste Feed Cutoff. For AWFCOs indicated by ▪Y•, the Permit Limit in the table triggers an AWFCO.

[3]Specific gravity associated with the volumetric rate must be known to determine the mass feed rate.

[4]The respective specific gravity and constituent concentration of each stream associated with a volumetric rate must be known to determine the mass feed rate.

Table V.H.3. - Maximum Constituent Feed Rates
Not Applicable

[Multi-chamber Incinerators (e.g., rotary kilns) may need feed rate limits to each combustion chamber.] The total feed rate of constituents to the incinerator(s) shall not exceed the following limitations in grams per hour (g/hr) or tons per year (T/yr), as noted. The metals limitations have been evaluated through the risk assessment. The ash and chlorine limits are based upon testing or regulatory limits.

Constituent	Maximum Allowable Feed Rate In All Feedstreams Hourly Basis (g/hr)	Maximum Allowable Feed Rate In All Hazardous Waste Feedstreams Hourly Basis (g/hr)[1]	Maximum Allowable Feed Rate in All Pumpable Hazardous Waste Feedstreams Hourly Basis (g/hr)[1]	Maximum Allowable Feed Rate in All Feedstreams Annual Basis (T/yr)
Arsenic				
Beryllium				
Cadmium				
Total Chromium				
Antimony				
Barium				
Lead				
Mercury				
Silver				
Thallium				
(Others as Necessary)				
Total Chlorine		Not applicable	Not applicable	Not applicable
Ash to Secondary Combustion Chamber or Other Primary Chamber if Only Pumpable Waste is Fed		Not applicable	Not applicable	Not applicable

[1]Not applicable for Tier I or Tier I adjusted metals feed rate screening limits.
[Hourly feed rate limits must comply with the requirements of 40 CFR 266.106 for carcinogenic metals and non-carcinogenic metals. As applicable, the feed rate limit for chromium may be specified as hexavalent and total chromium limits.]

Table V.H.4. - Maximum Allowable Emission Rates Not Applicable

Use a table for each operating mode as applicable

Carcinogenic Constituent (Compliance Tier)	Maximum Allowable Emission Rate[1]	Units[2]
Arsenic (Tier)		g/hr
Beryllium (Tier)		g/hr
Cadmium (Tier)		g/hr
Chromium, Total (Tier)		g/hr
Non-Carcinogenic Constituent (Compliance Tier)	Maximum Allowable Emission Rate[1]	Units[2]
Antimony (Tier)		g/hr
Barium (Tier)		g/hr
Lead (Tier)		g/hr
Mercury (Tier)		g/hr
Silver (Tier)		g/hr
Thallium (Tier)		g/hr
Hydrogen Chloride (Tier)		g/hr
Free Chlorine (Tier)		g/hr
Particulate Matter	0.08	Grains/dscf

[1] Not applicable for Tier I or Tier I adjusted feed rate screening limits.

[2] g/hr denotes grams per hour. Grains/dscf denotes grains per dry standard cubic foot (standard conditions: 760 mm Hg, 68 EF) after correction to a stack gas concentration of 7% oxygen.

Note: Site-specific dispersion modeling factor =x.xxx [insert dispersion factor for Tier III as applicable] micrograms per cubic meter per grams per second emission rate.

Table V.H.5. - Incinerator Permit Conditions, Monitoring and Automatic Waste Feed Cutoff Systems - Short-Term Operation Not Applicable

[Use this table for each new or modified Incinerator unit and fill in all columns with the appropriate information]

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
				Pre-Trial Burn - Shakedown	Trial Burn	Post Trial Burn		
Operating Parameters								
Maximum Total Hazardous Waste Feed Rate (Additional hazardous waste feed limits shall be added as determined necessary based upon feed mechanism and/or waste-specific needs)		[Volumetric Flow Meter3 or Mass Flow Meter as applicable to the feed mechanism]	Feed System	lb/hr			Y	Y
Maximum Total Pumpable Hazardous Waste Mass Feed Rate **[Not applicable for Tier I or Tier I adjusted metals screening limits]**		Volumetric Flow Meter[3] or Mass Flow Meter	Feed System	lb/hr				
Minimum Primary Combustion Chamber Temperature		Thermocouple **[or other device]**	Primary Chamber Exit	°F			Y	N
Minimum Secondary Combustion Chamber Temperature		Thermocouple **[or other device]**	Secondary Chamber Exit	°F			Y	Y
Maximum Secondary and/or Primary Combustion Chamber Temperature **[Include if using Tier II/ III metals controls.]**		Thermocouple **[or other device]**	Secondary Chamber Exit	°F			Y	Y

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
				Pre-Trial Burn - Shakedown	Trial Burn	Post Trial Burn		
Maximum Flue Gas Temperature at PM Control Device Inlet **[Tier II/III metals controls as applicable.]**		Thermocouple [or other device]	At entrance to PM Control Device	°F			Y	Y
Maximum Combustion Gas Velocity Indicator **[If condition is something other than maximum combustion gas velocity, write specific name of condition]**							Y	Y
Atomization parameters **[as necessary]**								**[as appropriate]**
Feed Rates: (Metals, Total Chlorine, and Ash)		Volumetric Flow Meter[4] or Mass Flow Meter	Feed Systems	Limits Specified in Table ____			N	N
Secondary Combustion Zone Pressure **[or other method for fugitives monitoring]**				e.g., in. H_2O			[Yes, if neg. pressure is used to control fugitives.]	[Yes, if neg. pressure is used to control fugitives.]
Primary Combustion Zone Pressure **[or other method for fugitives monitoring]**				e.g., in. H_2O			[Yes, if neg. pressure is used to control fugitives.]	N
CEMS Monitoring Parameters								
Stack Oxygen	C	CEMS	Stack	No Limit (for correction to 7% O_2)			N	N
Stack CO	C, HRA	CEMS	Stack	100 ppmv HRA, 7% O_2, dry basis			Y	Y

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
				Pre-Trial Burn - Shakedown	Trial Burn	Post Trial Burn		
Stack THC **[If specified in the permit]**	C, HRA	CEMS		20 ppmv HRA, 7% O_2, dry basis			Y	Y
APCD PARAMETERS								
Pressure drop across Baghouse [or fabric filter]				_____ in. W.C.				
[Wet Scrubbers:]								
Ionizing Wet Scrubber minimum voltage				_____ kilovolts (kV)				
Minimum liquid to flue gas ratio (L/G)				_____ gallons/1000 actual cubic feet (acf)				
Minimum scrubber blowdown				_____ gallons/min				
Minimum scrubber water pH				_____				
[Venturi Scrubbers:]								
Venturi scrubber minimum liquid to gas ratio (L/G)				_____ gallons/1000 actual cubic feet minute (acfm)				
Minimum differential gas pressure across venturi scrubber				____ in. W.C.				
[Dry Scrubbers:]								

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			Primary Combustion Chamber AWFCO Y/N[2]	Secondary Combustion Chamber AWFCO Y/N[2]
				Pre-Trial Burn - Shakedown	Trial Burn	Post Trial Burn		
Minimum alkaline reagent [insert name of reagent here, such as lime] flow to the dry scrubber				_____ pounds per minute				
Maximum flue gas flow rate				_____acfm				
[Absorbers:]								
Absorber minimum pH of incoming liquid				_____				
Absorber minimum liquid to gas ratio (L/G)				_____ gallons/1000 actual cubic feet (acf)				
Other Air Pollution Control Devices permit conditions as necessary								

[1] **(I)** *Instantaneous* as defined in 40 CFR 266.102(e)(6)(i)(A) shall mean a value which occurs at any time. A value shall be determined by the monitoring device no less than every 15 seconds.
(C) Continuous monitor is one which continuously samples or measures the regulated parameter without interruption, and evaluates the detector response at least once each 15 seconds, and computes and records the average value at least every 60 seconds.
(HRA) *Hourly Rolling Average* (HRA) as defined in 40 CFR 266.102(e)(6)(ii).

[2] *AWFCO*: Automatic Waste Feed Cutoff. For AWFCOs indicated by ▪Y•, the Permit Limit in the table triggers an AWFCO.

[3] Specific gravity associated with the volumetric rate must be known to determine the mass feed rate.

[4] The respective specific gravity and constituent concentration of each stream associated with a volumetric rate must be known to determine the mass feed rate.

Table V.H.8 - Principal Organic Hazardous Constituents Not Applicable

List the wastes for which the trial burn demonstration will be made and the principal organic hazardous constituents (POHCs) in each waste.

Waste	Principal Organic Hazardous Constituents

Table V.I.1. - Boilers/Industrial Furnaces Not Applicable

Permit Unit No.	Boilers/Industrial Furnaces	N.O.R. No.	Waste Nos.[1]	Waste Physical Form (Pumpable or Non-pumpable)	Reactive, Incompatible, or F020, F021, F022, F023, F026, or F027 Waste

[1]From the first column of Table IV.B.

* If the unit is already permitted, use the established "Permit Unit No." If the unit is not yet permitted, the number given here for the unit will become the "Permit Unit No." The numbers should be in an order that will be convenient for the facility operator.

Table V.I.2. - Boiler/Industrial Furnace Permit Conditions, Monitoring and Automatic Waste Feed Cutoff Systems Not Applicable

[Use a table for each unit and fill in all columns with the appropriate information]

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Permit Limit	AWFCO Y/N[2]
Operating Parameters					
Maximum Total Hazardous Waste Feed Rate				lb/hr	Y
Maximum Total Pumpable Hazardous Waste Mass Feed Rate **[Not applicable for Tier I or Tier I adjusted metals screening limits]**		Volumetric Flow Meter[3] or Mass Flow Meter	Feed System	lb/hr	Y
Minimum Device Production Rate **(e.g., steam)**				**[e.g., lb/hr]**	
Maximum Device Production Rate **(e.g., steam)**				**[e.g., lb/hr]**	
Minimum Combustion Temperature		Thermocouple **[or other device]**	**Boiler/Industrial** Furnace Exit	°F	Y
Maximum Combustion Temperature **[Include if using Tier II/ III metals controls.]**		Thermocouple **[or other device]**		°F	Y
Maximum Flue Gas Temperature at PM Control Device Inlet **[Tier II/ III metals controls as applicable.]**		Thermocouple **[or other device]**	At entrance to PM Control Device	°F	Y
Maximum Combustion Gas Velocity Indicator **[If condition is something other than maximum combustion gas velocity, write specific name of condition]**					Y
Atomization parameters **[as necessary]**					**[as appropriate]**

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Permit Limit	AWFCO Y/N[2]
Feed Rates: (Metals, Total Chlorine, and Ash)		Volumetric Flow Meter[4] or Mass Flow Meter	Feed Systems	Limits Specified in Table ____ **[•Maximum Constituent Feed Rates•]**	N
Number of Soot Blowing Events per 24 hours **[if applicable]**				**[insert number]**	N
Combustion Zone Pressure **[or other method for fugitives monitoring]**				e.g., in. H_2O	**[Yes, if neg. pressure is used to control fugitives.]**
CEMS Monitoring Parameters					
Stack Oxygen	Continuous	CEMS	Stack	No Limit (for correction to 7% O_2)	N
Stack CO	Continuous HRA	CEMS	Stack	100 ppmv HRA, 7% O_2, dry basis	Y
Stack THC ***[If specified in the permit]***	Continuous HRA	CEMS	Stack	20 ppmv HRA, 7% O_2, dry basis	Y
APCD Parameters					
Pressure drop across Baghouse [or fabric filter]				_____ in. W.C.	
[Wet Scrubbers:]					
Ionizing Wet Scrubber minimum voltage				_____ kilovolts (kV)	
Minimum liquid to flue gas ratio (L/G)				_____ gallons/1000 actual cubic feet (acf)	
Minimum scrubber blowdown				_____ gallons/min	

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Permit Limit	AWFCO Y/N[2]
Minimum scrubber water pH				_____	
[Venturi Scrubbers:]					
Venturi scrubber minimum liquid to gas ratio (L/G)				_____ gallons/1000 actual cubic feet minute (acfm)	
Minimum differential gas pressure across venturi scrubber				____ in. W.C.	
[Dry Scrubbers:]					
Minimum alkaline reagent [insert name of reagent here, such as lime] flow to the dry scrubber				_____ pounds per minute	
Maximum flue gas flow rate				_____acfm	
[Absorbers:]					
Absorber minimum pH of incoming liquid				_____	
Absorber minimum liquid to gas ratio (L/G)				_____ gallons/1000 actual cubic feet (acf)	
Other Air Pollution Control Devices permit conditions as necessary					

[1] *Instantaneous* as defined in 40 CFR 266.102(e)(6)(i)(A) shall mean a value which occurs at any time. A value shall be determined by the monitoring device no less than every 15 seconds.
Continuous monitor is one which continuously samples or measures the regulated parameter without interruption, and evaluates the detector response at least once each 15 seconds, and computes and records the average value at least every 60 seconds.
Hourly Rolling Average (HRA) as defined in 40 CFR 266.102(e)(6)(i)(B).
For carcinogenic metals and lead feed rates: Instantaneous as defined above or, Rolling average as defined in 40 CFR 266.102(e)(6)(ii).

[2] *AWFCO:* Automatic Waste Feed Cutoff. For AWFCOs indicated by ▪Y•, the Permit Limit in the table triggers an AWFCO.

[3] Specific gravity associated with the volumetric rate must be known to determine the mass feed rate.

[4] The respective specific gravity and constituent concentration of each stream associated with a volumetric rate must be known to determine the mass feed rate.

Table V.I.3 - Maximum Constituent Feed Rates Not Applicable

The total feed rate of constituents to the **boiler/industrial furnace(s)** shall not exceed the following limitations in grams per hour (g/hr) or tons per year (T/yr), as noted. The metals limitations have been evaluated through risk assessment. The ash and chlorine limits are based upon testing or regulatory limits.

Constituent	Maximum Allowable Feed Rate In All Feedstreams Hourly Basis (g/hr)	Maximum Allowable Feed Rate In All Hazardous Waste Feedstreams Hourly Basis (g/hr)[1]	Maximum Allowable Feed Rate in All Pumpable Hazardous Waste Feedstreams Hourly Basis (g/hr)[1]	Maximum Allowable Feed Rate in All Feedstreams Annual Basis (T/yr)
Arsenic				
Beryllium				
Cadmium				
Total Chromium				
Antimony				
Barium				
Lead				
Mercury				
Silver				
Thallium				
(Others as Necessary)				
Total Chlorine		Not applicable	Not applicable	Not applicable
Ash		Not applicable	Not applicable	Not applicable

[1]Not applicable for Tier I or Tier I adjusted metals feed rate screening limits.

[Hourly feed rate limits must comply with the requirements of 40 CFR 266.106 for carcinogenic metals and non-carcinogenic metals. As applicable, the feed rate limit for chromium may be specified as hexavalent and total chromium limits.]

[Applicant to use a table for each operating mode as applicable and for each unit]

Table V.I.4. - Maximum Allowable Emission Rates
Not Applicable

Carcinogenic Constituent (Compliance Tier)	Maximum Allowable Emission Rate[1]	Units[2]
Arsenic (Tier)		g/hr
Beryllium (Tier)		g/hr
Cadmium (Tier)		g/hr
Chromium, Total (Tier)		g/hr
Non-Carcinogenic Constituent (Compliance Tier)	**Maximum Allowable Emission Rate[1]**	**Units[2]**
Antimony (Tier)		g/hr
Barium (Tier)		g/hr
Lead (Tier)		g/hr
Mercury (Tier)		g/hr
Silver (Tier)		g/hr
Thallium (Tier)		g/hr
Hydrogen Chloride (Tier)		g/hr
Free Chlorine (Tier)		g/hr
Particulate Matter	0.08	Grains/dscf

[1] Not applicable for Tier I or Tier I adjusted feed rate screening limits.

[2] g/hr denotes grams per hour. Grains/dscf denotes grains per dry standard cubic foot (standard conditions: 760 mm Hg, 68 EF) after correction to a stack gas concentration of 7% oxygen.

Note: Site-specific dispersion modeling factor =x.xxx [insert dispersion factor for Tier III as applicable] micrograms per cubic meter per grams per second emission rate.

Table V.I.5 - Boiler/Industrial Furnace Permit Conditions, Monitoring and Automatic Waste Feed Cutoff Systems - Short-Term Operation
Not Applicable

[Use this table for each new or modified Boiler/Industrial Furnace unit and fill in all columns with the appropriate information]

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			AWFCO (Y/N)[2]
				Pre-trial burn (Shakedown Period)	Trial Burn	Post Trial Burn	
Operating Parameters							
Maximum Total Hazardous Waste Feed Rate						lb/hr	Y
Maximum Total Pumpable Hazardous Waste Mass Feed Rate **[Not applicable for Tier I or Tier I adjusted metals screening limits]**		Volumetric Flow Meter[3] or Mass Flow Meter	Feed System			lb/hr	Y
Minimum Device Production Rate **(e.g., steam)**						**[e.g., lb/hr]**	
Maximum Device Production Rate **(e.g., steam)**						**[e.g., lb/hr]**	
Minimum Combustion Temperature		Thermocouple **[or other device]**	**Boiler/ Industrial** Furnace Exit			°F	Y
Maximum Combustion Temperature **[Include if using Tier II/ III metals controls.]**		Thermocouple **[or other device]**				°F	Y
Maximum Flue Gas Temperature at PM Control Device Inlet **[Tier II/Tier III metals controls as applicable.]**		Thermocouple **[or other device]**	At entrance to PM Control Device			°F	Y

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			AWFCO (Y/N)[2]
				Pre-trial burn (Shakedown Period)	Trial Burn	Post Trial Burn	
Maximum Combustion Gas Velocity Indicator **[If condition is something other than maximum combustion gas velocity, write specific name of condition]**						[as appropriate]	Y
Atomization parameters **[as necessary]**						**[as appropriate]**	**[as appropriate]**
Feed Rates: (Metals, Total Chlorine, and Ash)		Volumetric Flow Meter[3] or Mass Flow Meter	Feed Systems			Limits Specified in Table ____ **[Maximum Constituent Feed Rates]**	
Number of Soot Blowing Events per 24 hours **[if applicable]**						**[insert number]**	N
Combustion Zone Pressure **[or other method for fugitives monitoring]**						e.g., in. H_2O	[Yes, if neg. pressure is used to control fugitives.]
CEMS Monitoring Parameters							
Stack Oxygen	Continuous	CEMS	Stack			No Limit (for correction to 7% O_2)	N
Stack CO	Continuous HRA	CEMS	Stack			100 ppmv HRA, 7% O_2, dry basis	Y

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			AWFCO (Y/N)[2]
				Pre-trial burn (Shakedown Period)	Trial Burn	Post Trial Burn	
Stack THC **[If specified in the permit]**	Continuous HRA	CEMS	Stack			20 ppmv HRA, 7% O_2, dry basis	Y
APCD Parameters [insert parameters as applicable]							
Pressure drop across Bathhouse [or fabric filter]						_____ in. W.C.	
[Wet Scrubbers:]							
Ionizing Wet Scrubber minimum voltage						_____ kilovolts (kV)	
Minimum liquid to flue gas ratio (L/G)						_____ gallons/1000 actual cubic feet (acf)	
Minimum scrubber blowdown						_____ gallons/min	
Minimum scrubber water pH						_____	
[Venturi Scrubbers:]							
Venturi scrubber minimum liquid to gas ratio (L/G)						_____ gallons/1000 actual cubic feet minute (acfm)	
Minimum differential gas pressure across venturi scrubber						_____ in. W.C.	

Parameter	Monitoring Basis[1]	Monitoring Device	Device Location	Short-Term Operating Permit Limits			AWFCO (Y/N)[2]
				Pre-trial burn (Shakedown Period)	Trial Burn	Post Trial Burn	
[Dry Scrubbers:]							
Minimum alkaline reagent [insert name of reagent here, such as lime] flow to the dry scrubber						_____ pounds per minute	
Maximum flue gas flow rate						_____acfm	
[Absorbers:]							
Absorber minimum pH of incoming liquid						_____	
Absorber minimum liquid to gas ratio (L/G)						_____ gallons/1000 actual cubic feet (acf)	
Other Air Pollution Control Devices permit conditions as necessary							

[1] *Instantaneous* as defined in 40 CFR 266.102(e)(6)(i)(A) shall mean a value which occurs at any time. A value shall be determined by the monitoring device no less than every 15 seconds.
Continuous monitor is one which continuously samples or measures the regulated parameter without interruption, and evaluates the detector response at least once each 15 seconds, and computes and records the average value at least every 60 seconds.
Hourly Rolling Average (HRA) as defined in 40 CFR 266.102(e)(6)(i)(B).
- For carcinogenic metals and lead feed rates: Instantaneous as defined above or, Rolling average as defined in 40 CFR 266.102(e)(6)(ii).

[2] *AWFCO*: Automatic Waste Feed Cutoff. For AWFCOs indicated by ■Y•, the Permit Limit in the table triggers an AWFCO. During the Trial Burn phase, AWFCOs will be as necessary to ensure protection of human health and the environment.

[3] The respective specific gravity and constituent concentration of each stream associated with a volumetric rate must be known to determine the mass feed rate.

Table V.I.8. - Principal Organic Hazardous Constituents Not Applicable

List the wastes for which the trial burn demonstration will be made and the principal organic hazardous constituents in each waste.

Waste	Principal Organic Hazardous Constituents

Table V.J.1. - Drip Pads
Not Applicable

Permit Unit No.*	Drip Pad	N.O.R. No.	Storage and/or Processing	Waste Nos.[1]	Overall Dimensions	Collection System Volume

[1]from Table IV.B, first column

* If the unit is already permitted, use the established "Permit Unit No." If the unit is not yet permitted, the number given here for the unit will become the "Permit Unit No." The numbers should be in an order that will be convenient for the facility operator.

Table V.J.2 - Drip Pad Synthetic Liner System
Not Applicable

Drip Pad	Synthetic Liner			Leakage Detection System			Leak Collection System		
	Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness	Material	Permeability (cm/sec)	Thickness

Table V.K. - Miscellaneous Units
Not Applicable

Permit Unit No.	Miscellaneous Unit	N.O.R. No.	Storage, Processing, and/or Disposal	Waste Nos.[1]	Rated Capacity	Dimensions	Unit will manage Ignitable, Reactive, or Incompatible Waste (state all that apply)

[1]from Table IV.B, first column

Table V.L. - Containment Buildings
Not Applicable

Permit Unit No.*	Containment Building	N.O.R. No.	Storage and/or Processing	Waste Nos.[1]	Rated Capacity	Overall Dimensions

[1]from Table IV.B, first column

*If the unit is already permitted, use the established "Permit Unit No." If the unit is not yet permitted, the number given here for the unit will become the "Permit Unit No." The numbers should be in an order that will be convenient for the facility operator.

V. ENGINEERING REPORT

**ENGINEERING REPORT FOR THE
PART B PERMIT APPLICATION
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS**

TABLE OF CONTENTS

LIST OF PART B APPLICATION FORM TABLES

LIST OF FIGURES

Exhibit 5, 6 and 7 were prepared by Geo Associates and submitted to the TCEQ as part of the original Part B Permit in 1991 (SPTCo, 1991). These figures were taken directly from that report. Figures V.A.1 and V.A.2 were prepared by PBW.

V.A. GENERAL ENGINEERING REPORTS

V.A.1. General Information

Solid Waste Management Unit (SWMU) No. 1 is an inactive surface impoundment and is a grass-covered section of land located at the southwest corner of the facility property (Figure V.A.1). SWMU No. 1 was built in 1979 for the disposal of contaminated surface soils remediated from an adjacent low-lying ponding area (AOC 6). Surface soils from the ponding area were remediated in response to a fire in 1979 and the discovery of contaminated soils. Installation of SWMU No. 1 was based on an agreement with the Texas Department of Water Resources (TDWR) for disposal of the soils.

In 1984, Southern Pacific Transportation Company (SPTCo) closed SWMU No. 1 by excavating the soils and materials contained within. The visual hazardous material was removed along with apparent contaminated soil. An additional 3-inches of soil was then removed. When soil confirmation sample concentrations were lower than those of background samples, the excavated area was backfilled with compacted clay and a groundwater monitoring system was installed.

V.A.2. Features to Mitigate Unsuitable Site Characteristics

This section does not apply since the unit is closed.

V.A.3. Construction Schedules

This section does not apply since the unit is closed.

V.D. SURFACE IMPOUNDMENTS

V.D.5. SWMU No. 1

The surface impoundment SWMU No. 1 was not an engineered structure, nor was it designated to serve as a landfill. It was used from 1979 to 1982 for the disposal of contaminated surface soils containing K001 type wastes.

SWMU No. 1 is bordered on the southern side by an earthen berm, which is about 2 feet by 3 feet by about 80 to 100 feet long. The berm extends about 100 feet south of the southwest corner of the SWMU No. 1. A chain-link security fence is located along the northern and western margins of SWMU No. 1. The original dimensions of the unit were about 180 feet by 106 feet at the surface, extending to a depth of about 7 feet bgs (SPTCo, 1991). Based on these dimensions, SWMU No. 1 would have a capacity of 133,560 cubic feet (about 4,950 cubic yards). According to SPTCo facility representatives, a clay liner was installed during the original construction of SWMU No. 1. No information was available concerning the thickness and engineering properties of the liner.

The cross-sections prepared by Geo Associates and included in the original 1991 permit application are included in the Figures section as Exhibits 5, 6 and 7 (SPTCo, 1991).

In 1984 SWMU No. 1 was closed by excavating the soils and materials contained within the unit and SPTCo requested a clean closure for the unit. However, groundwater impacts above groundwater protective standards (GWPS) were detected and the unit entered corrective action monitoring in 1994. Constituent concentrations in groundwater were below their respective groundwater protective standards (GWPS) between 2006 and 2019, compliant with the TCEQ Remedy Standard A requirements for groundwater protection. Naphthalene was detected above the GWPS at one of the point of compliance (POC) wells in July 2019 and verified in October 2019, but returned to below GWPS in January 2020. RCRA-Regulated Waste Management Unit 001 (SWMU 1) will remain in the corrective action program until concentrations in the POC wells are below respective GWPS for three consecutive years in accordance with Section IV.F.3 of the Compliance Plan.

V.E REFERENCES

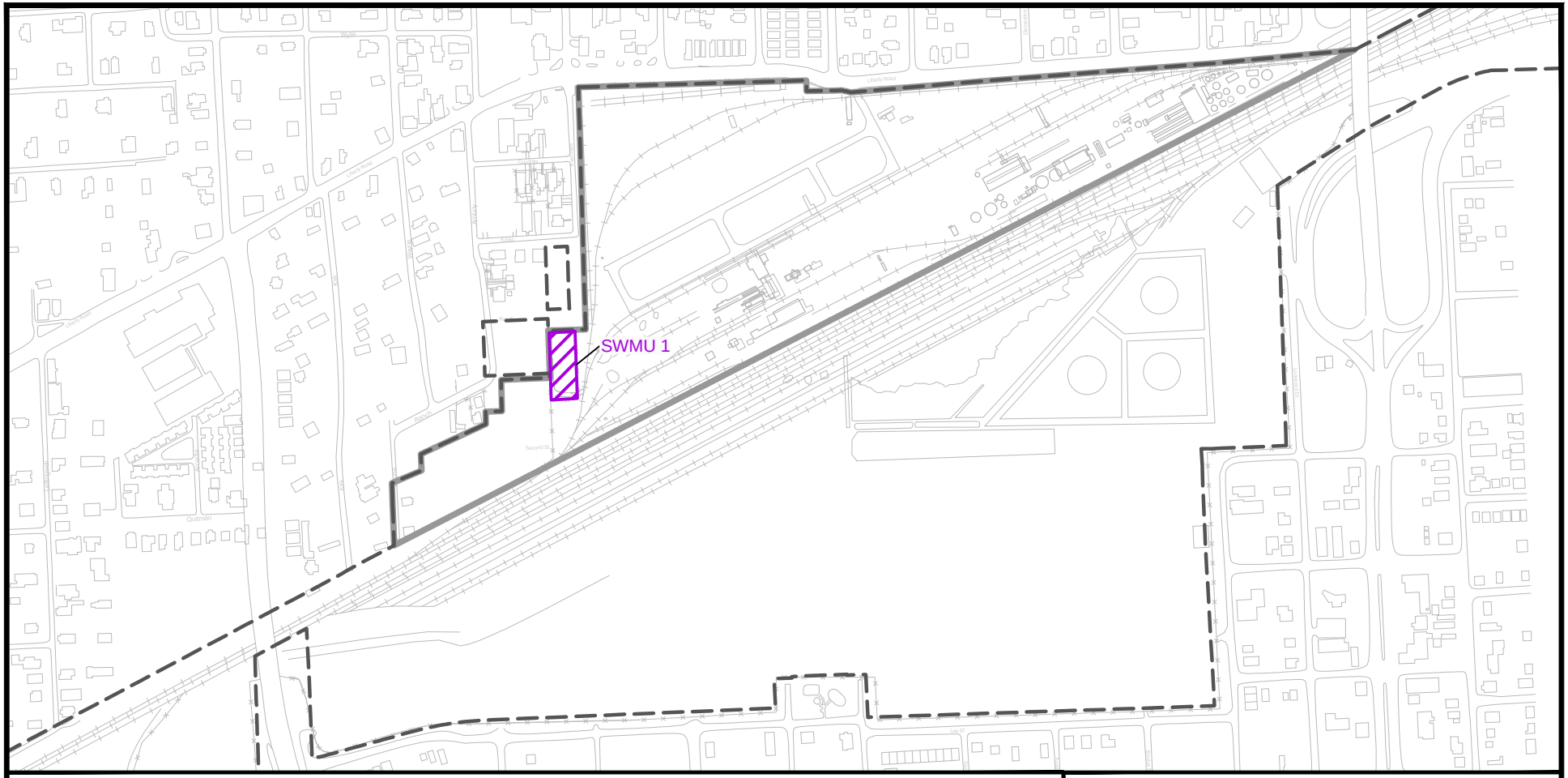
Southern Pacific Transportation Company (SPTCo), 1991. *Part B Permit Application – Post Closure Care and Compliance Plan for the Closed Surface Impoundment.* Volumes I-III. May 13.

Table V.D.1. - Surface Impoundments

Permit Unit No.	Surface Impoundment	N.O.R. No.	Waste Nos.[1]	Rated Capacity	Dimensions	Distance from lowest liner to groundwater	Action Leakage Rate (if required)	Unit will manage Ignitable, Reactive, Incompatible, or F020, F021, F022, F023, F026, and F027 Waste (state all that apply)
1	Closed Surface Impoundment	001	No waste stored.	Closed (rated capacity before closure was 5065 yd^3)[2]	180 ft x 106 ft x 7ft (before closure)	Clean Closed. No waste or liner system in place.	Not Required	No Waste stored. The surface impoundment was clean closed in 1984.

[1]from Table IV.B, first column
[2]Estimated amount of waste and contaminated soil removed in 1984.

FIGURES



EXPLANATION

- UPRR Property Boundary
- UPRR Facility Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad

N

Approx. Scale in Feet

0 250 500

SOURCE:
Base map from ERM-Southwest, Inc APAR Addendum, Fig 3-1, dated June 2004.

UNION PACIFIC RAILROAD CO.

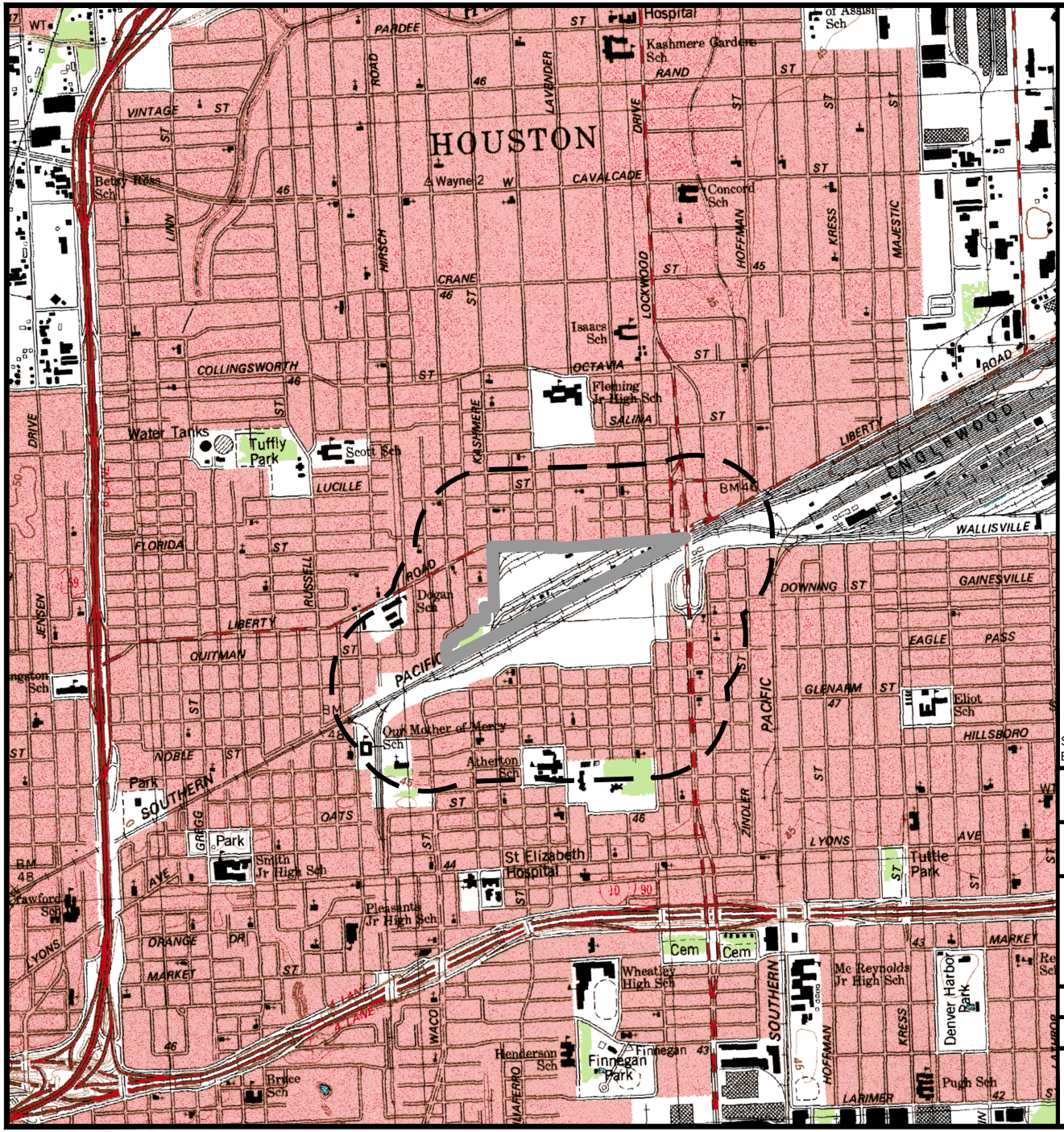
HOUSTON WOOD PRESERVING WORKS

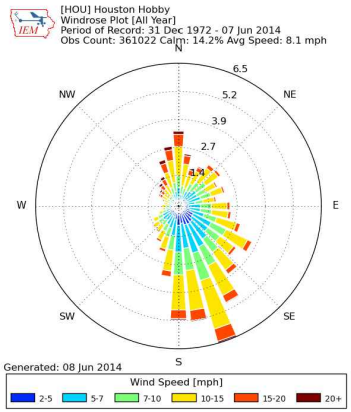
Figure V.A.1

SITE MAP

PROJECT: 1358	BY: AJD	REVISIONS
DATE: NOV., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS





EXPLANATION

- Site Property Boundary, Fence
- 1000 Ft Radius
- Residential (All other surrounding property land use is industrial)

N

Scale in Feet

0 1000 2000

QUADRANGLE LOCATION

SOURCE: Base map from www.tnris.gov, Settegast, TX 7.5 min. USGS quadrangle dated 1982.

UNION PACIFIC RAILROAD CO.

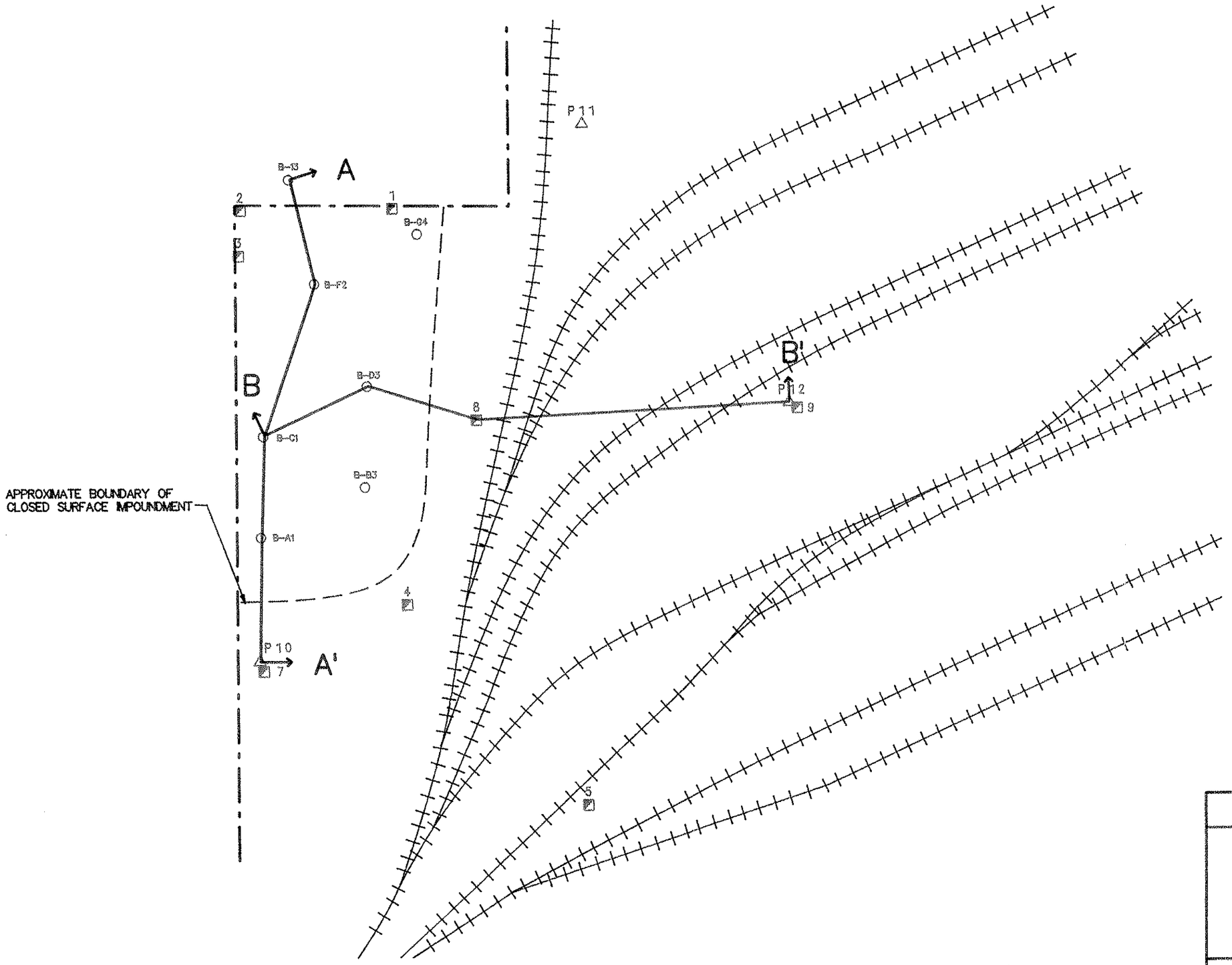
HOUSTON WOOD PRESERVING WORKS

Figure V.A.2

TOPOGRAPHIC MAP

PROJECT: 1358	BY: AJD	REVISIONS
DATE: NOV., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



GEO ASSOCIATES

CROSS SECTION LOCATION MAP

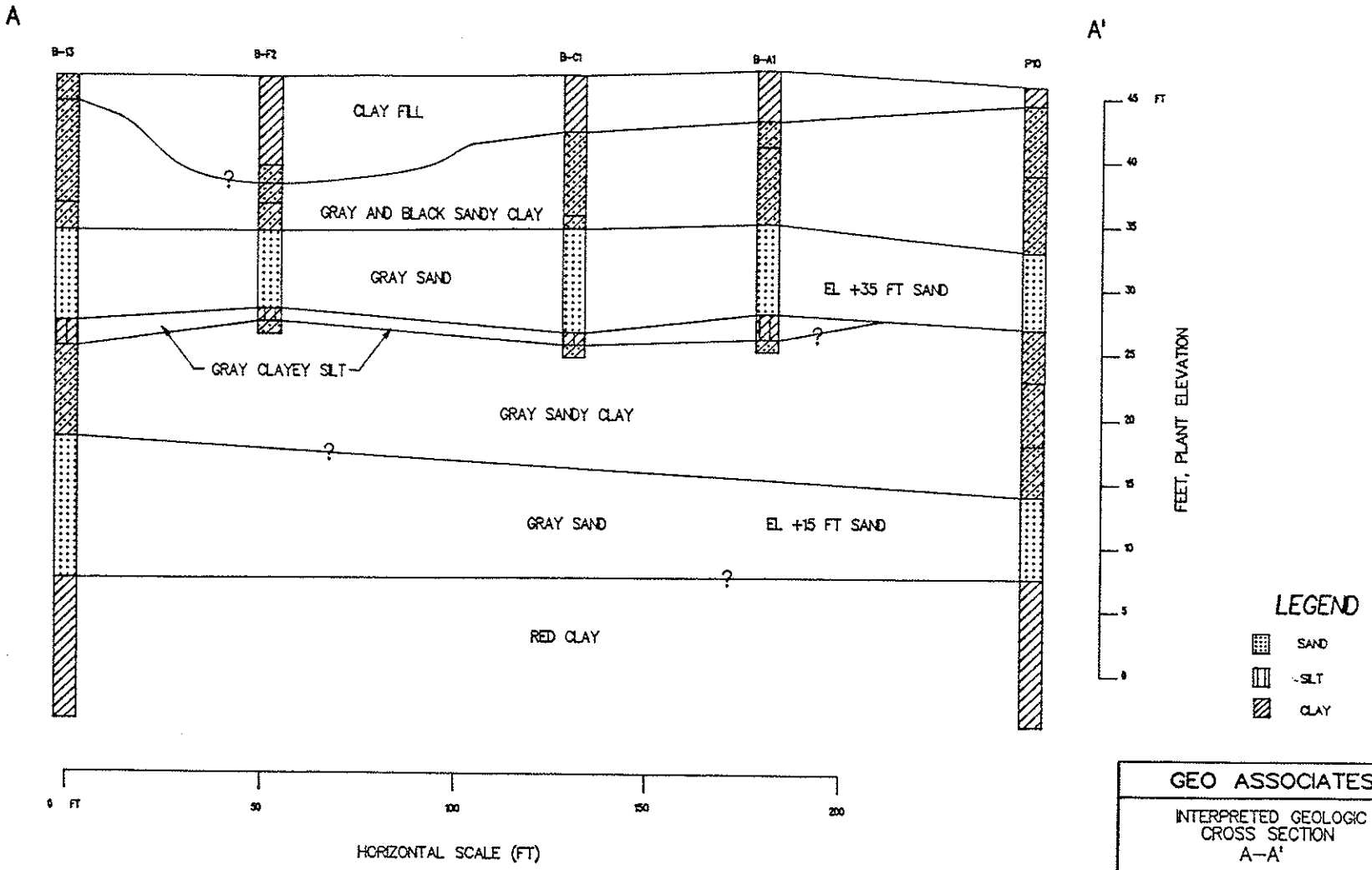
ENGLEWOOD YARD

SOUTHERN PACIFIC ENVIRONMENTAL SYSTEMS INC.

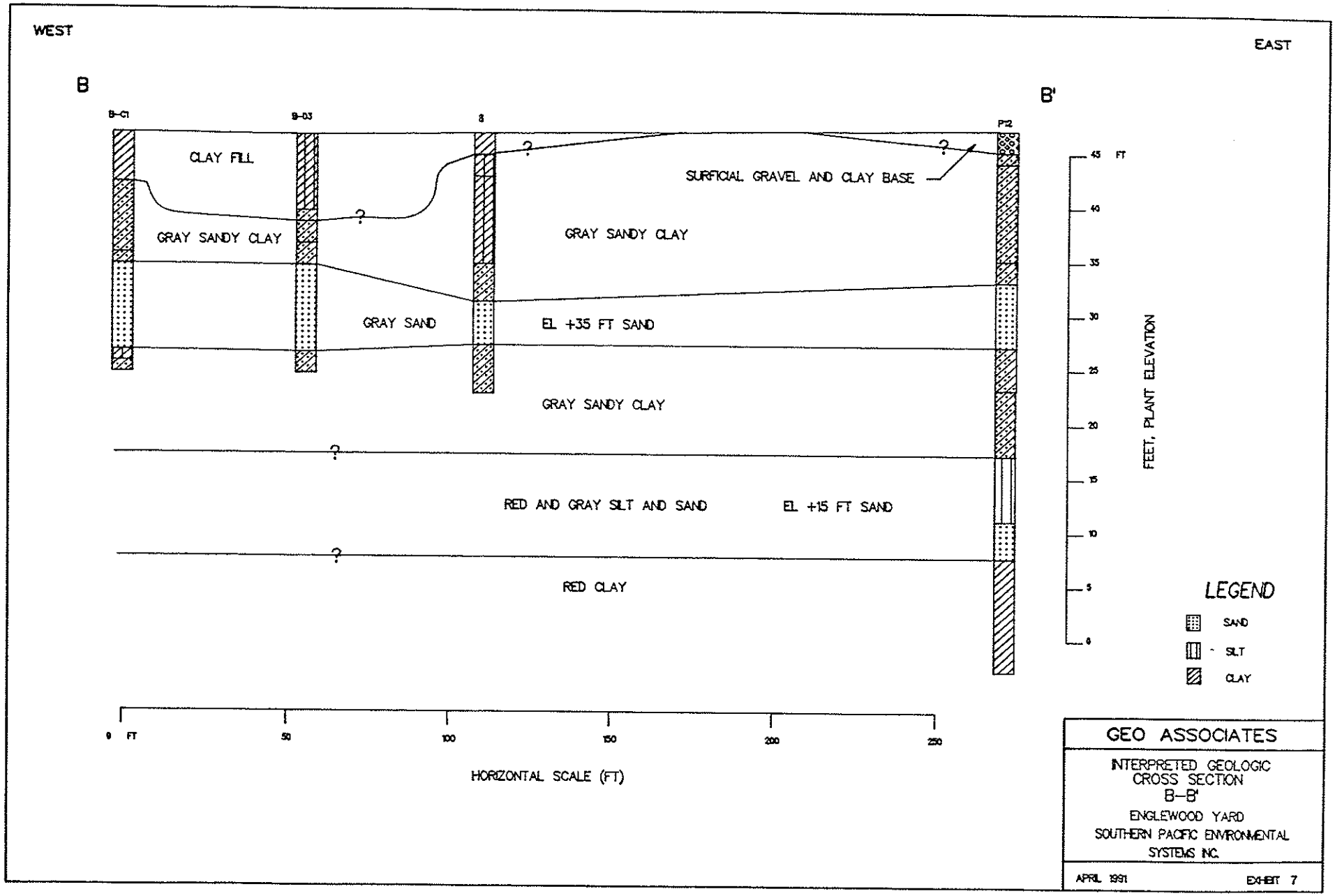
APRIL 1991 EXHIBIT 5

NORTH

SOUTH



GEO ASSOCIATES
INTERPRETED GEOLOGIC CROSS SECTION A–A' ENGLEWOOD YARD SOUTHERN PACIFIC ENVIRONMENTAL SYSTEMS INC.
APRIL 1991 — EXHIBIT 6



GEO ASSOCIATES

INTERPRETED GEOLOGIC CROSS SECTION
B–B'
ENGLEWOOD YARD
SOUTHERN PACIFIC ENVIRONMENTAL SYSTEMS INC.

APRIL 1991 EXHIBIT 7

VI. Geology Report

This portion of the application applies to owners or operators of new hazardous waste management facilities; areal and/or capacity expansions of existing hazardous waste management facilities; and existing industrial solid waste facilities that store, process or dispose of hazardous waste in surface impoundments, landfills, land treatment units, waste piles (except those waste piles that meet the requirements of Section V.E.10.b. of this application), and tanks or drip pads which require a contingent post-closure plan.

For a new Compliance Plan or modification/amendment to an existing Compliance Plan of Section XI of this application, submit a Geology Report which contains updated site geologic information derived from on-going investigations since submittal of the last Permit modification/amendment application.

Submit a Geology Report which includes at a minimum the following information. This report and all specifications, details, calculations/estimates and each original sheet of plans, drawings, maps, cross-sections, other graphics, such as limits of contamination maps, etc. or any other geoscientific work must be signed and sealed by a Professional Geoscientist licensed in the State of Texas under the Professional Geoscientists Practice Act.

An updated Geology Report is attached as a separate report with each subsection of the report correlated to the corresponding subsection in the application form. The report has been updated to include updated site geologic information derived from investigations which have taken place since the submittal of the last Permit application.

A. Geology and Topography

1. Active Geologic Processes

   Provide a description and interpretation of the active geologic processes in the vicinity of the facility. This description should include:

   a. An identification of any faults (active or otherwise) in the area of the facility. The preparer should determine which Holocene sediments or man-made structures have been displaced. The report should contain a description of the investigation techniques used to identify faults and should assess the degree, if any, to which a particular fault increases the long-term potential for waste migration. The clearance required from active faults to ensure that liner systems will not be disrupted will be based upon site specific factors such as the zone of significant surface deformation, uncertainty in locating the fault, activity of the fault, and a distance to provide a reasonable margin of safety. These issues should be addressed when discussing the offset of an industrial solid waste facility unit from an active fault.

      To satisfy the requirements of 30 TAC 305.50(a)(4)(F) and 305.50(a)(10)(E), for a proposed hazardous waste management facility or a modification or amendment of a permit which includes a capacity expansion of an existing hazardous waste management facility, submit the following.

      (1) A geologic literature review should be conducted, from which useful information on the possibility of faulting at a given site may be revealed. This includes, but is not limited to, maps of surface faults, subsurface structure, and field investigations by the author(s).
      (2) Descriptions and maps of faulting, fracturing, and lineations in the area are necessary. An aerial photo with lineation interpretations is suggested.
      (3) The maps and cross-sections are to be constructed using an amount of data necessary to adequately describe the geology of the area. Surface data, including data regarding known surface expressions, such as surface faults, gas seeps, lineations,

etc., should be accounted for in the subsurface interpretations. A surface structure map should be prepared, incorporating all of the subsurface data as well as known surface features.

(4) A minimum of two structural cross-sections, utilizing available oil field and/or water well electric log data, shall be made perpendicular to each other, crossing at the proposed surface unit location. These cross-sections should define geologic units, indicating especially Holocene sediments and Underground Sources of Drinking Water (USDWs), as well as lithology. The cross-sections should be constructed from the surface, down through the shallowest major structure or the base of the Holocene, whichever is deeper. These cross-sections need to be on a scale necessary to depict the local geology (3000' radius from the site location minimum). If needed to adequately describe the local geology, then a larger radius or deeper area of review may be necessary.

(5) A minimum of two structural subsurface maps need to be prepared. One map should be made on the shallowest mappable subsurface marker, the other on a deeper horizon that shows the underlying major structure. Additional maps may be necessary.

(6) Field surveillance will be necessary to check the area of the facility for surface features, such as lineations, and to investigate potential surface faults as indicated by, but not limited to, aerial photos, topographic maps, and seismic and subsurface structural maps.

(7) The above requirements do not limit the use of any additional information, such as seismic data, isopach maps, or potentiometric maps, that may help in defining the geology of the area of review.

(8) If faulting exists within 3000 feet of the surface unit, it must be demonstrated that the fault has not had displacement within Holocene time. If such a fault does exist, it cannot pass within 200 feet of the surface unit.

(9) If a fault that has been active within the Holocene is located within 3000 feet of the surface unit, it must be demonstrated that, a.) the fault is not transmissive, i.e., it will not provide for groundwater movement that would result in endangerment to human health or the environment, and b.) there is no actual and/or potential problem of subsidence, which could endanger the stability of the surface unit.

b. A discussion of the extent of land surface subsidence in the vicinity of the facility including total recorded subsidence and past and projected rates of subsidence. For facilities located at low elevations along the coast which have experienced appreciable rates of subsidence, the potential for future submergence beneath Gulf water should be addressed.

c. A discussion of the degree to which the facility is subject to erosion. The potential for erosion due to surface water processes such as overland flow, channeling, gullying, and fluvial processes such as meandering streams and undercut banks should be evaluated. If the facility is located in a low-lying coastal area, historical rates of shoreline erosion should also be provided.

d. Complete Table VI.A.1. – Major Geologic Formations. – **See Attached.**

2. Regional Physiography and Topography (applicable only to owners or operators of facilities that store, process, or dispose of hazardous waste in surface impoundments, landfills, land treatment units, waste piles, except waste piles exempt from groundwater monitoring requirements, and tanks which require a contingent post-closure plan)

   a. Distance and direction to nearest surface water body

   b. Slope of land surface

   c. Direction of slope

d. Maximum elevation of facility

e. Minimum elevation of facility

3. Regional Geology (applicable only to owners or operators of facilities that store, process, or dispose of hazardous waste in surface impoundments, landfills, land treatment units, waste piles, except waste piles exempt from groundwater monitoring requirements, and tanks which require a contingent post-closure plan)

   Provide a description of the regional geology of the area. This section should include:

   a. A geologic map of the region with text describing the stratigraphic and lithologic properties of the map units. An appropriate section of a published map series such as the Geologic Atlas of Texas prepared by the Bureau of Economic Geology is acceptable.

   b. A description of the generalized stratigraphic column in the facility area from the base of the lowermost aquifer capable of providing usable groundwater to the land surface. At least the uppermost 1,000 feet of section below the facility should be described. The geologic age, lithology, variation in lithology, thickness, depth, geometry, hydraulic conductivity, and depositional history of each geologic unit should be described based upon available geologic information. Regional stratigraphic cross sections should be provided, where available.

4. Subsurface Soils Investigation Report

   This section should contain the results of an investigation of subsurface conditions for each land based unit and/or unit which requires contingent closure and post-closure care. If several units are in close proximity, a single investigation for the area will suffice. This report should include:

   a. The logs of borings performed at the waste management area. All borings must be conducted in accordance with established field exploration methods. Investigation procedures should be discussed in the report. A sufficient number of borings should be performed to establish subsurface stratigraphy and to identify and allow assessment of potential pathways for pollution migration. Borings must be sufficiently deep to allow identification of the uppermost aquifer and underlying hydraulically interconnected aquifers. Borings should penetrate through the uppermost aquifer and all deeper hydraulically interconnected aquifers, deep enough to identify the aquiclude at the lower boundary. Borings should be completed to a depth at least 30 feet below the deepest excavation planned at the waste management area. The required number of borings will increase or decrease depending on the heterogeneity of subsurface materials. Locations with stratigraphic complexities such as non-uniform beds which pinch out, vary significantly in thickness, coalesce, or grade into other units, will require a significantly greater degree of subsurface investigation than areas with simple hydrogeologic frameworks. Boring logs should include a detailed description of materials encountered including any discontinuities such as fractures, fissures, slickensides, lenses or seams. Whenever possible, electric logs should be run on each borehole. The hollow stem auger boring method is recommended in those instances where an accurate determination of initial water levels is important. A key explaining both the symbols used on the boring logs and the classification terminology for soil type, consistency, and structure should be provided.

   b. Cross-sectional drawings prepared from the borings depicting the generalized soil strata profile at the site. For small waste management areas two cross sections prepared perpendicular to each other will normally suffice.

   c. A text which describes the investigator's interpretations of the subsurface stratigraphy based upon the field investigation. If appropriate, soils may be assigned to generalized strata to aid in the discussion.

d. Complete Table VI.A.4. - Waste Management Area Subsurface Conditions and provide in the report data which describes the geotechnical properties of the subsurface soil materials. All laboratory and field tests must be performed in accordance with recognized procedures. A brief discussion of test procedures should be included. All major strata encountered during the field investigation phase should be characterized with regard to: Unified Soil Classification, moisture content, percent less than number 200 sieve, Atterberg limits (liquid limit, plastic limit, and plasticity index), and coefficient of permeability. Field permeability tests should be used to determine the coefficient of permeability of sand or silt units and should also be used to supplement laboratory tests for more clay-rich soils. In addition, particle size distribution and relative density based upon penetration resistance should be determined for coarse-grained soils. For fine-grained soils the following parameters should also be determined: cohesive shear strength based upon either penetrometer or unconfined compression tests, dry unit weight, and degree of saturation(s). For the major soil strata encountered, the maximum, minimum, and average for each of these variables should be compiled.

Table VI.A.4 is not applicable.

e. For land treatment units, provide a description of the surficial soils at the site which includes:

(1) The name and description of the soil series at the site;
(2) Important physical properties of the series such as depth, permeability, available water capacity, soil pH, and erosion factors;
(3) Engineering properties and classifications such as USDA texture, Unified Soil Classification, size gradation, and Atterberg limits (liquid limit, plastic limit, and plasticity index); and
(4) The cation exchange capacity (CEC) of the soil(s) expressed in units of meq/100g.

Much of this information may be obtained by consulting the county soil survey published by the United States Department of Agriculture, Soil Conservation Service. If available, a copy of an aerial photograph showing soil series units on the land treatment area should be provided.

If an aerial photograph is not available, include a soil series map as an attachment to this subsurface soils investigation report.

B. Facility Groundwater

If past monitoring has shown the presence of hazardous constituents in the groundwater, the owner or operator must submit a Compliance Plan Application with this application. The Compliance Plan Application and instructions can be found in Section XI of this application form.

1. Regional Aquifers

Provide a description of the regional aquifers in the vicinity of the facility based upon available geologic references. The section should provide:

a. Aquifer names and their association with geologic units described in Section VI.A.3.b.;
b. A description of the constituent materials of the aquifer(s);
c. A description of the water-bearing and transmitting properties of the aquifer(s);
d. Whether the aquifers are under water table or artesian conditions;
e. Whether the aquifers are hydraulically connected;
f. A regional water table contour map or potentiometric surface map for each aquifer, if available, from published references;

g. An estimate of the rate of groundwater flow in units of ft/yr;

h. Values for total dissolved solids content of groundwater from the aquifers;

i. Identification of areas of recharge to the aquifers; and

(An application for a new hazardous waste surface impoundment, waste pile, land treatment unit, or landfill, which is to be located in the apparent recharge zone of a major or minor aquifer, as designated by the Texas Water Development Board in the publication entitled Water for Texas, Today and Tomorrow (1990) or subsequent revision must include a hydrogeologic report documenting the potential effects, if any, on the regional aquifer in the event of a release from the waste containment system. (30 TAC 305.50(6)])

j. The present use of groundwater withdrawn from aquifers in the vicinity of the facility.

The preparer should update Section III.C.1.e. of the Part A permit application to ensure that all water wells within 1 mile of the property boundaries of the facility have been located. The aquifer(s) yielding water should be identified for each well.

2. Provide groundwater conditions for each land based unit or unit which requires post closure care which includes all the information specified in 30 TAC 335.156-335.167. This discussion should also include:

   a. Records of water level measurements in borings. The boring logs prepared in response to Section VI.A.4.a. should be annotated to note the level at which groundwater is first encountered and the level of groundwater after equilibration. Normally a 24-hour period is adequate for equilibration of groundwater but an extended period may be required for saturated clay deposits. This information should also be presented on the cross-sections required in Section VI.A.4.b. and recorded and retained in the facility groundwater monitoring record.

   b. Records of maximum and minimum static water level measurements in monitor wells. Historic water level measurements made during any previous groundwater monitoring should be presented in a table for each well.

   c. Upper and lower limits of the uppermost aquifer and deeper aquifers which are hydraulically interconnected to it beneath the facility boundary. In most cases this identification would include surface contour maps of the top and bottom surfaces.

   d. A site specific water table contour map or potentiometric surface map for the uppermost aquifer, and the basis for such identification (the information obtained from hydrogeologic investigations of the facility area). The predicted groundwater flow direction and rate should be indicated.

   e. A discussion of the variation of hydraulic gradient across the site, including vertical gradient. Calculations for the maximum, minimum, and average groundwater flow velocities for each aquifer identified should also be provided, including pump test data where appropriate.

   f. An analysis of the most likely pathway(s) for pollutant migration in the event that the primary barrier liner system is penetrated.

3. Description of the Detection Monitoring Program

A Detection Monitoring Program is not applicable to the regulated unit. Table VI.B.3.b. and Table VI.B.3.c. are not applicable. It is recommended at this time that all post-closure care activities, including groundwater monitoring of SWMU No. 1, be terminated and the monitoring wells associated with the unit be plugged and abandoned. While it is proposed that groundwater monitoring of the regulated unit be terminated, facility wide groundwater monitoring activities will be on-going. These activities are

discussed in detail in Section XI – Compliance Plan of this Permit application and the Response Action Plan.

The groundwater monitoring standards apply to owners and operators of facilities that treat, store, or dispose of hazardous waste in surface impoundments, waste piles, land treatment units, landfills, or tanks without satisfactory secondary containment for which a post-closure care plan or permit is required. If a waste management unit meets certain standards it may qualify for an exemption to the groundwater monitoring requirements. An exemption for a unit does not exempt an entire facility. (See the instructions for each type of unit for a specific exemption.) A facility-wide exemption is described in Section VI.C.

It is important to note that even if the proposed program may use the same well system as the present program, the sampling parameters may be different.

a. Include in the design report a description of the proposed detection monitoring program. This description should contain all requirements of 30 TAC 335.163-335.164. Provide a justification for the selected suite of waste specific parameters specified in Table VI.B.3.c. - Groundwater Sample Analysis based on toxicity, mobility, persistence, and concentrations in light and dense non-aqueous phase components of the waste. Describe the proposed sampling, analysis, and statistical comparison procedures to be utilized in evaluating groundwater monitoring data. Specify the statistical method and process for determining whether constituent concentrations in groundwater are above background, in accordance with 30 TAC 335.163. Refer to the EPA guidance document entitled ***Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities – Unified Guidance*** *(March 2009) (document # EPA 530-F-09-020)* for recommended methods.

   All data submitted to the TCEQ shall be in a manner consistent with the latest version of the "*Quality Assurance Project Plan for Environmental Monitoring and Measurement Activities Relating to the Resource Conservation Recovery Act and Underground Injection Control*" (TCEQ QAPP) which a can be found on the agency's website.

   Monitoring samples and measurements shall be taken at times and in a manner so as to be representative of the monitored activity. The method used to obtain a representative sample of the material to be analyzed shall be the appropriate method from Ground Water, Volume II: Methodology, (document # EPA/625/6-90/016b) or an equivalent method approved by the Executive Director of the TCEQ. Laboratory methods shall be those specified in ***Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846,*** *1987*, as revised; ***Standard Methods for the Examination of Water and Wastewater, Fifteenth Edition,*** *1980*, and *1981 supplement*, or current adopted edition; ***RCRA Ground-Water Monitoring: Draft Technical Guidance, 1992, OSWER Directive 9950.1,*** or an equivalent method approved in writing prior to use by the Executive Director. [30 TAC Section 305.125(11)(A)]

b. For inclusion into a permit, complete Table VI.B.3.b. - Unit Groundwater Detection Monitoring System to specify the proposed well system for each unit or waste management area which requires groundwater monitoring.

c. For inclusion into a permit, complete Table VI.B.3.c to specify:

   (1) the suite of waste specific parameters (indicator parameters, waste constituents, or reaction products) which will be analyzed at each sampling event for each well or group of wells. These parameters must provide a reliable indication of the presence of hazardous constituents in the groundwater;

   (2) the sampling frequencies and calendar intervals (e.g., monthly; quarterly within the second 30 days of each quarter; semiannually within the first 30 days of the 2nd and 4th quarters, etc.);

(3) the analytical method and the achievable detection limit of the sample preparation and analysis methods for the selected parameters. This detection limit will represent the capability of the sampling and analysis to reliably and accurately determine the presence of the selected parameters in the sample; and

(4) the concentration limit which will be the basis for determining whether a release has occurred from the waste management unit/area. Concentration limits shall be based on background values for the waste management unit/area, or Practical Quantitation Limit (PQL) values developed through laboratory data obtained using practices consistent with the latest version of the TCEQ QAPP. If background values are lower than PQLs, the applicant may choose respective PQLs as concentration limits for hazardous constituents.

d. Submit drawings depicting the monitoring well design, current and proposed.

e. Submit at least one map of the entire facility and additional maps or drawings if necessary on one or more 8." x 11" sheets of sufficient scale to show the following in adequate detail:

(1) Monitoring well locations, current and proposed;
(2) Soil-pore liquid and core sampling points, current and proposed;
(3) Waste management unit(s)/area;
(4) Property boundary;
(5) Point of compliance;
(6) Direction of groundwater flow; and
(7) Extent of any known plume of contamination

C. Exemption from Groundwater Monitoring for an Entire Facility

In accordance with 30 TAC 335.156(b)(4), a waste management facility may be exempt from groundwater monitoring if the owner or operator can demonstrate that there is no potential for migration of liquid from any regulated unit to the uppermost aquifer during the active life of the regulated unit (including the closure period) and post-closure care period. This demonstration must be submitted with the permit application, and must be certified by a qualified geologist or geotechnical engineer.

This exemption does not apply to Unsaturated Zone Monitoring. Owners and operators of Land Treatment Units must monitor the unsaturated zone under all circumstances.

The following areas should be addressed in the demonstration, and any predictions must be made on assumptions that maximize the rate of liquid migration:

1. Thickness of soil between the base of the unit and saturated zone;

2. Thickness of saturated zone;

3. Head pressure of the fluids;

4. Properties of the saturated and unsaturated zone (including permeability, effective porosity, and homogeneity), and

5. Total life of facility

The criteria used for the evaluation of this demonstration are more stringent than those used for evaluations of demonstrations submitted prior to permitting. Thus it is necessary for an owner or operator to submit another demonstration even if one was submitted and approved previously.

This type of exemption differs from the exemptions described in Sections V.D. (Surface Impoundments), V.E. (Waste Piles), and V.G. (Landfills). An owner or operator may pursue a facility-wide exemption as well as an exemption for a particular unit, if the owner or operator wishes.

D. Unsaturated Zone Monitoring

This section applies only to facilities which contain land treatment units. Attach any previous monitoring data to the monitoring report.

1. List all hazardous constituents that have been or will be monitored.
   a. Current parameters.
   b. Proposed parameters.

2. Number of soil-pore liquid sampling points.
   a. Depth of sampling points.
   b. Equipment used for soil pore liquid monitoring.

3. Number of soil core sampling points.
   a. Depth of soil core sampling points.
   b. Indicate on a facility map locations of all sampling points.

Table VI.A.1. – Major Geologic Information

Names Of Major Geologic Formation(s) Beneath The Facility	Lithology Of The Major Geologic Formation	Formation Thickness (Feet)	Depth To Top Of Formation	
			Feet/MSL[1]	Feet/BGS[2]
1. Formation: Fill & Alluvium Series: Holocene System: Quaternary Era: Cenozoic	Well-sorted, fin-rained sand with some silt and clay; typically includes some fill material on site	9 ft	15 ft MSL	30-39 ft
2. Formation: Beaumont Series: Pleistocene System: Quaternary Era: Cenozoic	Mostly clay and silt with discontinuous sand layers or lenses (cannel sands, point bar deposits or reworked barrier islands)	>200 ft	Approximately -3 ft to -30 ft MSL	Varies; approximately 50 ft to 80 feet MSL
3. Formation: Lissie (upper Lissie = Montgomery; Lower Lissie = Bently) Series: Pleistocene System: Quaternary Era: Cenozoic	Fluvial clay, silt, sand and gravel (minor amounts). Upper Lissie is locally calcareous; Lower Lissie is non-calcareous	Unknown	No information; not differentiated	No information
4. Formation: Willis Series: Pleistocene System: Quaternary Era: Cenozoic	Fluvial clay, silt and fine gravel, locally cemented with iron oxide, non-calcareous	75-100 ft	No information; not differentiated	No information
5. Formation: Goliad Sand Series: Pliocene System: Tertiary Era: Cenozoic	Coarse sand interbedded with siliceous gravel and silty or clayey zones	Approximately 1600 ft	-550(±) ft MSL	Approximately 550 ft

(1) MSL = Mean Sea Level
MLGL = Mean Low-tide Gulf Level

(2) BGS = Below Ground Surface

Source: *Compliance Plan Application and Amendments*, ERM, 2003.

Table VI.A.4. - WASTE MANAGEMENT AREA SUBSURFACE CONDITIONS
Information taken from Original Part B Application (STPCo, 1991)

Boring Number	Depth Below Grade	Stratum	USC Symbol	Liquid Limit	Plasticity Index	Percent Passing #200 Sieve	Permeability	Percent Porosity
7	4-6	1 – Shallow Sandy Clay	SC	47	34	NA	NA	NA
7	10-12	1 – Shallow Sandy Clay	SC	NA	NA	NA	$1.7x10^{-8}$	NA
9	6-8	1 – Shallow Sandy Clay	SC	54	39	NA	NA	NA
9	10-12	1 – Shallow Sandy Clay	SC	NA	NA	NA	$7.6x10^{-9}$	NA
9	12-14	1 – Shallow Sandy Clay	SC	32	17	NA	NA	NA
P11	2-4	1 – Shallow Sandy Clay	SC	43	30	NA	NA	NA
P11	8-10	1 – Shallow Sandy Clay	SC	NA	NA	54	NA	NA
P13	10-12	1 – Shallow Sandy Clay	SC	41	26	NA	NA	NA
8	12-14	2 – EL +35 ft Sand	SP	NA	NA	42	NA	NA
8	20-22	3 – Intermediate Sandy Clay	SC	NA	NA	79	NA	NA
9	20-22	3 – Intermediate Sandy Clay	SC	NA	NA	NA	$5.3x10^{-8}$	NA
P10	23-25	3 – Intermediate Sandy Clay	SC	42	27	NA	NA	NA
P10	28-30	3 – Intermediate Sandy Clay	SC	NA	NA	NA	$3.9x10^{-7}$	NA
P11	23-25	3 – Intermediate Sandy Clay	SC	NA	NA	83	NA	NA
P11	28-30	3 – Intermediate Sandy Clay	SC	29	12	NA	NA	NA
P12	28-30	3 – Intermediate Sandy Clay	SC	36	20	NA	NA	NA
B13	23-25	3 – Intermediate Sandy Clay	SC	57	37	NA	NA	NA
P10	38-40	4 – EL +15 ft Sand	SP	NA	NA	NA	NA	NA
P11	33-35	4 – EL +15 ft Sand	SP	NA	NA	NA	NA	NA
P11	38-40	4 – EL +15 ft Sand	SP	NA	NA	NA	NA	NA
P12	33-35	4 – EL +15 ft Sand	SP	NA	NA	NA	NA	NA
P12	38-40	4 – EL +15 ft Sand	SP	NA	NA	NA	NA	NA
P10	43-45	5 – Deep Clay	CL	NA	NA	NA	$4.4x10^{-9}$	NA
P11	43-45	5 – Deep Clay	CL	65	42	NA	NA	NA
P12	48-50	5 – Deep Clay	CL	61	38	NA	NA	NA
B13	43-45	5 – Deep Clay	CL	65	41	NA	NA	NA

Maximum depth: 50 feet below grade
-4 feet above MSL

Table VI.B.3.b. - Unit Groundwater Detection Monitoring System
Not Applicable

Waste Management Unit/Area Name[1]						
Well Number(s):						
Hydrogeologic Unit Monitored						
Type (e.g., point of compliance, background, observation, etc.)						
Up or Down Gradient						
Casing Diameter and Material						
Screen Diameter and Material						
Screen Slot Size (in.)						
Top of Casing Elevation (ft, MLGL or MSL)						
Grade or Surface Elevation (ft, MLGL or MSL)						
Well Depth (ft, Below Grade Surface [BGS])						
Well Depth (Ft, Below Top of Casing [BTOC])						
Screen Interval, From(ft, BGS) To(ft, BGS)						
Screen Interval, From(ft, BTOC) To(ft, BTOC)						
Facility Coordinates (e.g., lat/long or company coordinates)						

[1]From Tables in Section V.

Table VI.B.3.c. - Groundwater Detection Monitoring Parameters Not Applicable

Unit/Waste Management Area

Well No(s).

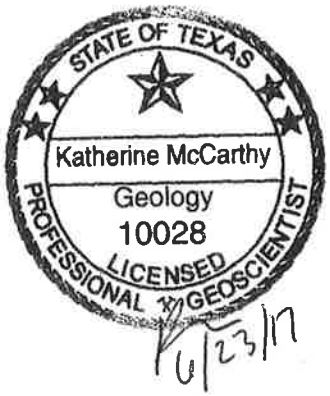
Parameter	Sampling Frequency	Analytical Method	Practical Quantification Limit (units)	Concentration Limit [1]

[1] The concentration limit is the basis for determining whether a release has occurred from the waste management unit/area.

VI. GEOLOGY REPORT

PROFESSIONAL CERTIFICATIONS

This report has been prepared by Pastor, Behling & Wheeler, LLC under the professional supervision of Katherine J. McCarthy, P.G. and Eric Matzner, P.G. based on information previously developed by others. The findings, recommendations, and/or professional opinions presented in this report have been prepared in accordance with generally accepted professional practices and within the scope of the project.



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GEOLOGY REPORT
PART B PERMIT APPLICATION
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

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VI.A. GEOLOGY AND TOPOGRAPHY

VI.A.1. Active Geologic Processes

VI.A.1.a. Identification of Faults

A review of the Harris County Flood Control District's (HCFCD) map, *Principle Active Faults in Harris County* (2006) and the *Geologic Atlas of Texas, Houston Sheet* (BEG, 1982) showed no active faults within one mile of the of Houston Wood Preserving Works (HWPW) (the Site). Surface geology of the Site area is shown on Figure VI.A.

VI.A.1.b. Extent of Land Surface Subsidence

The principal active geologic process in the vicinity which could affect the Site would be subsidence. Subsidence in this portion of Harris County, while once substantial (up to six feet of subsidence was measured in northwest Houston between 1906 and 1987), has been minimized in recent years by the action of the Harris-Galveston Coastal Subsidence District (HGCSD) in limiting groundwater pumpage.

An extensometer located in northeast Houston (LJ65-14-746) within about three miles of the Site that continuously records the compaction of the upper 2,170 feet of the subsurface has recorded subsidence of about 0.85 feet since its installation in 1980. Subsidence at this location has remained relatively stable since about 2000. The long-term water-level trends from 1977 to 2013 for the Chicot and Evangeline aquifer, centered in southeastern Harris County, have shown a stabilized area of rebound (Kasmarek, Johnson and Ramage, 2014) further reducing the risk of subsidence in the area.

VI.A.1.c. Erosion Potential

Based on the Soil Survey of Harris County, 1976, Site soils are primarily the Urban land complex (Map Unit Ur). As observed, the Site is well sodded with indigenous vegetation, showing no serious evidence of erosion across the surface or adjacent to the Site.

No creeks or rivers trace through the Site area, further limiting erosion. Finally, the natural land topography and slope, discussed below, are relatively flat, with little potential for erosion due to channeling or gullying.

VI.A.2. Regional Physiography and Topography

VI.A.2.a. Physiography

The Site is located within the Brazos Deltaic Plain of the Western Gulf Coast Plain physiographic province as shown on Figure VI.B (Bernard and Major, 1956). The physiography consists primarily of a relatively flat coastal plain located inland from coastal marshes and inclined gulfward at about five feet or less per mile. The Site is composed of surficial clays (compacted fill) underlain by a relict fluvial-deltaic complex which consists of clay, silt, sand and clayey sand deposits.

The main physiographic limitation of the Site is one that is common to the Gulf Coast area, i.e. poor drainage resulting from the generally flat topography.

VI.A.2.b. Topography

The nearest surface water body to the Site is Buffalo Bayou, located approximately 1.6 miles to the southwest. Based on a review of the USGS (1982) topographic map for the Settegast Quadrangle (Figure VI.C), the regional topography in the vicinity of the Site is flat with a slope of the natural land surface of less than 1% toward the east. A Site specific topographic survey performed in 2012 showed the Facility ranged in elevation from 49.9 feet AMSL to 46.2 feet AMSL with the highest elevations in the center of the Site along the railroad tracks sloping gently to the northwest and southeast.

VI.A.3. Regional Geology

The surficial soils of this region are deposits of the Pleistocene fluvial-deltaic system. The generalized stratigraphic column of the upper 1,000 feet of the Site consists primarily of sand, silt, clay and shell which have been deposited within the last 1.8 million years (Quarternary Period). The youngest sediments comprise the Recent-Holocene (post glacial) depositional surface which is composed of deltaic and coastal interdeltaic plains. The Pleistocene coastal plain occurs between the recent formations near the coast and the youngest Tertiary formation inland. A regional geologic map is presented as Figure VI.A. A stratigraphic column of surface and subsurface units for Gulf Coast is shown on Figure VI.D.

Pleistocene soils underlying the Site consist of fluvial, deltaic and associated marginal marine sediments deposited during interglacial stages of rising sea level within the Beaumont, Montgomery, Bentley and Willis formations. In general, these formations are all comprised of similar lithologic material and for the

most part do not have persistent individual characteristics that can be recognized in the subsurface, consequently, they have not been correlated satisfactorily in the subsurface of the Harris-Galveston County area (ERM, 2003).

VI.A.4. Subsurface Soils Investigations

The Site has undergone a number of investigations attributed to historical releases associated with the Site activities that occurred between 1911 and 1984. These investigations are summarized in the Site Chronology included in Appendix VI.A. To date, an estimated 210 soil borings, 95 current groundwater monitoring wells and 99 Cone Penetration Testing/Rapid Optical Screening Tool (CPT/ROST) have been drilled around the Site. Boring logs and well completion logs are included in Appendix VI.B. A comprehensive listing of the current monitoring wells is presented as Table VI.A. A list of soil borings, CPT/ROST, hydropunch, AOC soil samples and plugged and abandoned monitoring wells are listed in Table VI.B. Cross-sectional drawings developed from boring logs and CPT/ROST borings are included as Figures VI.E.1 through VI.E.5.

The stratigraphy at the Site from the ground surface to a total depth of approximately 135 feet below ground surface is separated into the following units:

- Fill Material – Fill material is present from ground surface to a typical depth of approximately three ft bgs. Visual observations of the fill material indicate that the fill is primarily a mixture of gravel, clay, construction debris, and railroad ties. The fill material is underlain by the A-CZ.

- A-Cohesive Zone (A-CZ) – The A-CZ ranges in thickness from approximately 8 to 15 feet and was encountered in all of the CPT soundings and borings. Based on lithologic descriptions from boring logs for MW-10A, MW-10B, and MW-11A, the A-CZ generally consists of gray silty clay. The silty clay is stiff to very stiff, laminated, moist, and contains indications of plant material, calcium carbonate, iron oxide nodules, roots, and sandy clay lenses. The A-CZ is underlain by the A-TZ.

- A-Transmissive Zone (A-TZ) – The CPT soundings and boring logs indicate that the A-TZ is a continuous silty sand and sand layer beneath the Site. The A-TZ is thickest on the eastern portion of the property (approximately 21 feet thick), and gradually thins from east to west (to less than four feet thick). Based on lithologic descriptions from boring logs for MW-10A, MW-10B, and MW-11A, the A-TZ consists of light greenish-gray to light gray sand and silty sand that is very fine-grained, wet, and contains some natural organic debris and approximately 10 to 25 percent clay. The A-TZ is underlain by the B-CZ.

- B-Cohesive Zone (B-CZ) – The B-CZ is a layer of cohesive soils (mostly clays, silty clays, sandy clays, and clayey silts) ranging in thickness from approximately 6 to 19 feet. The B-CZ was encountered in all the CPT soundings. Based on the boring logs from the Point of Compliance (POC) well nests (i.e., MW-10A/MW-10B and MW-11A/MW-11B), the B-CZ in the area is

comprised of clay, silty clay, and sandy clay. It is mottled gray and reddish brown, very stiff to hard, and moist with a high plasticity. The unit also contains thin seams of silty sand, thin carbonate clayey gravel and nodule seams (~0.1 feet thick), and slickensides, as seen in boring logs MW-33B and MW-63B. The B-CZ is underlain by the B-TZ or the C-CZ where the B-TZ is absent (i.e., toward the northeast portion of the Site). Where the B-TZ is absent, the clay zone is referred to as the B/C-CZ, and ranges in thickness from 34 to 39 feet.

- B-Transmissive Zone (B-TZ) – The B-TZ is a discontinuous sand layer that underlies the B-CZ in the western portion of the Site only, and is not present in the eastern portion of the Site. The B-TZ appears to pinch out between MW-35B and MW-33B. Where present, the B-TZ is approximately 3 to 10 feet thick and is present at approximately 25 to 35 ft bgs. The B-TZ consists of silty sand and sand that is mottled brown and gray, very fine-grained, and very dense in consistency. Where present, the B-TZ is underlain by the C-CZ.

- C-Cohesive Zone (C-CZ) – The C-CZ is a layer of cohesive soils (primarily) that underlie the B-TZ to the west and the B-CZ to the east. The C-CZ is approximately 8 to 20 feet thick. Based on boring logs from MW-12C and MW-18C, the C-CZ consists of silt and clayey silt that is reddish brown, firm in consistency, has low plasticity, and contains minor amounts of sand. The top of the C-CZ occurs at depths ranging from 35 to 50 ft bgs and is underlain by the C-TZ.

- C-Transmissive Zone (C-TZ) - The C-TZ is a silt and silty sand layer 10 to 13 feet thick that underlies the C-CZ and is present at approximately 60 to 75 ft bgs. Based on the boring logs from MW-12C and MW-18C, the C-TZ consists of silty sand that is reddish brown, and very fine-grained. The C-TZ overlies reddish brown clay.

- D-Cohesive Zone (D-CZ) – The underlying clay below the C-TZ has been designated the D-CZ. The unit was fully described in four locations (GB-1, MW-59D, MW-665D, and MW-66D). The unit consists of clay and silty clay, red to yellowish-red in color, and very hard and stiff. The D-CZ ranges in thickness from 17 feet to 36 feet thick.

- D-Transmissive Zone (D-TZ) – The D-TZ is a series of silty sand layers with minor amounts of thin clay intervals underlying the D-CZ unit with the top of the unit present at approximately 85 to 104 ft bgs. The D-TZ consists of silty sand that is light yellowish brown to light brown, and very fine to fine grained. The zone also has interbedded reddish brown and gray silty clay intervals. The base of the unit was encountered in MW-59D at 116.8 feet bgs and at GB-1 at 120 feet bgs. The underlying clay is greenish-gray and hard.

VI.B. FACILITY GROUNDWATER

VI.B.1. Regional Aquifers and Characteristics

VI.B.1.a. Aquifer Names

According to the latest nomenclature by the U.S. Geological Survey, the formations which supply water wells in the Harris County area are from the oldest to youngest: the Fleming Formation of Miocene Age; the Goliad Sand of Pliocene Age; the Willis Sand, Bentley Formation, Montgomery Formation, and Beaumont Clay of Pleistocene Age; and Alluvium of Pleistocene and Recent Ages. Three of these four subdivisions are identified as aquifers and one is identified as a confining layer. From oldest to youngest, and deepest to shallowest, the subdivisions are the Jasper Aquifer, the Burkeville Confining Layer, the Evangeline Aquifer, and the Chicot Aquifer (Kasmarek and Strom, 2002).

The Jasper Aquifer and the Burkeville Confining Layer are considered to be parts of the Fleming Formation. The Evangeline Aquifer includes the upper part of the Fleming Formation and the Goliad Sand. The Chicot aquifer includes the remaining formations up to the land surface. Figure VI.D shows the aquifers and how they correlate to the geologic units in the Gulf Coast Aquifer system.

VI.B.1.b. Constituent Materials

The Evangeline and the Chicot Aquifers are made up of sand and clay beds with the relative proportions varying throughout the area. Generally, they average half sands and half clays with the Evangeline having a lower sand to clay ration than the overlying Chicot. The aquifers are geologically similar and as a result, the basis for separating them is primarily a difference in hydraulic conductivity (Meyer and Carr, 1979).

VI.B.1.c. Aquifer Description

The hydraulic conductivity of the Chicot can be up to twice that of the Evangeline, however the transmissivity of the aquifers is similar. The Chicot Aquifer has an estimated transmissivity of between 3,000 to 50,000 ft^2/d while the transmissivity of the Evangeline is between 3,000 to 15,000 ft^2/d. Storativity for the Chicot is about 0.0004 to 0.1 while it ranges from about 0.0005 to 0.1 for the Evangeline (Kasmarek and Strom, 2002).

VI.B.1.d. Aquifer Conditions

The Chicot and the Evangeline Aquifers have shallow water-table conditions in their up dip areas and become confined down dip (Kasmarek and Strom, 2002), including in the vicinity of the Site.

VI.B.1.d. Hydraulic Connection

Sand beds in the Chicot Aquifer are hydraulically connected to some extent with the sand beds in the underlying Evangeline Aquifer and water moves slowly through circuitous routes from one aquifer to another in response to head differences between the aquifers. The two aquifers have been separately identified by the USGS on the basis of production screenings, and the degree of hydraulic connection between the aquifers is not high (ERM, 2003).

VI.B.1.f. Regional Water Table Contour Map

The USGS has maintained records of the potentiometric surface elevations in wells in the Chicot and Evangeline Aquifers in this area over a period of years. The potentiometric surface elevations for 2013 shown on Figures VI.F.1 and VI.F.2 are those interpreted for the Chicot and Evangeline Aquifers in this part of the region. The potentiometric surface elevations in aquifers in the area have risen substantially since 1977. Chicot potentiometric surfaces have risen approximately 100 feet during the period 1977-2013, and Evangeline potentiometric surfaces have risen approximately 140 to 160 feet in the same period in the vicinity of the Site (Kasmarek, Johnson and Ramage, 2013).

VI.B.1.g. Flow Rate

Using simulated 1996 Chicot aquifer flow rates, Kasmarek and Strom (2002) found that a net flow of 562.5 ft^3/s enters the Chicot aquifer in the outcrop area as discussed in Section VI.B.1.i. A net flow of 459.5 ft^3/s passes through the Chicot aquifer into the Evangeline aquifer. The remaining 103.0 ft^3/s of flow is withdrawn as well pumpage, with a shortfall of about 84.9 ft^3/s supplied to the wells from storage in sands and clays.

For the Evangeline aquifer, simulated 1996 flow rates indicate that a net flow of 14.8 ft^3/s enters the Evangeline aquifer in the outcrop area. A total inflow of 474.3 ft^3/s was estimated for the Evangeline aquifer made up of inflow from the outcrop area and the Chicot. A greater amount, 528.6 ft^3/s, is

withdrawn by wells; the shortfall of about 54.8 ft^3/s is supplied from storage in sands and clays (Kasmerek and Strom, 2002).

VI.B.1.h. Dissolved Solids Content of Groundwater

A total of 90 total dissolved solids (TDS) analyses have been performed for the three upper groundwater transmissive zones at the Site (ERM, 2004). The TDS values for the A-TZ, B-TZ and C-TZ ranged from 294 mg/L to 1,566 mg/L.

VI.B.1.i. Recharge Areas

The Chicot Aquifer recharge area is in northwestern Harris County, southern Montgomery County and adjacent areas. The Evangeline recharges farther northwest in Grimes, Walker, and northern Montgomery counties as shown on Figure VI.G (Gabrysch, 1977). The Beaumont Clay near land surface in much of southern Harris County restricts the amount of recharge to the Chicot Aquifer from the land directly above it.

VI.B.1.j. Groundwater Withdrawal

Through a review of the available water well records within a one mile radius of the Site, 26 water wells were identified within the search radius. Details of the water wells are summarized in Table VI.C and their locations are shown on Figure VI.H. Of the 26 wells identified, 11 are reported as unused, plugged or destroyed, five additional wells are listed as USGS observation wells and eight are industrial or irrigation wells. Two wells (Well ID 65-14-7 and 65-14-8F), located at a residence, are used to operate a heat-pump according to the well logs.

One water well (Well ID 65-14-809) is located within the Site and is destroyed (plugged and abandoned), and five other water wells (Well IDs HGSDHG1967, HGSDHG1968, 65-14-801, 65-14-802 and 65-14-814) are located east of the Site (associated with the UPRR Englewood Yard). None of the wells in the Englewood Yard are in use. One water well (Well ID 65-14-8A) is located south of the Site, and is owned by Houston Power and Light. There were no domestic or public water supply wells in use within a one-mile radius of the Site.

The HGCSD (1998) requires notification and permits for the drilling of new groundwater supply wells, discouraging the use of private water supply wells in those areas adequately served by the City of Houston municipal water supply system.

VI.B.2. Site Specific Groundwater Conditions

VI.B.2.a. Records of Water Level Measurements in Borings and Wells

Table VI.B is a comprehensive listing of soil borings, piezometers and monitoring wells. Water level observations in the wells and piezometers as encountered during drilling are presented on the respective boring logs where recorded. Water levels are also shown on the attached cross-sections (Figures VI.E.1 through VI.E.5)

VI.B.2.b. Records of Maximum and Minimum Static Water Levels in Wells

Records of the minimum and maximum water levels from the current well system are presented on Table VI.D.

VI.B.2.c. Upper and Lower Limits of Aquifers

The Chicot, the uppermost aquifer in the vicinity of the Site, extends from the surface to approximately 600 feet below ground surface (bgs). Site stratigraphy from the ground surface to a depth of approximately 135 feet has been characterized and is described in detail in Section VI.A.4. – Subsurface Soils Investigations. The lithology at the Site is consistent with the published descriptions of the Beaumont Formation, part of the Chicot aquifer.

Below the Chicot is the Evangeline Aquifer which in the vicinity of the Site is estimated to extend from approximately 600 ft bgs to 2,000 feet bgs (Kasmarek, Johnson and Ramage, 2013). Figure VI.I shows a cross section of the Gulf Coast Aquifer system in Harris and surrounding counties.

VI.B.2.d. Water Table Contour Map

A water table contour map for each of the transmissive zones is presented as Figures VI.J.1 through VI.J.4 for water levels measured in the current well system on July 15, 2014.

VI.B.2.e. Hydraulic Gradients and Groundwater Flow Velocities

Based on a review of the contour maps for the A-TZ, B-TZ and B-CZ, C-TZ and D-TZ (Figures VI.J.1 through VI.J.4, respectively), groundwater flow along the western property boundary appears to be to the west and northwest. In the A-TZ, groundwater flow from the Tie Storage Area and Former Process Area appears to converge in the Former Process Area near MW-17. Groundwater flow from the north and northeast of the Site is toward the northeastern corner of the Former Process Area.

Based on the July 2014 gauging data, the horizontal hydraulic gradients are very slight.

Transmissive Zone	Hydraulic Gradient (ft/ft)	Hydraulic Conductivities (ft/day)
A-TZ	0.0009 - 0.011	2.8[1]
B-TZ	0.005 - 0.011	3.7[1]
B-CZ	0.005 - 0.011	0.0014[2]
C-TZ	0.001	NA
D-TZ	0.002 - 0.003	0.085[3]

[1]ERM, 2004
[2]PBW, 2010
[3]PBW, 2011

Based on these horizontal gradients and the hydraulic conductivities and an assumed effective porosity of 30% (ERM, 2004), the calculated groundwater Darcy velocities are approximately:

- 17.0 to 34.0 ft/yr in the A-TZ;
- 18.0 to 49.5 ft/yr in the B-TZ;
- 0.00004 ft/yr in the B-CZ;
- 0.2 to 0.3 ft/yr in the D-TZ.

The hydraulic conductivity of the C-TZ zone has not been determined, so no groundwater Darcy velocity was calculated.

Transmissive Zone A-TZ

Groundwater in the A-TZ generally flows from west to east across the Site at a gradient ranging from approximately 0.005 to 0.01 ft/ft, with groundwater divide on the east side of the Site just west of the Lockwood Road Bridge (Figure VI.J.1). Identified just west of the bridge is the 60-in wastewater line that runs north to south and appears to intersect the A-TZ (PBW, 2010). Groundwater flow in the A-TZ flows to the east on the west side of the wastewater line, and flows to the west on the east side of the wastewater line. The highest groundwater elevations in the A-TZ are generally near SWMU No.1 (42.85

feet relative to the City of Houston Vertical Datum (HVD) (MW-22A, July 2014)), with the lowest elevations near the east side of the Site along Lockwood Drive (33.43 feet HVD (MW-18A, July 2014)) near the area where the wastewater line is located.

Transmissive Zone B-TZ/Cohesive Zone B-CZ

Groundwater in the B-TZ/B-CZ generally flows from west to east across the Site at a gradient of approximately 0.004 ft/ft, and flows to the west on the far west side of the Site at a gradient approximately 0.011 ft/ft (Figure VI.J.2). As shown on Figure VI.J.2, there is a piezometric high near the west perimeter of the Site, similar to the A-TZ. The highest groundwater elevation in the B-TZ in 2014 was 43.15 feet HVD (MW-42B near SWMU No. 1, July 2014), and lowest elevation in the B-TZ wells was 32.71 feet HVD (MW-67B, July 2014).

Four wells were installed in 2007 and 2009 in the B-CZ clay unit east of where the B-TZ pinches out to evaluate dissolved phase chemicals of concern (COCs) and potential dense non-aqueous phase liquid (DNAPL) migration in the clay unit: MW-33B, MW-35B, MW-49B, and MW-63B. Three additional wells were installed in June 2010 in the B-CZ to evaluate COC concentrations in the clay: MW36B, MW-59B, and MW-67B. At each location, groundwater was encountered in very thin carbonate seams (typically less than 0.1 feet thick) within the B-CZ clay unit. Groundwater flow in the B-CZ clay unit based on the January 2014 measurements is to the east-northeast, with a component of flow from the northeast to the southwest off-site to the north (wells MW-36B and MW-57B) (Figure VI.J.2). Groundwater flow during the July 2014 gauging event shows flow to the east-northeast on the east portion of the Site; however, with groundwater potentiometric elevations from the wells east of the Site (i.e., MW-36B and MW-59B), there is a component of groundwater flow to the southwest from MW-36B and flow to the northwest from MW-59B (Figure VI.J.2).

As detailed in the APAR Addendum (PBW, 2011), the B-CZ yields less than 0.1 gallons per minute (GPM) (i.e., behaves as a Class 3 Groundwater-Bearing Unit (GWBU)) in those areas east of MW-35B. Additional groundwater yield testing was conducted on the three new B-CZ wells (MW-36B, MW-59B, and MW-67B) installed in 2010 (See attachment 1A of Section XI (Compliance Plan Attachment D)). Based on the aquifer testing results, the hydraulic conductivity estimated using the Bouwer-Rice analysis ranged from 6×10^{-8} cm/sec to 1×10^{-7} cm/sec for six of the seven wells completed in the B-CZ. The only well with a hydraulic conductivity greater than 1×10^{-5} cm/sec (criteria for saturated soils) was well MW-35B, which had a hydraulic conductivity estimate at 1×10^{-4} cm/sec. MW-35B appears to be installed in the area of the lateral

transitional boundary where the B-TZ pinches out into the B-CZ with some hydraulic connection between the more transmissive sands to the southwest and the carbonate seams encountered in MW-35B. Generally east of MW-35B, the B-CZ is considered a Class 3 Groundwater Classification as approved by the TCEQ in a letter dated April 10, 2017.

Based on the potentiometric elevations within the A-TZ and B-TZ, there appears to be communication between the two GWBUs on the west side of the Site as shown with the relatively similar groundwater elevations shown for the two units on Figures VI.J.1 for the A-TZ wells, and Figure VI.J.2 for the B-TZ/B-CZ wells. Groundwater elevations in the B-CZ on the east side of the Site are generally higher relative to the groundwater elevations in the A-TZ, indicating an upward vertical gradient between the B-CZ and the A-TZ.

Transmissive Zone C-TZ

Groundwater in the C-TZ flows from northeast to southwest across the Site (Figure VI.J.3) at a gradient ranging from 0.0006 ft/ft to 0.0009 ft/ft. Groundwater elevations measured in 2014 ranged from a high of approximately 28.12 feet (MW-53C, July 2014) to 22.60 feet (MW-45C, January 2014). This flow pattern has been consistent at the Site since 2004. There does not appear to be significant communication between the upper A-TZ/B-TZ/CZ and C-TZ with the groundwater flow direction significantly different and potentiometric elevations 10 to 15 feet deeper than the upper zones.

Transmissive Unit D-TZ

Groundwater in the D-TZ appears to flow from the southeast to northwest (Figure VI.J.4) at a gradient of 0.002 ft/ft (January 2014) to 0.003 ft/ft (July 2014). Groundwater elevations range from a high of -38.82 feet HVD (MW-59D, Jan 2014) to a low of -41.60 feet HVD (MW-36D, July 2014).

Aquifer testing in MW-36D resulted in an average hydraulic conductivity of $3x10^{-5}$ cm/sec (PBW, 2011). However, yield is likely greater at the other D-TZ where the sand unit is thicker relative to MW-36D.

VI.B.2.f. Analysis of Most Likely Pathways of Migration

An on-site field survey and water-well data search was conducted and indicated that there were no water wells (that were not plugged and abandoned) that would act as a conduit for migration of shallow groundwater into the underlying groundwater formation. However, as discussed in the APAR Addendum (PBW, 2010), two sets of fiber optic lines, Level 3 Communications and Qwest, run along the north side of the rail main lines across the entire length of the Site. Based on conversations with both Level 3 Communications and Qwest

representatives, the fiber lines run underneath SWMUs 2, 5, 4, 8, and 10/11. The fiber lines run directly underneath the drainage ditch southwest of the Site and under the southern drainage ditch about 3 to 5 feet bgs. The Level 3 Communications line reportedly was directionally bored to a depth of 40 to 45 feet bgs underneath the Original and Recent Process Areas (SWMU Nos. 5 and 4, respectively) and under the AST Area (SWMU No. 8). The Qwest fiber line reportedly runs 10 to 15 feet northwest and parallel of the main rail line, and is about 5 to 10 feet bgs through the Site. Just east of SWMU No. 8, the both fiber lines return to approximately 4 to 6 feet below grade an continue running northeast parallel to the rail main line. The Level 3 Communications line may act as an artificial penetration since the reported depths of the line go through both the A-TZ and into the B-CZ immediately below the primary source areas. Given the depth of the fiber optic line is below the A-TZ and likely below the B-TZ (or the carbonate seams within the B-CZ), monitoring well MW-19C will continue to be monitored as a Corrective Action Observation Well to evaluate if the directional bored fiber optic lines are creating a preferential pathway for COCs to migrate to the C-TZ GWBU.

In addition to the fiber lines, three City of Houston utilities were identified in the previous APAR (PBW, 2010) that cut across the Site oriented north-south just west of the Lockwood Street Bridge: 1) 60-in wastewater line, 2) 84-in water line, and 3) a 42-in storm sewer line (PBW, 2010). Through a review of the utility drawing files obtained from the City of Houston Public Works Survey Department, two of the underground utility lines (the 60-in sanitary sewer line and the 84-in water line) appear to be at depths that potentially intersect the uppermost GWBU A-TZ. The estimated depths of the utilities based on the city drawings are shown on the Geologic Cross Sections A-A', B-B', and C-C' (Figure VI.E.1). The estimated base depth of the 60-in wastewater line and the 84-in water line where Cross Section B-B' crosses the utility lines is approximately 23 feet bgs (approximate elevation of 26 feet HVD). It is highly unlikely that A-TZ groundwater is seeping into the 84-in water line, given the line is under pressure (flow is south to north), constructed with welded steel pipe, and is relatively new (constructed in 2000). Sampling of the 60-in sanitary sewer line was conducted in 2010.

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TABLES

TABLE VI.A
CURRENT MONITORING WELL SYSTEM
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well/Boring ID	Date Installed	Northing	Easting	Top of Casing Elevation (FT HVD)	Total Depth (FT BGS)	Top Screen Interval (FT BGS)	Bottom Screen Interval (FT BGS)	Zone
SWMU No. 1 Monitoring Wells								
MW-01A	1/0/1900	728,006	3,165,936	47.92	19	8.5	18.5	A-TZ
MW-02	4/17/1984	728,007	3,165,857	47.97	18.5	8.5	18.5	A-TZ
MW-07	3/27/1991	727,779	3,165,867	48.86	23	14.1	19.1	A-TZ
MW-08	3/27/1991	727,903	3,165,972	49.33	24	14.2	19.2	A-TZ
MW-10A	9/13/1994	727,921	3,165,866	49.86	23	11	20.5	A-TZ
MW-10B	9/14/1994	727,916	3,165,866	49.94	46	27.1	41.6	B-TZ
MW-11A	9/15/1994	727,849	3,165,869	50.05	22	10	19.3	A-TZ
MW-11B	9/19/1994	727,845	3,165,869	50.18	44	27.5	41.2	B-TZ
P-10	3/26/1991	727,786	3,165,866	47.69	50	36.2	38.2	B-TZ
P-12	3/27/1991	727,912	3,166,127	48.78	50	36.3	38.3	B-TZ
Site-Wide Monitoring Wells								
MW-03	4/17/1984	727,985	3,165,857	48.34	18.5	8.5	18.5	A-TZ
MW-04	4/18/1984	727,813	3,165,938	49.85	21	11	21	A-TZ
MW-05	1/0/1900	727,715	3,166,026	49.24	26	10	25	A-TZ
MW-09	3/26/1991	727,908	3,166,130	49.26	24	14.8	19.8	A-TZ
MW-12A	2/27/1997	728,333	3,166,004	49.96	30	17.5	27.5	A-TZ
MW-12B	2/27/1997	728,328	3,166,004	50.02	45	32.5	42.5	B-TZ
MW-12C	4/21/1997	728,345	3,166,005	50.14	75.3	69	73.5	C-TZ
MW-13	2/25/1997	728,777	3,165,977	50.65	25	9	22.5	A-TZ
MW-14	2/27/1997	728,718	3,166,550	50.66	45	28	42.5	B-TZ
MW-15A	2/25/1997	728,755	3,166,931	50.41	30	12	26.1	A-TZ
MW-15B	12/19/2011	728,761	3,166,960	47.05	40	28	38	B-TZ
MW-15C	4/25/1997	728,761	3,166,947	50.01	75	64	73.5	C-TZ
MW-16	2/26/1997	728,305	3,167,235	51.51	30	12.5	27	A-TZ
MW-17	3/25/1997	728,787	3,167,447	50.92	35	18	32.5	A-TZ
MW-17C	12/10/2003	728,779	3,167,446	50.17	70	59.5	69.5	C-TZ
MW-18A	2/26/1997	728,839	3,168,227	51.57	35	18	32.5	A-TZ
MW-18C	4/25/1997	728,849	3,168,219	51.47	80.2	62	76.5	C-TZ
MW-19C	10/15/1998	728,620	3,167,727	53.05	73	63	73	C-TZ
MW-20A	9/28/1998	728,600	3,167,091	50.43	30	15	25	A-TZ
MW-21C	10/26/1998	727,730	3,165,884	49.05	72.5	62.5	72.5	C-TZ
MW-22A	10/1/1998	727,876	3,165,677	46.07	25	10	20	A-TZ
MW-22B	10/27/1998	727,871	3,165,678	45.86	38	27.5	37.5	B-TZ
MW-23C	10/14/1998	728,759	3,167,721	51.91	72.5	62.5	72.5	C-TZ
MW-25A	3/7/2000	729,089	3,168,524	44.65	29	18.5	28.5	A-TZ
MW-25C	3/7/2000	729,089	3,168,518	44.49	74	58	68	C-TZ

TABLE VI.A
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UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well/Boring ID	Date Installed	Northing	Easting	Top of Casing Elevation (FT HVD)	Total Depth (FT BGS)	Top Screen Interval (FT BGS)	Bottom Screen Interval (FT BGS)	Zone
MW-26A	3/7/2000	729,159	3,167,519	44.62	26	14.5	24.5	A-TZ
MW-27A	3/26/2001	730,002	3,169,610	44.90	30	17	27	A-TZ
MW-27C	4/16/2001	730,009	3,169,610	45.04	73.5	60.5	70.5	C-TZ
MW-28A	3/26/2001	729,462	3,167,926	43.86	28	16	26	A-TZ
MW-28C	4/12/2001	729,461	3,167,920	43.96	88	75	85	C-TZ
MW-30A	12/8/2003	728,759	3,167,517	50.45	31	19.5	29.5	A-TZ
MW-31A	12/8/2003	728,648	3,167,477	52.08	33	21.5	31.5	A-TZ
MW-32AR	12/15/2011	728,925	3,167,400	44.74	22	10	20	A-TZ
MW-32B	12/15/2011	728,918	3,167,400	44.73	40	26	36	B-TZ
MW-33A	12/30/2003	728,989	3,167,668	44.25	25	13	23	A-TZ
MW-33BR	12/19/2011	729,142	3,167,662	44.86	40	28	38	B-CZ
MW-34CR	5/9/2014	728,982	3,168,227	46.47	70	60	70	C-TZ
MW-35A	2/21/2007	728,985	3,167,045	44.75	28	13	28	A-TZ
MW-35B	2/26/2007	728,988	3,167,045	44.83	42	32	42	B-CZ
MW-36A	2/22/2007	729,148	3,168,167	44.53	28	18	28	A-TZ
MW-36B	6/24/2010	729,161	3,168,172	44.07	43	38	43	B-CZ
MW-36D	6/23/2010	729,162	3,168,180	44.33	110	100	110	D-TZ
MW-38A	2/21/2007	728,402	3,165,934	46.39	22	12	22	A-TZ
MW-38B	12/31/2003	728,319	3,165,945	45.51	37	25.5	35.5	B-TZ
MW-39B	12/16/2003	728,424	3,166,019	49.58	40	29.5	39.5	B-TZ
MW-40B	12/15/2004	728,341	3,166,122	49.59	40	29.5	39.5	B-TZ
MW-41B	1/7/2003	728,176	3,166,003	49.37	40	29.5	39.5	B-TZ
MW-42B	8/24/2006	728,257	3,166,324	50.52	42	30	40	B-TZ
MW-44A	2/22/2007	729,021	3,168,349	45.11	28	18	28	A-TZ
MW-44C	1/16/2004	729,021	3,168,349	45.03	70	57.5	67.5	C-TZ
MW-45C	1/20/2004	729,155	3,168,512	44.73	70	58	68	C-TZ
MW-46C	1/9/2004	729,121	3,168,576	44.94	72	60	70	C-TZ
MW-47C	3/16/2007	728,725	3,168,535	45.61	71	61	71	C-TZ
MW-48C	2/2/2004	728,417	3,168,241	44.68	72	60	70	C-TZ
MW-49A	2/28/2007	728,345	3,168,191	46.18	30	20	30	A-TZ
MW-49B	1/24/2009	728,375	3,168,184	46.43	35	30	35	B-CZ
MW-50A	3/1/2007	727,501	3,167,958	46.96	25	15	25	A-TZ
MW-51A	2/28/2007	726,925	3,166,885	47.80	25	15	25	A-TZ
MW-51C	5/10/2014	726,935	3,166,894	47.48	80	62	72	C-TZ
MW-52A	2/27/2007	728,699	3,167,814	51.91	30	20	30	A-TZ
MW-53C	8/15/2006	729,613	3,168,481	45.49	72	60	70	C-TZ
MW-54C	8/15/2006	729,218	3,168,766	44.99	72	60	70	C-TZ
MW-55A	1/12/2009	728,540	3,167,482	52.01	25	10	25	A-TZ
MW-55B	12/14/2011	728,538	3,167,474	49.15	40	32	37	B-TZ
MW-57A	1/22/2009	728,858	3,167,974	47.72	27	12	27	A-TZ

TABLE VI.A
CURRENT MONITORING WELL SYSTEM
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well/Boring ID	Date Installed	Northing	Easting	Top of Casing Elevation (FT HVD)	Total Depth (FT BGS)	Top Screen Interval (FT BGS)	Bottom Screen Interval (FT BGS)	Zone
MW-57B	12/21/2011	728,857	3,167,965	47.93	40	34	39	B-TZ
MW-58A	1/23/2009	728,875	3,168,176	47.76	29	14	29	A-TZ
MW-59A	1/28/2009	728,155	3,168,358	44.18	21	11	21	A-TZ
MW-59B	6/26/2010	728,145	3,168,358	44.36	33	28	33	B-CZ
MW-59D	1/27/2009	728,114	3,168,365	44.22	118	108	118	D-TZ
MW-60A	1/26/2009	728,825	3,168,823	46.79	28.5	18.5	28.5	A-TZ
MW-61A	1/26/2009	728,336	3,168,630	44.67	22	12	22	A-TZ
MW-62B	1/21/2009	728,190	3,165,880	48.16	35	25	35	B-TZ
MW-63B	1/28/2009	729,361	3,167,652	44.48	36	31	36	B-CZ
MW-64A	1/26/2009	727,496	3,165,573	44.55	19.5	14.5	19.5	A-TZ
MW-65D	1/17/2009	729,512	3,168,331	44.55	110	100	110	D-TZ
MW-66D	1/20/2009	729,137	3,169,381	46.51	103	93	103	D-TZ
MW-67B	6/26/2010	729,782	3,167,588	43.93	40	35	40	B-CZ
MW-68B	12/15/2011	729,162	3,167,328	44.93	40	28	38	B-TZ
MW-68C	6/25/2010	729,164	3,167,346	44.8	70	60	70	C-TZ
MW-69A	6/23/2010	728,136	3,168,234	45.71	18.5	8.5	18.5	A-TZ
MW-70B	12/14/2011	728,944	3,167,671	45.02	40	25	35	B-CZ
MW-71B	12/13/2011	728,956	3,167,951	45.06	40	32	37	B-TZ
MW-72B	12/21/2011	728,790	3,167,792	48.69	41	32	37	B-TZ
MW-73B	12/13/2011	728,419	3,167,123	48.66	55	47	52	B-TZ
MW-74B	12/20/2011	728,373	3,167,718	47.83	40	26.5	36.5	B-TZ
MW-75B	12/20/2011	728,066	3,168,022	47.18	40	32.2	37.2	B-TZ
MW-76C	5/7/2014	727,485	3,166,628	47.84	70	60	70	C-TZ
MW-77A	5/7/2014	727,672	3,166,981	49.05	25	13	23	A-TZ
MW-78A	5/6/2014	727,953	3,167,512	48.677	30	15	25	A-TZ
MW-79A	5/7/2014	728,237	3,167,666	48.946	30	17	27	A-TZ
MW-80B	5/8/2014	727,907	3,168,201	47.107	35	29	34	B-TZ
MW-81B	5/11/2014	727,292	3,167,926	46.766	40	29	34	B-TZ
P-11	3/25/1991	728,049	3,166,025	48.98	50	36.2	38.2	B-TZ
TW-41B	1/22/2009	728,222	3,166,002	49.67	40	30	40	B-TZ
TW-56A	1/23/2009	728,758	3,168,070	51.89	31	21	31	A-TZ

Notes:
BGS=Below Ground Surface
HVD = Elevations relative to Houston Vertical Datum, Houston Monument System
Northing/Easting = Coordinates based on NAD 1927 Texas State Plane, South Central Zone, US Survey Feet

TABLE VI.B
COMPREHENSIVE LISTING OF SOIL BORINGS AND PLUGGED AND ABANDONED MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well/Boring ID	Date Installed	Northing	Easting	Surface Elevation (FT HVD)	Total Depth (FT BGS)
Area of Concern Soil Sampling					
AOC-3E	3/4/1997	728,870	3,168,119	47.97	5
AOC-3W	3/4/1997	728,868	3,168,110	48.00	5
AOC-4NE	3/3/1997	728,192	3,166,665	47.83	5
AOC-4NW	3/3/1997	728,183	3,166,657	48.00	5
AOC-4SE	3/3/1997	728,190	3,166,677	47.93	5
AOC-4SER	8/28/2006	728,190	3,166,677	47.93	
AOC-4SW	3/3/1997	728,179	3,166,674	48.06	5
AOC-5E	4/10/1997	728,835	3,168,053	47.11	
AOC-5W	3/4/1997	728,789	3,167,956	48.08	7
AOC-7	3/3/1997	728,747	3,167,544	47.71	10
Cone Penetrometer Test (CPT) Locations					
CPT-01E	11/14/1995	727,826	3,165,870	47.59	34.7
CPT-02E	11/15/1995	727,772	3,165,942	46.56	43.2
CPT-03E	11/15/1995	727,905	3,166,015	47.39	43.2
CPT-03R	11/15/1995	727,747	3,166,162	47.24	43.2
CPT-04E	11/15/1995	727,710	3,165,886	46.81	35
CPT-04R	11/15/1995	727,894	3,166,456	47.25	51
CPT-05E	11/15/1995	727,631	3,165,888	46.63	39.7
CPT-05R	11/18/1995	728,070	3,166,734	47.99	53
CPT-06E	11/14/1995	728,035	3,166,041	47.35	34.8
CPT-06R	11/18/1995	728,195	3,166,942	48.03	53.5
CPT-07E	11/15/1995	727,637	3,165,777	45.33	40
CPT-07R	11/16/1995	728,299	3,167,232	48.51	52.8
CPT-08E	11/15/1995	727,636	3,165,706	45.75	34
CPT-08R	11/16/1995	728,531	3,167,212	48.96	55.7
CPT-09E	11/15/1995	728,031	3,165,945	46.13	33
CPT-09R	11/17/1995	728,420	3,167,453	49.53	59
CPT-10E	11/16/1995	728,052	3,165,679	45.74	42.9
CPT-10R	11/16/1995	728,651	3,167,444	49.15	53.7
CPT-11E	11/16/1995	728,053	3,165,770	45.26	34.4
CPT-11R	11/17/1995	728,516	3,167,636	50.95	50.4
CPT-12E	11/16/1995	728,062	3,165,840	45.59	34.3
CPT-12R	11/16/1995	728,713	3,167,613	49.26	56
CPT-13E	11/16/1995	727,849	3,165,688	46.07	40.1
CPT-13R	11/18/1995	728,682	3,167,793	48.74	58.4
CPT-14E	11/16/1995	727,861	3,165,799	45.49	32.6
CPT-14R	11/16/1995	728,786	3,167,760	48.87	54.5
CPT-15R	11/18/1995	728,748	3,168,046	49.14	57.6
CPT-16R	11/17/1995	728,844	3,167,956	48.47	49.6
CPT-17R	11/17/1995	728,831	3,168,224	48.53	48.6
CPT-18R	11/14/1995	728,756	3,167,290	47.43	52
CPT-19R	11/17/1995	728,757	3,166,899	47.35	51.9
CPT-20R	11/17/1995	728,473	3,166,699	47.60	52.6
CPT-21R	11/17/1995	728,754	3,166,367	47.57	50
CPT-22R	11/18/1995	728,371	3,166,301	48.38	56
CPT-23R	11/18/1995	728,753	3,165,986	47.68	51.8
CPT-24R	11/18/1995	728,529	3,165,983	46.62	33.9
CPT-25R	11/18/1995	728,322	3,166,002	47.28	52.7
CPT-26R	11/17/1995	728,403	3,167,161	48.87	59.8
CPT-27R	11/19/1995	728,068	3,166,423	48.05	58.9

TABLE VI.B
COMPREHENSIVE LISTING OF SOIL BORINGS AND PLUGGED AND ABANDONED MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well/Boring ID	Date Installed	Northing	Easting	Surface Elevation (FT HVD)	Total Depth (FT BGS)
CPT-28R	11/19/1995	728,710	3,166,555	47.54	59
CPT-29R	11/19/1995	728,659	3,167,262	47.43	56.2
CPT-30R	11/19/1995	728,355	3,167,044	48.52	55.8
CPT-31R	11/19/1995	728,546	3,167,050	47.84	53.4
CPT-32R	11/19/1995	728,531	3,167,477	49.30	21.8
CPT-33R	11/19/1995	728,604	3,167,624	49.14	59.1
CPT-34R	11/19/1995	728,529	3,167,436	49.18	22.2
CPT-35	5/8/1997	727,647	3,165,756	45.49	100
CPT-36	2/25/1997	728,474	3,166,702	47.59	65.35
CPT-37	2/25/1997	728,519	3,167,238	49.02	48.23
CPT-38	2/25/1997	728,682	3,167,798	48.89	68.24
CPT-39	2/25/1997	728,736	3,167,083	47.33	99.41
CPT-40	2/26/1997	728,347	3,166,009	47.21	65.09
CPT-41	2/26/1997	728,823	3,168,157	48.78	66.67
CPT-42	5/8/1997	728,122	3,165,771	45.78	64.37
CPT-01-13	2/11/2013	727,094	3,165,989		
CPT-02-13	2/11/2013	727,177	3,166,585		
CPT-03-13	2/11/2013	727,269	3,167,048		
CPT-04-13	2/11/2013	727,555	3,167,957		
CPT-05-13	2/11/2013	727,675	3,168,198		
CPT-06-13	2/12/2013	728,014	3,168,174		
CPT-07-13	2/12/2013	728,044	3,168,046		
CPT-08-13	2/12/2013	727,835	3,167,778		
CPT-09-13	2/12/2013	727,641	3,167,398		
CPT-10-13	2/15/2013	728,116	3,167,848		
CPT-11-13	2/12/2013	727,836	3,167,468		
CPT-12-13	2/13/2013	727,699	3,167,220		
CPT-13-13	2/13/2013	727,591	3,167,016		
CPT-14-13	2/14/2013	728,000	3,167,439		
CPT-15-13	2/14/2013	727,886	3,167,291		
CPT-16-13	2/13/2013	727,722	3,166,907		
CPT-17-13	2/15/2013	728,210	3,167,658		
CPT-18-13	2/14/2013	728,276	3,168,143		
CPT-19-13	2/14/2013	728,442	3,168,004		
CPT-20-13	2/14/2013	727,301	3,167,511		
CPT-21-13	2/15/2013	728,380	3,167,774		
CPT-23-13	2/15/2013	727,508	3,166,548		
Hydropunch Sampling					
HP01STZ	12/5/1995	727,638	3,165,770	45.47	36
HP01UTZ	12/5/1995	727,638	3,165,772	45.40	18
HP02STZA	12/4/1995	727,850	3,165,691	46.07	36
HP02STZB	12/4/1995	727,638	3,165,774	46.07	36
HP02UTZ	12/5/1995	727,850	3,165,690	46.09	19
HP03STZ	12/4/1995	728,052	3,165,680	45.81	36
HP03UTZ	12/4/1995	728,052	3,165,681	45.78	16
HP04STZ	12/4/1995	728,061	3,165,841	45.56	33
HP04UTZ	12/4/1995	728,060	3,165,840	45.55	16
HP05STZ	12/6/1995	728,040	3,166,042	47.35	33
HP05UTZ	12/6/1995	728,042	3,166,042	47.33	18
HP06STZ	12/6/1995	727,901	3,166,015	47.26	36
HP06UTZ	12/6/1995	727,902	3,166,015	47.42	21

TABLE VI.B
COMPREHENSIVE LISTING OF SOIL BORINGS AND PLUGGED AND ABANDONED MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well/Boring ID	Date Installed	Northing	Easting	Surface Elevation (FT HVD)	Total Depth (FT BGS)
HP07STZ	12/5/1995	727,776	3,165,939	46.53	36
HP07UTZ	12/5/1995	727,770	3,165,937	46.59	21
HP08UTZ	12/5/1995	727,636	3,165,707	45.78	17
HP09UTZ	12/6/1997	728,748	3,165,984	47.68	16
HP10STZ	12/6/1997	728,758	3,166,904	47.32	33
HP10UTZ	12/6/1997	728,757	3,166,901	47.35	18
HP11UTZ	12/6/1995	728,844	3,167,959	48.42	16
HP12UTZ		728,849	3,167,797	47.29	
HP13UTZ	12/7/1995	728,303	3,167,234	48.43	16
HP14UCU	12/6/1995	728,529	3,167,212	49.02	
HP14UTZ	12/6/1995	728,527	3,167,213	49.06	22
HP15STZ	12/6/1995	728,066	3,166,420	48.09	35
HP15UTZ	12/6/1995	728,064	3,166,418	48.10	18
HP16LTZ	12/7/1995	728,193	3,166,936	47.98	50
HP16UTZ	12/7/1995	728,194	3,166,939	48.03	18
HP17STZ	5/8/1997	727,559	3,165,708	45.26	37
HP17UTZ	5/8/1997	727,561	3,165,707	45.28	18
HP18STZ	5/8/1997	727,933	3,165,833	45.89	32.5
HP18UTZ	5/8/1997	727,932	3,165,832	45.79	21
HP19STZ	5/9/1997	727,789	3,165,664	46.13	35
HP19UTZ	5/8/1997	727,791	3,165,666	46.25	17
HP20STZ	5/9/1997	728,119	3,165,775	45.70	37
HP20UTZ	5/9/1997	728,116	3,165,777	45.52	16.5
HP21STZ	5/9/1997	727,920	3,165,690	45.83	34
HP21UTZ	5/9/1997	727,924	3,165,685	45.72	16.5
Soil Borings					
SB-02	3/3/1997	728,477	3,166,697	47.63	55
SB-03	3/5/1997	728,514	3,167,240	49.03	57
SB-04	3/5/1997	728,689	3,167,804	48.28	60
SB-04		728,689	3,167,804		
SB-05	3/4/1997	728,348	3,166,002	47.30	60
SB-05		728,348	3,166,002		
SB-06	3/4/1997	728,353	3,167,040	48.36	57
SB-07	3/6/1997	728,525	3,167,431	49.07	25
SB-07R		728,528	3,167,410		
SB-08	3/6/1997	728,531	3,167,436	49.20	25
SB-21	10/9/1998	729,024	3,168,355	45.51	24
SB-22	9/29/1998	728,979	3,167,971	44.91	45
SB-23		728,746	3,167,736		
SB-24	9/28/1998	728,626	3,167,444	49.24	50
SB-25	9/29/1998	728,933	3,167,397	44.91	50
SB-26	10/26/1998	727,828	3,166,105	47.13	2
SB-27	10/29/1998	728,743	3,165,904	45.77	2
SB-28	9/30/1998	728,573	3,165,898	45.22	50
SB-29	9/30/1998	728,290	3,165,955	45.17	35
SB-30	10/12/1998	728,168	3,165,948	45.22	34
SB-31	10/29/1998	728,043	3,165,966	45.37	2
SB-32	10/26/1998	727,683	3,165,883	46.25	2
SB-33	10/27/1998	727,660	3,165,854	45.91	2
SB-34	10/27/1998	727,863	3,165,767	45.24	2
SB-35	10/9/1998	727,637	3,165,333	46.51	2

TABLE VI.B
COMPREHENSIVE LISTING OF SOIL BORINGS AND PLUGGED AND ABANDONED MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well/Boring ID	Date Installed	Northing	Easting	Surface Elevation (FT HVD)	Total Depth (FT BGS)
SB-36	10/27/1998	727,653	3,165,720	45.99	2
SB-37	10/9/1998	727,592	3,165,341	46.42	24
SB-38	10/8/1998	727,513	3,165,745	47.52	33
SB-39	10/8/1998	727,454	3,165,636	47.32	30
SB-40	10/1/1998	727,773	3,165,514	46.35	54
SB-43	10/12/1998	727,397	3,165,534	47.58	24
SB-44	10/12/1998	727,297	3,165,375	46.88	24
SB-50		729,142	3,168,192	45.12	0
SB-51		728,812	3,167,439		
SB-52		728,822	3,167,559		
SB-53		728,857	3,168,071		
SB-54		728,869	3,168,216		
SB-55		728,729	3,167,971		
SB-56		728,295	3,167,026		
SB-57		728,824	3,168,231		
SB-58		728,871	3,168,339		
SB-59		728,948	3,168,211		
SB-60		728,931	3,168,055		
SB-61		728,908	3,167,717		
SB-62		728,885	3,167,480		
SB-64		728,807	3,167,317		
SB-65		729,088	3,167,413		
SB-66		728,624	3,167,805		
SB-67		728,619	3,167,480		
SB-70		729,214	3,168,334		
SB-72		728,509	3,167,169		
SB-73		728,578	3,167,360		
SB-74		728,517	3,167,495		
SB-75		728,686	3,167,405		
SB-76		728,748	3,167,651		
SB-77		728,827	3,167,796		
SB-78		728,684	3,167,866		
SB-79		727,556	3,165,621		
SB-80		727,590	3,165,720		
SB-81		727,616	3,165,666		
SB-82		727,605	3,165,787		
SB-83		727,526	3,165,676		
SB-84		727,530	3,165,567		
SB-85		727,574	3,165,886		
SB-86A		727,659	3,166,044		
SB-86A2	8/8/2006	727,654	3,166,035		
SB-86A9	8/10/2006	727,705	3,166,131		
SB-86B	8/8/2006	727,664	3,166,042		
SB-86C1	8/10/2006	727,674	3,166,048		
SB-87B		727,753	3,166,225		
SB-88B		727,844	3,166,397		
SB-89B		727,941	3,166,585		
SB-90B		728,046	3,166,765		
SB-91B		728,131	3,166,937		
SB-92B		728,232	3,167,119		
SB-93B		728,420	3,167,477		

TABLE VI.B
COMPREHENSIVE LISTING OF SOIL BORINGS AND PLUGGED AND ABANDONED MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well/Boring ID	Date Installed	Northing	Easting	Surface Elevation (FT HVD)	Total Depth (FT BGS)
SB-94B		728,314	3,167,287		
SB-95B		728,509	3,167,654		
SB-95B1		728,508	3,167,659		
SB-95B2		728,513	3,167,668		
SB-95B3		728,518	3,167,679		
SB-95B4		728,524	3,167,688		
SB-95B5		728,529	3,167,697		
SB-95B6		728,534	3,167,710		
SB-95B7		728,539	3,167,719		
SB-95C		728,516	3,167,645		
SB-95D		728,524	3,167,640		
SB-96a		728,604	3,167,825		
SB-96B	8/28/2006	728,604	3,167,825		
SB-96B1		728,597	3,167,816		
SB-96B2		728,595	3,167,807		
SB-96B3		728,584	3,167,797		
SB-99		728,664	3,167,590		
SB-100		727,484	3,165,700		
SB-101		727,387	3,165,521		
SB-102		727,289	3,165,344		
SB-103		727,197	3,165,176		
SB-104		727,107	3,165,013		
SB-105	3/15/2007	727,621	3,165,583		
SB-106	3/15/2007	727,520	3,165,542		
SB-107	3/15/2007	727,425	3,165,578		
SB-108		727,528	3,165,512		
SB-109		727,498	3,165,512		
SB-110		727,133	3,165,063		
SB-111		727,051	3,164,898		
SB-112		726,988	3,164,805		
SB-113		726,821	3,164,498		
SB-114		726,654	3,164,190		
SB-115		727,570	3,165,473		
SB-116		727,486	3,165,457		
SB-117		727,430	3,165,481		
SB-118		728,815	3,167,395		
SB-119		728,833	3,167,482		
SB-120		728,842	3,167,583		
SB-121		728,847	3,167,678		
SB-122		728,848	3,167,786		
SB-123		728,863	3,167,881		
SB-124		728,877	3,168,080		
SB-125		728,883	3,168,278		
SB-126		728,480	3,168,202		
SB-127		728,080	3,168,216		
SB-128		727,681	3,168,230		
SB-129		727,545	3,167,961		
SB-130		727,145	3,167,981		
SB-131		726,806	3,167,938		
SB-132		726,793	3,167,538		
SB-133		726,779	3,167,139		

TABLE VI.B
COMPREHENSIVE LISTING OF SOIL BORINGS AND PLUGGED AND ABANDONED MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well/Boring ID	Date Installed	Northing	Easting	Surface Elevation (FT HVD)	Total Depth (FT BGS)
SB-134		726,908	3,166,870		
SB-135		726,800	3,166,569		
SB-136		726,783	3,166,170		
SB-137		726,767	3,165,770		
SB-138	6/24/2010	728,907	3,167,791		
SB-139	6/24/2010	728,923	3,167,934		
SB-140	6/23/2010	728,933	3,168,027		
SB-141	6/23/2010	728,935	3,168,100		
SB-142	6/22/2010	728,947	3,168,183		
SB-143	6/22/2010	728,893	3,168,184		
SB-144	6/22/2010	728,854	3,167,787		
SB-145	6/22/2010	728,881	3,168,080		
SB-146	6/22/2010	728,849	3,167,715		
SB-147	6/22/2010	727,530	3,165,209		
SS0-11R		728,835	3,168,030		
SSO-11	4/9/1997	728,835	3,168,030	48.56	
SSO-A01	4/8/1997	728,718	3,165,974	46.85	
SSO-A02	4/8/1997	728,714	3,166,186	47.73	
SSO-A03	4/8/1997	728,730	3,166,401	47.43	
SSO-A04	4/8/1997	728,747	3,166,618	47.37	
SSO-A05	4/8/1997	728,750	3,166,832	46.99	
SSO-A06	4/8/1997	728,779	3,167,108	47.22	
SSO-B01	4/8/1997	728,438	3,165,999	47.57	
SSO-B02	4/8/1997	728,507	3,166,262	47.09	
SSO-B03	4/8/1997	728,504	3,166,466	47.68	
SSO-B04	4/8/1997	728,509	3,166,647	47.86	
SSO-B05	4/8/1997	728,571	3,166,920	47.33	
SSO-B06	4/8/1997	728,629	3,167,111	47.37	
SSO-C01	4/8/1997	728,234	3,166,038	47.22	
SSO-C02	4/8/1997	728,273	3,166,245	48.05	
SSO-C03	4/8/1997	728,294	3,166,469	47.31	
SSO-C04	4/8/1997	728,309	3,166,695	48.09	
SSO-C05	4/8/1997	728,402	3,167,025	48.31	
SSO-C06	4/8/1997	728,450	3,167,199	48.99	
SSO-D01	4/8/1997	728,040	3,166,092	46.98	
SSO-D02	4/8/1997	728,133	3,166,270	47.67	
SSO-F07	4/9/1997	728,564	3,167,263	48.66	
SSO-F08	4/9/1997	728,668	3,167,435	48.61	
SSO-F09	4/9/1997	728,761	3,167,615	48.10	
SSO-F10	4/9/1997	728,850	3,167,796	47.24	
SSO-G07	4/9/1997	728,383	3,167,348	49.27	
SSO-G08	4/9/1997	728,492	3,167,531	49.39	
SSO-G09	4/9/1997	728,589	3,167,720	50.23	
SSO-G10	4/9/1997	728,652	3,167,884	49.45	
SSO-G11	4/9/1997	728,748	3,168,092	48.80	
WPW-M-001-P	12/13/1995	700,000	3,000,000		
WPW-S-002P	12/13/1995	728,101	3,165,970	45.30	
WPW-S-003P	12/13/1995	728,504	3,165,954	44.37	
WPW-S-004P	12/13/1995	728,681	3,165,947	44.36	
WPW-S-007P	12/13/1995	728,764	3,167,613	47.79	
WPW-S-009P	12/13/1995	728,433	3,167,402	49.36	

TABLE VI.B
COMPREHENSIVE LISTING OF SOIL BORINGS AND PLUGGED AND ABANDONED MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well/Boring ID	Date Installed	Northing	Easting	Surface Elevation (FT HVD)	Total Depth (FT BGS)
SB-1	3/12/2013	727,146	3,165,609		
SB-2	3/12/2013	727,564	3,166,416		
SB-3	3/12/2013	727,655	3,166,597		
SB-4	3/12/2013	727,421	3,165,919		
SB-5	3/12/2013	727,695	3,166,443		
SB-6	3/12/2013	727,969	3,166,952		
SB-7	3/12/2013	728,113	3,167,201		
SB-8	3/12/2013	728,254	3,167,501		
SB-9	3/12/2013	727,731	3,166,404		
SB-10	3/12/2013	727,902	3,166,725		
SB-11	3/12/2013	728,032	3,166,974		
SB-12	3/12/2013	728,148	3,167,189		
SW-1		727,089	3,165,461		
SW-2		727,299	3,165,688		
SW-3		727,591	3,166,241		
SW-4		727,792	3,166,838		
SW-5		727,386	3,166,068		
SW-6		727,777	3,166,595		
SW-7		727,920	3,167,094		
SW-8		728,134	3,167,483		
SW-9		728,140	3,167,284		
SB-22-13	2/15/2013	728,501	3,167,891		
Plugged and Abandoned Wells					
TW-01		728,540	3,167,423		
TW-02		728,821	3,168,081		
TW-03		727,734	3,167,007		
MW-24A	3/7/2000	727,549	3,165,205	46.11	25
MW-24AR	1/27/2009	727,531	3,165,207		
MW-24B	3/7/2000	727,534	3,165,208	46.46	50
MW-24C	3/8/2000	727,542	3,165,206	46.27	74
MW-32A	12/29/2003	728,914	3,167,401	44.54	33
MW-33B	12/30/2003	728,989	3,167,668	44.76	25.5
MW-34C	1/13/2004	728,934	3,168,160	45.63	60
MW-29A	4/19/2001	727,310	3,164,239	46.71	23
MW-29B	4/12/2001	727,303	3,164,239	46.73	57
MW-29C	4/27/2001	727,293	3,164,240	46.79	75

TABLE VI.C
LIST OF WELL OWNERS AND USES WITHIN 1-MILE RADUS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

PBW Map ID	Well ID	Well Owner	Current Water Use	Depth Drilled	Completion Date	Reported Aquifer
1	65-14-809	Southern Pacific Railroad	Destroyed	947	01/01/1925	Evangeline
2	65-14-8A	Houston Lighting & Power	Industrial	1550	01/19/1982	Evangeline
3	HGSDHG1968	Southern Pacific Trans. Co.	Irrigation	1200	01/01/1954	Evangeline
	65-14-802	Southern Pacific Railroad	Industrial	1201	01/01/1954	Evangeline
	65-14-801	Southern Pacific Railroad	Industrial	1206	01/01/1954	Evangeline
	HGSDHG1967	Southern Pacific Trans. Co.	Irrigation	1200	01/01/1981	Evangeline
4	65-14-814	Southen Pacific Railroad	Destroyed	919	01/01/1941	Evangeline
5	65-14-7	Dr. Carroll	Other	530	12/06/1984	Chicot
	65-14-8F	Dr. Carroll	Other	223	08/28/1984	Chicot
6	65-14-759, G1010013HH, USGS-294728095200101	City of Houston Northeast #2	Plugged	1291	01/01/1938	Evangeline
	USGS-294728095200102	USGS	Observation	1596	02/01/1980	Evangeline
	USGS-294728095200103	USGS	Observation	487	02/15/1980	Chicot
	USGS-294728095200104	USGS	Observation	1035	02/15/1980	Evangeline
	USGS-294728095200105	USGS	Observation	298	02/01/1980	Chicot
	USGS-294728095200106	USGS	Observation	2170	04/25/1980	Evangeline
	65-14-7	Williams Brothers Const.	Plugged	280	6/5/1992	NA
7	65-14-727, G1010013HG	City of Houston Northeast #1	Plugged	1876	01/01/1931	Evangeline
8	65-14-517, 65-06-8D	Corbett Fabricating Co	Industrial	344	03/04/1966	Chicot
9	65-14-508	General Metals Corp.	Unused	912	01/01/1938	Evangeline
	65-14-505	General Metals Corp.	Unused	217	01/01/1943	Chicot
10	HGSDHG1084, 65-14-406, USGS-294745095201001	City of Houston Northeast #3	Plugged	1993	05/15/1944	Evangeline
11	65-14-507, G1010013ND	City of Houston Kashmere Gardens	Plugged	544	01/01/1940	Chicot
	65-14-501, G1010013NC	City of Houston Kashmere Gardens	Plugged	1035	07/01/1948	Evangeline
12	65-14-823, 65-14-8, USGS-294609095194601	National Vinegar Co.	Industrial	506	04/14/1987	Chicot
	HGSDHG4117	National Vinegar Company	Industrial	350	01/01/1990	Chicot
	65-14-4	National Vinegar	Plugged	200	04/14/1998	Chicot

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-01A	47.92	2-Sep-93	6.96			40.99
	47.92	21-Dec-93	3.28			44.67
	47.92	24-Mar-94	3.95			44
	47.92	22-Jun-94	5.30			42.65
	47.92	28-Sep-94	7.10			40.85
	47.92	13-Oct-94	7.26			40.69
	47.92	24-Jan-95	2.63			45.32
	47.92	11-Apr-95	2.61			45.34
	47.92	11-Jul-95	4.78			43.17
	47.92	23-Jan-96	5.67			42.28
	47.92	19-Jul-96	7.84			40.11
	47.92	17-Sep-96	8.33			39.62
	47.92	31-Oct-96	6.90			41.05
	47.92	22-Nov-96	8.63			39.32
	47.92	27-Dec-96	5.50			42.45
	47.92	22-Jan-97	3.41			44.54
	47.92	21-Feb-97	2.68			45.27
	47.92	25-Mar-97	2.96			44.99
	47.92	23-Apr-97	4.27			43.68
	47.92	24-Apr-97	4.47			43.48
	47.92	13-May-97	2.91			45.04
	47.92	20-Jun-97	4.88			43.07
	47.92	25-Jun-97	2.59			45.36
	47.92	1-Jul-97	4.04			43.91
	47.92	24-Jul-97	6.80			41.15
	47.92	16-Aug-97	7.84			40.11
	47.92	22-Aug-97	9.52			38.43
	47.92	25-Sep-97	6.02			41.93
	47.92	22-Oct-97	4.89			43.06
	47.92	25-Nov-97	4.88			43.07
	47.92	19-Dec-97	4.26			43.69
	47.92	20-Jan-98	3.10			44.85
	47.92	3-Mar-98	2.87			45.08
	47.92	18-Mar-98	2.68			45.27
	47.92	24-Apr-98	6.73			41.22
	47.92	21-May-98	6.89			41.06
	47.92	30-Jul-98	7.96			39.99
	47.92	25-Aug-98	6.87			41.08
	47.92	21-Sep-98	4.70			43.25
	47.92	26-Oct-98	5.98			41.97
	47.92	23-Nov-98	4.11			43.84
	47.92	29-Jan-99	3.01			44.94
	47.92	26-Feb-99	3.20			44.75
	47.92	16-Mar-99	3.71			44.24
	47.92	29-Apr-99	3.93			44.02
	47.92	1-Jun-99	3.98			43.97
	47.92	30-Jul-99	4.31			43.64
	47.92	27-Aug-99	4.11			43.84
	47.92	27-Sep-99	9.67			38.28
	47.92	29-Oct-99	10.67			37.28
	47.92	29-Dec-99	10.00			37.95
	47.92	4-Feb-00	12.71			35.24
	47.92	25-Feb-00	9.10			38.85
	47.92	27-Mar-00	7.38			40.57
	47.92	7-Apr-00	7.00			40.95
	47.92	31-May-00	7.15			40.8
	47.92	1-Jun-00	7.00			40.95
	47.92	28-Jul-00	7.11			40.84
	47.92	30-Aug-00	10.33			37.62
	47.92	19-Sep-00	11.56			36.39
	47.92	27-Oct-00	9.01			38.94
	47.92	21-Nov-00	8.49			39.46
	47.92	1-May-01	6.60			41.35
	47.92	1-Oct-01	6.85			41.1
	47.92	11-Mar-02	3.31			44.64
	47.92	23-Sep-02	3.23			44.72
	47.92	10-Mar-03	2.48			45.44
	47.92	23-Sep-03	4.29			43.63
	47.92	15-Mar-04	3.49			44.43
	47.92	13-Sep-04	8.26			39.66
	47.92	18-Jul-05	3.73			44.19
	47.92	4-Jan-06	8.54			39.38
	47.92	27-Jul-06	3.10			44.82
	47.92	23-Jan-07	2.26			45.66
	47.92	7-Mar-07	2.36			45.56
	47.92	27-Jul-07	4.05			43.87

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-01A	47.92	28-Jan-08	2.51			45.41
	47.92	16-Jul-08	7.21			40.71
	47.92	22-Jan-09	6.21			41.71
	47.92	22-Jul-09	6.96			40.96
	47.92	8-Jan-10	3.07			44.85
	47.92	12-Jul-10	3.87			44.05
	47.88	12-Jan-11	3.63			44.25
	47.88	13-Jul-11	9.94			37.94
	47.88	27-Jan-12	3.19			44.69
	47.88	10-Jul-13	9.96			37.92
	47.88	8-Jan-14	5.21			42.67
	47.88	2-Jul-14	6.81			41.07
MW-02	47.97	2-Sep-93	7.45			40.58
	47.97	21-Dec-93	2.58			45.45
	47.97	24-Mar-94	4.08			43.95
	47.97	22-Jun-94	5.85			42.18
	47.97	28-Sep-94	7.05			40.98
	47.97	13-Oct-94	7.69			40.34
	47.97	24-Jan-95	2.12			45.91
	47.97	11-Apr-95	2.53			45.5
	47.97	11-Jul-95	5.34			42.69
	47.97	23-Jan-96	5.69			42.34
	47.97	19-Jul-96	8.28			39.75
	47.97	17-Sep-96	8.84			39.19
	47.97	31-Oct-96	7.11			40.92
	47.97	22-Nov-96	8.99			39.04
	47.97	27-Dec-96	5.42			42.61
	47.97	22-Jan-97	3.08			44.95
	47.97	21-Feb-97	2.60			45.43
	47.97	25-Mar-97	2.98			45.05
	47.97	23-Apr-97	4.60			43.43
	47.97	24-Apr-97	4.78			43.25
	47.97	13-May-97	2.89			45.14
	47.97	20-Jun-97	5.45			42.58
	47.97	25-Jun-97	2.59			45.44
	47.97	1-Jul-97	4.48			43.55
	47.97	24-Jul-97	7.42			40.61
	47.97	16-Aug-97	8.42			39.61
	47.97	22-Aug-97	9.20			38.83
	47.97	25-Sep-97	4.53			43.5
	47.97	22-Oct-97	4.95			43.08
	47.97	25-Nov-97	4.97			43.06
	47.97	19-Dec-97	4.33			43.7
	47.97	20-Jan-98	3.05			44.98
	47.97	3-Mar-98	2.88			45.15
	47.97	18-Mar-98	2.66			45.37
	47.97	24-Apr-98	7.09			40.94
	47.97	21-May-98	7.00			41.03
	47.97	30-Jul-98	8.11			39.92
	47.97	25-Aug-98	7.33			40.7
	47.97	21-Sep-98	4.18			43.85
	47.97	26-Oct-98	6.85			41.18
	47.97	23-Nov-98	4.63			43.4
	47.97	29-Jan-99	3.51			44.52
	47.97	26-Feb-99	3.61			44.42
	47.97	16-Mar-99	3.55			44.48
	47.97	29-Apr-99	3.76			44.27
	47.97	1-Jun-99	3.76			44.27
	47.97	30-Jul-99	4.61			43.42
	47.97	27-Aug-99	3.96			44.07
	47.97	27-Sep-99	10.12			37.91
	47.97	29-Oct-99	11.33			36.7
	47.97	29-Dec-99	10.66			37.37
	47.97	4-Feb-00	13.19			34.84
	47.97	25-Feb-00	9.57			38.46
	47.97	27-Mar-00	7.73			40.3
	47.97	7-Apr-00	7.30			40.73
	47.97	31-May-00	7.33			40.7
	47.97	1-Jun-00	7.31			40.72
	47.97	28-Jul-00	7.35			40.68
	47.97	30-Aug-00	10.55			37.48
	47.97	19-Sep-00	11.93			36.1
	47.97	27-Oct-00	9.04			38.99
	47.97	21-Nov-00	8.66			39.37
	47.97	1-May-01	6.91			41.12
	47.97	1-Oct-01	8.22			39.81
	47.97	11-Mar-02	3.33			44.7
	47.97	23-Sep-02	3.16			44.87
	47.97	10-Mar-03	2.54			45.43

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-02	47.97	23-Sep-03	3.29			44.68
	47.97	15-Mar-04	2.87			45.1
	47.97	13-Sep-04	8.71			39.26
	47.97	18-Jul-05	2.98			44.99
	47.97	4-Jan-06	8.77			39.2
	47.97	27-Jul-06	2.87			45.1
	47.97	23-Jan-07	2.34			45.63
	47.97	7-Mar-07	2.23			45.74
	47.97	27-Jul-07	4.40			43.57
	47.97	28-Jan-08	2.42			45.55
	47.97	16-Jul-08	7.72			40.25
	47.97	22-Jan-09	6.31			41.66
	47.97	22-Jul-09	7.56			40.41
	47.97	8-Jan-10	3.91			44.06
	47.97	12-Jul-10	4.37			43.6
	48.00	12-Jan-11	3.63			44.37
	48.00	13-Jul-11	10.28			37.72
	48.00	27-Jan-12	2.67			45.33
	48.00	10-Jul-13	10.58			37.42
	48.00	8-Jan-14	5.47			42.53
	48.00	2-Jul-14	7.51			40.49
MW-03	48.34	2-Sep-93	8.17			40.17
	48.34	21-Dec-93	3.81			44.53
	48.34	24-Mar-94	4.74			43.6
	48.34	22-Jun-94	6.35			41.99
	48.34	28-Sep-94	7.56			40.78
	48.34	13-Oct-94	8.21			40.13
	48.34	24-Jan-95	3.18			45.16
	48.34	11-Apr-95	3.22			45.12
	48.34	11-Jul-95	7.90			40.44
	48.34	23-Jan-96	6.27			42.07
	48.34	19-Jul-96	8.77			39.57
	48.34	17-Sep-96	9.31			39.03
	48.34	31-Oct-96	7.61			40.73
	48.34	22-Nov-96	9.48			38.86
	48.34	27-Dec-96	6.14			42.2
	48.34	22-Jan-97	5.68			42.66
	48.34	21-Feb-97	3.13			45.21
	48.34	25-Mar-97	3.48			44.86
	48.34	23-Apr-97	5.17			43.17
	48.34	24-Apr-97	5.25			43.09
	48.34	13-May-97	3.41			44.93
	48.34	20-Jun-97	5.91			42.43
	48.34	25-Jun-97	3.11			45.23
	48.34	1-Jul-97	4.91			43.43
	48.34	24-Jul-97	7.90			40.44
	48.34	16-Aug-97	8.91			39.43
	48.34	22-Aug-97	9.65			38.69
	48.34	25-Sep-97	6.96			41.38
	48.34	22-Oct-97	5.50			42.84
	48.34	25-Nov-97	5.55			42.79
	48.34	19-Dec-97	5.10			43.24
	48.34	20-Jan-98	3.58			44.76
	48.34	3-Mar-98	3.37			44.97
	48.34	18-Mar-98	3.16			45.18
	48.34	24-Apr-98	7.54			40.8
	48.34	21-May-98	7.50			40.84
	48.34	30-Jul-98	8.44			39.9
	48.34	25-Aug-98	7.56			40.78
	48.34	21-Sep-98	5.28			43.06
	48.34	26-Oct-98	6.96			41.38
	48.34	23-Nov-98	5.11			43.23
	48.34	29-Jan-99	4.21			44.13
	48.34	26-Feb-99	4.32			44.02
	48.34	16-Mar-99	4.16			44.18
	48.34	29-Apr-99	4.33			44.01
	48.34	1-Jun-99	4.39			43.95
	48.34	30-Jul-99	5.88			42.46
	48.34	27-Aug-99	4.57			43.77
	48.34	27-Sep-99	10.48			37.86
	48.34	29-Oct-99	11.61			36.73
	48.34	29-Dec-99	10.11			38.23
	48.34	4-Feb-00	13.22			35.12
	48.34	25-Feb-00	9.14			39.2
	48.34	27-Mar-00	8.06			40.28
	48.34	7-Apr-00	7.64			40.7
	48.34	31-May-00	7.70			40.64
	48.34	1-Jun-00	7.66			40.68
	48.34	28-Jul-00	7.71			40.63

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-03	48.34	30-Aug-00	10.59			37.75
	48.34	19-Sep-00	12.29			36.05
	48.34	27-Oct-00	9.09			39.25
	48.34	21-Nov-00	9.11			39.23
	48.34	1-May-01	7.26			41.08
	48.34	1-Oct-01	7.57			40.77
	48.34	11-Mar-02	7.40			40.94
	48.34	23-Sep-02	4.60			43.74
	48.34	10-Mar-03	2.89			45.45
	48.34	23-Sep-03	3.74			44.6
	48.34	15-Mar-04	3.27			45.07
	48.34	13-Sep-04	9.03			39.31
	48.34	18-Jul-05	3.94			44.4
	48.34	4-Jan-06	9.13			39.21
	48.34	27-Jul-06	3.30			45.04
	48.34	7-Mar-07	2.62			45.72
	48.34	27-Jul-07	3.74			44.6
	48.34	30-Jan-08	2.85			45.49
	48.34	16-Jul-08	7.96			40.38
	48.34	4-Feb-09	7.18			41.16
	48.34	24-Jul-09	7.63			40.71
	48.34	8-Jan-10	5.06			43.28
	48.34	12-Jul-10	3.86			44.48
	48.34	12-Jan-11	3.71			44.63
	48.34	12-Jul-11	6.42			41.92
	48.34	26-Jan-12	--			
	48.34	9-Jul-12	4.06			44.28
	48.34	7-Jan-13	5.09			43.25
	48.34	22-Jul-13	8.24			40.1
	48.34	7-Jan-14	8.09			40.25
	48.34	15-Jul-14	8.78			39.56
MW-04	49.85	2-Sep-93	8.57			41.28
	49.85	21-Dec-93	5.42			44.43
	49.85	24-Mar-94	5.85			44
	49.85	22-Jun-94	6.77			43.08
	49.85	28-Sep-94	8.18			41.67
	49.85	13-Oct-94	8.93			40.92
	49.85	24-Jan-95	4.72			45.13
	49.85	11-Apr-95	4.57			45.28
	49.85	11-Jul-95	6.47			43.38
	49.85	23-Jan-96	7.85			42
	49.85	19-Jul-96	9.62			40.23
	49.85	17-Sep-96	10.09			39.76
	49.85	31-Oct-96	7.93			41.92
	49.85	22-Nov-96	10.62			39.23
	49.85	27-Dec-96	8.06			41.79
	49.85	22-Jan-97	6.07			43.78
	49.85	21-Feb-97	4.86			44.99
	49.85	25-Mar-97	5.16			44.69
	49.85	23-Apr-97	6.25			43.6
	49.85	24-Apr-97	6.45			43.4
	49.85	13-May-97	5.07			44.78
	49.85	20-Jun-97	6.69			43.16
	49.85	25-Jun-97	4.68			45.17
	49.85	1-Jul-97	5.91			43.94
	49.85	24-Jul-97	8.61			41.24
	49.85	16-Aug-97	9.62			40.23
	49.85	22-Aug-97	10.35			39.5
	49.85	25-Sep-97	8.13			41.72
	49.85	22-Oct-97	7.23			42.62
	49.85	25-Nov-97	7.25			42.6
	49.85	19-Dec-97	6.76			43.09
	49.85	20-Jan-98	5.40			44.45
	49.85	3-Mar-98	5.00			44.85
	49.85	18-Mar-98	4.82			45.03
	49.85	24-Apr-98	8.63			41.22
	49.85	21-May-98	9.30			40.55
	49.85	30-Jul-98	10.19			39.66
	49.85	25-Aug-98	9.05			40.8
	49.85	21-Sep-98	7.05			42.8
	49.85	26-Oct-98	8.12			41.73
	49.85	23-Nov-98	6.01			43.84
	49.85	29-Jan-99	5.19			44.66
	49.85	26-Feb-99	5.22			44.63
	49.85	16-Mar-99	6.21			43.64
	49.85	29-Apr-99	6.33			43.52
	49.85	1-Jun-99	6.39			43.46
	49.85	30-Jul-99	7.79			42.06

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HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
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Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-04	49.85	27-Aug-99	6.51			43.34
	49.85	27-Sep-99	11.32			38.53
	49.85	29-Oct-99	12.21			37.64
	49.85	29-Dec-99	11.52			38.33
	49.85	4-Feb-00	14.33			35.52
	49.85	25-Feb-00	10.63			39.22
	49.85	27-Mar-00	9.38			40.47
	49.85	7-Apr-00	9.09			40.76
	49.85	31-May-00	9.13			40.72
	49.85	1-Jun-00	9.10			40.75
	49.85	28-Jul-00	9.18			40.67
	49.85	30-Aug-00	12.17			37.68
	49.85	19-Sep-00	13.39			36.46
	49.85	27-Oct-00	10.69			39.16
	49.85	21-Nov-00	9.61			40.24
	49.85	1-May-01	8.41			41.44
	49.85	1-Oct-01	8.68			41.17
	49.85	11-Mar-02	5.41			44.44
	49.85	23-Sep-02	5.29			44.56
	49.85	10-Mar-03	4.36			45.49
	49.85	23-Sep-03	5.28			44.57
	49.85	15-Mar-04	4.80			45.05
	49.85	13-Sep-04	9.80			40.05
	49.85	18-Jul-05	5.84			44.01
	49.85	4-Jan-06	10.48			39.37
	49.85	27-Jul-06	5.30			44.55
	49.85	7-Mar-07	4.10			45.75
	49.85	27-Jul-07	5.36			44.49
	49.85	29-Jan-08	4.18			45.67
	49.85	16-Jul-08	8.66			41.19
	49.85	4-Feb-09	8.93			40.92
	49.85	24-Jul-09	9.27			40.58
	49.85	8-Jan-10	6.34			43.51
	49.85	12-Jul-10	5.02			44.83
	49.85	12-Jan-11	5.26			44.59
	49.85	12-Jul-11	8.06			41.79
	49.85	26-Jan-12	--			
	49.85	9-Jul-12	3.74			46.11
	49.85	7-Jan-13	4.62			45.23
	49.85	22-Jul-13	7.59			42.26
	49.85	7-Jan-14	7.16			42.69
	49.85	15-Jul-14	7.62			42.23
MW-05	49.24	2-Sep-93	4.90			44.34
	49.24	21-Dec-93	2.21			47.03
	49.24	24-Mar-94	2.30			46.94
	49.24	22-Jun-94	2.80			46.44
	49.24	28-Sep-94	3.90			45.34
	49.24	13-Oct-94	5.05			44.19
	49.24	24-Jan-95	1.36			47.88
	49.24	11-Apr-95	3.90			45.34
	49.24	11-Jul-95	5.33			43.91
	49.24	23-Jan-96	7.42			41.82
	49.24	19-Jul-96	8.61			40.63
	49.24	17-Sep-96	9.01			40.23
	49.24	31-Oct-96	7.84			41.4
	49.24	22-Nov-96	9.68			39.56
	49.24	27-Dec-96	7.66			41.58
	49.24	22-Jan-97	5.89			43.35
	49.24	21-Feb-97	4.45			44.79
	49.24	25-Mar-97	4.65			44.59
	49.24	23-Apr-97	5.53			43.71
	49.24	24-Apr-97	5.68			43.56
	49.24	13-May-97	4.39			44.85
	49.24	20-Jun-97	5.67			43.57
	49.24	25-Jun-97	3.97			45.27
	49.24	1-Jul-97	5.06			44.18
	49.24	24-Jul-97	7.46			41.78
	49.24	16-Aug-97	8.57			40.67
	49.24	22-Aug-97	9.20			40.04
	49.24	25-Sep-97	7.28			41.96
	49.24	22-Oct-97	6.70			42.54
	49.24	25-Nov-97	6.70			42.54
	49.24	19-Dec-97	6.26			42.98
	49.24	20-Jan-98	5.05			44.19
	49.24	4-Mar-98	4.54			44.7
	49.24	18-Mar-98	4.36			44.88

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-05	49.24	24-Apr-98	7.67			41.57
	49.24	21-May-98	8.80			40.44
	49.24	30-Jul-98	9.90			39.34
	49.24	25-Aug-98	8.86			40.38
	49.24	21-Sep-98	6.59			42.65
	49.24	26-Oct-98	7.77			41.47
	49.24	23-Nov-98	5.79			43.45
	49.24	29-Jan-99	4.88			44.36
	49.24	26-Feb-99	4.96			44.28
	49.24	16-Mar-99	5.81			43.43
	49.24	29-Apr-99	5.91			43.33
	49.24	1-Jun-99	5.99			43.25
	49.24	30-Jul-99	7.00			42.24
	49.24	27-Aug-99	6.13			43.11
	49.24	27-Sep-99	10.17			39.07
	49.24	29-Oct-99	11.65			37.59
	49.24	29-Dec-99	10.90			38.34
	49.24	4-Feb-00	13.77			35.47
	49.24	25-Feb-00	9.46			39.78
	49.24	27-Mar-00	8.62			40.62
	49.24	7-Apr-00	8.20			41.04
	49.24	31-May-00	8.26			40.98
	49.24	1-Jun-00	8.21			41.03
	49.24	28-Jul-00	8.26			40.98
	49.24	30-Aug-00	11.33			37.91
	49.24	19-Sep-00	12.33			36.91
	49.24	27-Oct-00	9.94			39.3
	49.24	21-Nov-00	9.21			40.03
	49.24	1-May-01	7.47			41.77
	49.24	1-Oct-01	7.79			41.45
	49.24	11-Mar-02	4.92			44.32
	49.24	23-Sep-02	4.76			44.48
	49.24	10-Mar-03	3.77			45.47
	49.24	23-Sep-03	4.61			44.63
	49.24	15-Mar-04	4.22			45.02
	49.24	13-Sep-04	8.58			40.66
	49.24	18-Jul-05	5.61			43.63
	49.24	4-Jan-06	9.76			39.48
	49.24	27-Jul-06	4.85			44.39
	49.24	7-Mar-07	5.94			43.3
	49.24	27-Jul-07	4.53			44.71
	49.24	29-Jan-08	3.71			45.53
	49.24	15-Jul-08	7.77			41.47
	49.24	4-Feb-09	8.33			40.91
	49.24	24-Jul-09	8.67			40.57
	49.24	8-Jan-10	6.06			43.18
	49.24	12-Jul-10	4.86			44.38
	49.24	12-Jan-11	5.06			44.18
	49.24	12-Jul-11	10.96			38.28
	49.24	2-Feb-12	4.9			44.34
	49.24	9-Jul-12	4.61			44.63
	49.24	7-Jan-13	7.58			41.66
	49.24	22-Jul-13	10.44			38.8
	49.24	7-Jan-14	6.92			42.32
	49.24	16-Jul-14	8.46			40.78
MW-07	48.86	2-Sep-93	8.09			40.77
	48.86	21-Dec-93	4.60			44.26
	48.86	24-Mar-94	5.06			43.8
	48.86	22-Jun-94	6.03			42.83
	48.86	28-Sep-94	7.52			41.34
	48.86	13-Oct-94	8.13			40.73
	48.86	24-Jan-95	3.81			45.05
	48.86	11-Apr-95	3.41			45.45
	48.86	11-Jul-95	5.74			43.12
	48.86	23-Jan-96	6.99			41.87
	48.86	19-Jul-96	8.89			39.97
	48.86	17-Sep-96	9.41			39.45
	48.86	31-Oct-96	8.04			40.82
	48.86	22-Nov-96	9.94			38.92
	48.86	27-Dec-96	7.30			41.56
	48.86	22-Jan-97	5.25			43.61
	48.86	21-Feb-97	4.00			44.86
	48.86	25-Mar-97	4.32			44.54
	48.86	23-Apr-97	5.51			43.35
	48.86	24-Apr-97	5.67			43.19
	48.86	13-May-97	4.26			44.6
	48.86	20-Jun-97	6.00			42.86

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-07	48.86	25-Jun-97	3.86			45
	48.86	1-Jul-97	5.21			43.65
	48.86	24-Jul-97	7.99			40.87
	48.86	16-Aug-97	8.92			39.94
	48.86	22-Aug-97	9.72			39.14
	48.86	25-Sep-97	7.50			41.36
	48.86	22-Oct-97	6.48			42.38
	48.86	25-Nov-97	6.50			42.36
	48.86	19-Dec-97	6.12			42.74
	48.86	20-Jan-98	4.52			44.34
	48.86	4-Mar-98	4.14			44.72
	48.86	18-Mar-98	3.94			44.92
	48.86	24-Apr-98	7.85			41.01
	48.86	21-May-98	8.61			40.25
	48.86	30-Jul-98	9.54			39.32
	48.86	25-Aug-98	8.63			40.23
	48.86	21-Sep-98	6.34			42.52
	48.86	26-Oct-98	7.56			41.3
	48.86	23-Nov-98	5.91			42.95
	48.86	29-Jan-99	4.71			44.15
	48.86	26-Feb-99	4.76			44.1
	48.86	16-Mar-99	5.32			43.54
	48.86	29-Apr-99	5.41			43.45
	48.86	1-Jun-99	5.49			43.37
	48.86	30-Jul-99	6.98			41.88
	48.86	27-Aug-99	5.61			43.25
	48.86	27-Sep-99	10.64			38.22
	48.86	29-Oct-99	11.56			37.3
	48.86	29-Dec-99	9.90			38.96
	48.86	4-Feb-00	14.21			34.65
	48.86	25-Feb-00	8.86			40
	48.86	27-Mar-00	8.62			40.24
	48.86	7-Apr-00	8.15			40.71
	48.86	31-May-00	8.21			40.65
	48.86	1-Jun-00	8.22			40.64
	48.86	28-Jul-00	8.29			40.57
	48.86	30-Aug-00	11.55			37.31
	48.86	19-Sep-00	12.65			36.21
	48.86	27-Oct-00	10.00			38.86
	48.86	21-Nov-00	9.46			39.4
	48.86	1-May-01	7.64			41.22
	48.86	1-Oct-01	8.00			40.86
	48.86	11-Mar-02	4.56			44.3
	48.86	23-Sep-02	4.69			44.17
	48.86	10-Mar-03	3.52			45.34
	48.86	23-Sep-03	4.70			44.16
	48.86	15-Mar-04	3.89			44.97
	48.86	13-Sep-04	9.04			39.82
	48.86	18-Jul-05	5.27			43.59
	48.86	4-Jan-06	9.91			38.95
	48.86	27-Jul-06	4.60			44.26
	48.86	23-Jan-07	3.46			45.4
	48.86	7-Mar-07	3.82			45.04
	48.86	27-Jul-07	4.94			43.92
	48.86	29-Jan-08	3.39			45.47
	48.86	16-Jul-08	7.94			40.92
	48.86	22-Jan-09	7.49			41.37
	48.86	24-Jul-09	NM			NM
	48.86	8-Jan-10	4.02			44.84
	48.86	12-Jul-10	4.72			44.14
	48.92	12-Jan-11	4.56			44.36
	48.92	12-Jul-11	10.91			38.01
	48.92	27-Jan-12	3.86			45.06
	48.92	10-Jul-13	10.62			38.30
	48.92	8-Jan-14	6.42			42.50
	48.92	2-Jul-14	7.61			41.31
MW-08	49.33	2-Sep-93	8.18			41.19
	49.33	21-Dec-93	5.02			44.35
	49.33	24-Mar-94	5.53			43.84
	49.33	22-Jun-94	6.38			42.99
	49.33	28-Sep-94	7.72			41.65
	49.33	13-Oct-94	8.43			40.94
	49.33	24-Jan-95	4.15			45.22
	49.33	11-Apr-95	4.02			45.35
	49.33	11-Jul-95	5.95			43.42
	49.33	23-Jan-96	7.20			42.17
	49.33	19-Jul-96	9.06			40.31
	49.33	17-Sep-96	9.51			39.86
	49.33	31-Oct-96	7.99			41.38

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-08	49.33	22-Nov-96	9.98			39.39
	49.33	27-Dec-96	7.24			42.13
	49.33	22-Jan-97	5.25			44.12
	49.33	21-Feb-97	4.21			45.16
	49.33	25-Mar-97	4.48			44.89
	49.33	23-Apr-97	5.61			43.76
	49.33	24-Apr-97	5.76			43.61
	49.33	13-May-97	4.45			44.92
	49.33	20-Jun-97	6.09			43.28
	49.33	25-Jun-97	4.56			44.81
	49.33	1-Jul-97	5.06			44.31
	49.33	24-Jul-97	7.97			41.4
	49.33	16-Aug-97	8.05			41.32
	49.33	22-Aug-97	9.73			39.64
	49.33	25-Sep-97	7.57			41.8
	49.33	22-Oct-97	6.43			42.94
	49.33	25-Nov-97	6.48			42.89
	49.33	19-Dec-97	5.22			44.15
	49.33	20-Jan-98	4.70			44.67
	49.33	4-Mar-98	4.38			44.99
	49.33	18-Mar-98	4.18			45.19
	49.33	24-Apr-98	8.00			41.37
	49.33	21-May-98	8.45			40.92
	49.33	30-Jul-98	9.33			40.04
	49.33	25-Aug-98	8.46			40.91
	49.33	21-Sep-98	6.31			43.06
	49.33	26-Oct-98	7.66			41.71
	49.33	23-Nov-98	5.96			43.41
	49.33	29-Jan-99	4.80			44.57
	49.33	26-Feb-99	4.89			44.48
	49.33	16-Mar-99	5.45			43.92
	49.33	29-Apr-99	5.66			43.71
	49.33	1-Jun-99	5.66			43.71
	49.33	30-Jul-99	7.20			42.17
	49.33	27-Aug-99	5.85			43.52
	49.33	27-Sep-99	10.78			38.59
	49.33	29-Oct-99	11.76			37.61
	49.33	29-Dec-99	11.03			38.34
	49.33	4-Feb-00	14.66			34.71
	49.33	25-Feb-00	10.33			39.04
	49.33	27-Mar-00	8.75			40.62
	49.33	7-Apr-00	8.37			41
	49.33	31-May-00	8.40			40.97
	49.33	1-Jun-00	8.36			41.01
	49.33	28-Jul-00	8.40			40.97
	49.33	30-Aug-00	11.29			38.08
	49.33	19-Sep-00	12.82			36.55
	49.33	27-Oct-00	12.63			36.74
	49.33	21-Nov-00	9.64			39.73
	49.33	1-May-01	7.83			41.54
	49.33	1-Oct-01	8.05			41.32
	49.33	11-Mar-02	4.75			44.62
	49.33	23-Sep-02	4.69			44.68
	49.33	10-Mar-03	3.84			45.49
	49.33	23-Sep-03	4.73			44.6
	49.33	15-Mar-04	4.31			45.02
	49.33	13-Sep-04	9.31			40.02
	49.33	18-Jul-05	5.32			44.01
	49.33	4-Jan-06	10.63			38.7
	49.33	27-Jul-06	4.79			44.54
	49.33	22-Jan-07	3.81			45.52
	49.33	7-Mar-07	3.96			45.37
	49.33	27-Jul-07	5.06			44.27
	49.33	29-Jan-08	3.71			45.62
	49.33	16-Jul-08	8.32			41.01
	49.33	22-Jan-09	7.71			41.62
	49.33	24-Jul-09	NM			NM
	49.33	8-Jan-10	4.17			45.16
	49.33	12-Jul-10	4.96			44.37
	49.33	12-Jan-11	5.32			44.01
	49.33	12-Jul-11	11.24			38.09
	49.33	27-Jan-12	4.68			44.65
	49.33	10-Jul-13	11.07			38.26
	49.33	8-Jan-14	6.87			42.46
	49.33	2-Jul-14	8.16			41.17
MW-09	49.26	2-Sep-93	7.43			41.86
	49.26	21-Dec-93	4.89			44.4
	49.26	24-Mar-94	4.92			44.37
	49.26	22-Jun-94	5.51			43.78

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-09	49.26	28-Sep-94	6.90			42.39
	49.26	13-Oct-94	7.66			41.63
	49.26	24-Jan-95	4.10			45.19
	49.26	11-Apr-95	3.74			45.55
	49.26	11-Jul-95	5.08			44.21
	49.26	23-Jan-96	7.09			42.2
	49.26	19-Jul-96	8.27			41.02
	49.26	17-Sep-96	8.58			40.71
	49.26	31-Oct-96	7.27			42.02
	49.26	22-Nov-96	9.17			40.12
	49.26	27-Dec-96	7.05			42.24
	49.26	22-Jan-97	5.42			43.87
	49.26	21-Feb-97	4.09			45.2
	49.26	25-Mar-97	4.17			45.12
	49.26	23-Apr-97	5.05			44.24
	49.26	24-Apr-97	5.21			44.08
	49.26	13-May-97	4.16			45.13
	49.26	20-Jun-97	5.32			43.97
	49.26	25-Jun-97	3.80			45.49
	49.26	1-Jul-97	4.57			44.72
	49.26	24-Jul-97	7.03			42.26
	49.26	16-Aug-97	8.26			41.03
	49.26	22-Aug-97	8.67			40.62
	49.26	25-Sep-97	6.99			42.3
	49.26	22-Oct-97	6.10			43.19
	49.26	25-Nov-97	6.12			43.17
	49.26	19-Dec-97	5.62			43.67
	49.26	20-Jan-98	4.60			44.69
	49.26	4-Mar-98	4.15			45.14
	49.26	18-Mar-98	4.02			45.27
	49.26	24-Apr-98	7.32			41.97
	49.26	21-May-98	8.10			41.19
	49.26	30-Jul-98	9.12			40.17
	49.26	25-Aug-98	8.41			40.88
	49.26	21-Sep-98	6.11			43.18
	49.26	26-Oct-98	7.61			41.68
	49.26	23-Nov-98	5.43			43.86
	49.26	29-Jan-99	4.60			44.69
	49.26	26-Feb-99	4.68			44.61
	49.26	16-Mar-99	5.46			43.83
	49.26	29-Apr-99	5.66			43.63
	49.26	1-Jun-99	5.66			43.63
	49.26	30-Jul-99	7.11			42.18
	49.26	27-Aug-99	5.86			43.43
	49.26	27-Sep-99	9.81			39.48
	49.26	29-Oct-99	10.63			38.66
	49.26	29-Dec-99	9.99			39.3
	49.26	4-Feb-00	12.44			36.85
	49.26	25-Feb-00	8.88			40.41
	49.26	27-Mar-00	8.22			41.07
	49.26	7-Apr-00	8.10			41.19
	49.26	31-May-00	8.15			41.14
	49.26	1-Jun-00	8.00			41.29
	49.26	28-Jul-00	8.11			41.18
	49.26	30-Aug-00	11.10			38.19
	49.26	19-Sep-00	11.91			37.38
	49.26	27-Oct-00	9.84			39.45
	49.26	21-Nov-00	8.89			40.4
	49.26	1-May-01	7.16			42.13
	49.26	1-Oct-01	7.39			41.9
	49.26	11-Mar-02	4.61			44.68
	49.26	23-Sep-02	4.45			44.84
	49.26	10-Mar-03	3.59			45.67
	49.26	23-Sep-03	4.31			44.95
	49.26	15-Mar-04	4.18			45.08
	49.26	13-Sep-04	8.39			40.87
	49.26	18-Jul-05	5.53			43.73
	49.26	4-Jan-06	9.46			39.8
	49.26	27-Jul-06	4.85			44.41
	49.26	7-Mar-07	5.58			43.68
	49.26	27-Jul-07	3.78			45.48
	49.26	29-Jan-08	3.52			45.74
	49.26	15-Jul-08	7.04			42.22
	49.26	4-Feb-09	8.01			41.25
	49.26	24-Jul-09	8.34			40.92
	49.26	8-Jan-10	5.89			43.37
	49.26	12-Jul-10	4.32			44.94

TABLE VI.D
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UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-09	49.26	12-Jan-11	4.61			44.65
	49.26	12-Jul-11	10.71			38.55
	49.26	26-Jan-12	4.73			44.53
	49.26	9-Jul-12	4.23			45.03
	49.26	7-Jan-13	6.73			42.53
	49.26	22-Jul-13	9.16			40.1
	49.26	7-Jan-14	8.72			40.54
	49.26	16-Jul-14	8.17			41.09
MW-10A	49.86	28-Sep-94	8.69			41.21
	49.86	13-Oct-94	9.36			40.54
	49.86	24-Jan-95	4.62			45.28
	49.86	11-Apr-95	4.60			45.3
	49.86	11-Jul-95	7.00			42.9
	49.86	23-Jan-96	7.74			42.16
	49.86	19-Jul-96	9.98			39.92
	49.86	17-Sep-96	10.54			39.36
	49.86	31-Oct-96	7.94			41.96
	49.86	22-Nov-96	10.82			39.08
	49.86	27-Dec-96	7.81			42.09
	49.86	22-Jan-97	5.45			44.45
	49.86	21-Feb-97	4.63			45.27
	49.86	25-Mar-97	5.01			44.89
	49.86	23-Apr-97	6.39			43.51
	49.86	24-Apr-97	6.58			43.32
	49.86	13-May-97	4.93			44.97
	49.86	20-Jun-97	7.08			42.82
	49.86	25-Jun-97	4.58			45.32
	49.86	1-Jul-97	6.13			43.77
	49.86	24-Jul-97	9.11			40.79
	49.86	16-Aug-97	10.10			39.8
	49.86	22-Aug-97	10.81			39.09
	49.86	25-Sep-97	8.47			41.43
	49.86	22-Oct-97	7.02			42.88
	49.86	25-Nov-97	7.05			42.85
	49.86	19-Dec-97	6.89			43.01
	49.86	20-Jan-98	5.10			44.8
	49.86	3-Mar-98	4.87			45.03
	49.86	18-Mar-98	4.65			45.25
	49.86	24-Apr-98	8.84			41.06
	49.86	21-May-98	9.10			40.8
	49.86	30-Jul-98	10.23			39.67
	49.86	25-Aug-98	9.11			40.79
	49.86	21-Sep-98	6.82			43.08
	49.86	26-Oct-98	8.19			41.71
	49.86	23-Nov-98	6.12			43.78
	49.86	29-Jan-99	5.61			44.29
	49.86	26-Feb-99	5.69			44.21
	49.86	16-Mar-99	5.91			43.99
	49.86	29-Apr-99	6.11			43.79
	49.86	1-Jun-99	6.10			43.8
	49.86	30-Jul-99	7.70			42.2
	49.86	27-Aug-99	6.31			43.59
	49.86	27-Sep-99	11.73			38.17
	49.86	29-Oct-99	12.69			37.21
	49.86	29-Dec-99	12.00			37.9
	49.86	4-Feb-00	14.30			35.6
	49.86	25-Feb-00	11.44			38.46
	49.86	27-Mar-00	9.57			40.33
	49.86	7-Apr-00	9.27			40.63
	49.86	31-May-00	9.31			40.59
	49.86	1-Jun-00	9.10			40.8
	49.86	28-Jul-00	9.30			40.6
	49.86	30-Aug-00	12.09			37.81
	49.86	19-Sep-00	13.70			36.2
	49.86	27-Oct-00	10.69			39.21
	49.86	21-Nov-00	10.49			39.41
	49.86	1-May-01	8.64			41.26
	49.86	1-Oct-01	8.93			40.97
	49.86	11-Mar-02	5.30			44.6
	49.86	23-Sep-02	5.19			44.71
	49.86	10-Mar-03	4.43			45.43
	49.86	23-Sep-03	5.31			44.55
	49.86	15-Mar-04	4.69			45.17
	49.86	13-Sep-04	10.30			39.56
	49.86	18-Jul-05	5.57			44.29
	49.86	4-Jan-06	9.68			40.18

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-10A	49.86	27-Jul-06	5.01			44.85
	49.86	23-Jan-07	4.29			45.57
	49.86	7-Mar-07	4.13			45.73
	49.86	27-Jul-07	6.03			43.83
	49.86	28-Jan-08	4.22			45.64
	49.86	16-Jul-08	9.31			40.55
	49.86	22-Jan-09	8.27			41.59
	49.86	24-Jul-09	NM			NM
	49.86	8-Jan-10	4.64			45.22
	49.86	12-Jul-10	5.23			44.63
	49.82	12-Jan-11	5.72			44.10
	49.82	13-Jul-11	11.96			37.86
	49.82	12-Jul-11	12.07			37.75
	49.82	27-Jan-12	4.88			44.94
	49.82	10-Jul-13	12.07			37.75
	49.82	8-Jan-14	7.33			42.49
	49.82	2-Jul-14	8.92			40.90
MW-10B	49.94	28-Sep-94	8.77			41.2
	49.94	13-Oct-94	9.45			40.52
	49.94	24-Jan-95	4.72			45.25
	49.94	11-Apr-95	4.72			45.25
	49.94	11-Jul-95	7.13			42.84
	49.94	23-Jan-96	7.84			42.13
	49.94	19-Jul-96	10.27			39.7
	49.94	17-Sep-96	10.64			39.33
	49.94	31-Oct-96	8.01			41.96
	49.94	22-Nov-96	10.93			39.04
	49.94	27-Dec-96	7.99			41.98
	49.94	22-Jan-97	5.72			44.25
	49.94	21-Feb-97	4.78			45.19
	49.94	25-Mar-97	5.13			44.84
	49.94	23-Apr-97	6.52			43.45
	49.94	24-Apr-97	6.71			43.26
	49.94	13-May-97	5.09			44.88
	49.94	20-Jun-97	7.21			42.76
	49.94	25-Jun-97	4.71			45.26
	49.94	1-Jul-97	6.27			43.7
	49.94	24-Jul-97	9.15			40.82
	49.94	16-Aug-97	10.19			39.78
	49.94	22-Aug-97	10.92			39.05
	49.94	25-Sep-97	8.69			41.28
	49.94	22-Oct-97	7.18			42.79
	49.94	25-Nov-97	7.21			42.76
	49.94	19-Dec-97	6.56			43.41
	49.94	20-Jan-98	5.25			44.72
	49.94	3-Mar-98	5.00			44.97
	49.94	18-Mar-98	4.79			45.18
	49.94	24-Apr-98	8.95			41.02
	49.94	21-May-98	9.30			40.67
	49.94	30-Jul-98	10.30			39.67
	49.94	25-Aug-98	9.20			40.77
	49.94	21-Sep-98	7.06			42.91
	49.94	26-Oct-98	8.31			41.66
	49.94	23-Nov-98	6.25			43.72
	49.94	29-Jan-99	5.71			44.26
	49.94	26-Feb-99	5.76			44.21
	49.94	16-Mar-99	6.05			43.92
	49.94	29-Apr-99	6.10			43.87
	49.94	1-Jun-99	6.10			43.87
	49.94	30-Jul-99	7.61			42.36
	49.94	27-Aug-99	6.33			43.64
	49.94	27-Sep-99	11.90			38.07
	49.94	29-Oct-99	12.60			37.37
	49.94	29-Dec-99	12.10			37.87
	49.94	4-Feb-00	14.29			35.68
	49.94	25-Feb-00	11.15			38.82
	49.94	27-Mar-00	9.67			40.3
	49.94	7-Apr-00	9.32			40.65
	49.94	31-May-00	9.38			40.59
	49.94	1-Jun-00	9.21			40.76
	49.94	28-Jul-00	9.33			40.64
	49.94	30-Aug-00	12.11			37.86
	49.94	19-Sep-00	13.77			36.2
	49.94	27-Oct-00	10.63			39.34
	49.94	21-Nov-00	10.64			39.33
	49.94	1-May-01	8.75			41.22
	49.94	1-Oct-01	9.12			40.85
	49.94	11-Mar-02	5.47			44.5
	49.94	23-Sep-02	5.40			44.57

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-10B	49.94	10-Mar-03	4.59			45.35
	49.94	23-Sep-03	5.58			44.36
	49.94	15-Mar-04	5.78			44.16
	49.94	13-Sep-04	10.41			39.53
	49.94	18-Jul-05	5.97			43.97
	49.94	4-Jan-06	10.75			39.19
	49.94	27-Jul-06	5.73			44.21
	49.94	23-Jan-07	4.45			45.49
	49.94	7-Mar-07	4.61			45.33
	49.94	27-Jul-07	6.15			43.79
	49.94	28-Jan-08	4.44			45.5
	49.94	16-Jul-08	9.42			40.52
	49.94	22-Jan-09	8.39			41.55
	49.94	24-Jul-09	NM			NM
	49.94	8-Jan-10	4.91			45.03
	49.94	12-Jul-10	5.33			44.61
	49.95	12-Jan-11	5.96			43.99
	49.95	13-Jul-11	12.07			37.88
	49.95	27-Jan-12	5.02			44.93
	49.95	10-Jul-13	12.18			37.77
	49.95	8-Jan-14	7.46			42.49
	49.95	2-Jul-14	8.96			40.99
MW-11A	50.05	28-Sep-94	8.66			41.38
	50.05	13-Oct-94	9.35			40.69
	50.05	24-Jan-95	4.88			45.16
	50.05	11-Apr-95	4.81			45.23
	50.05	11-Jul-95	6.67			43.37
	50.05	23-Jan-96	8.01			42.03
	50.05	19-Jul-96	10.09			39.95
	50.05	17-Sep-96	10.56			39.48
	50.05	31-Oct-96	8.16			41.88
	50.05	22-Nov-96	10.98			39.06
	50.05	27-Dec-96	8.21			41.83
	50.05	22-Jan-97	6.06			43.98
	50.05	21-Feb-97	4.98			45.06
	50.05	25-Mar-97	5.32			44.72
	50.05	23-Apr-97	6.59			43.45
	50.05	24-Apr-97	6.77			43.27
	50.05	13-May-97	5.31			44.73
	50.05	20-Jun-97	7.15			42.89
	50.05	25-Jun-97	4.88			45.16
	50.05	1-Jul-97	6.29			43.75
	50.05	24-Jul-97	9.12			40.92
	50.05	16-Aug-97	10.11			39.93
	50.05	22-Aug-97	10.82			39.22
	50.05	25-Sep-97	8.70			41.34
	50.05	22-Oct-97	7.40			42.64
	50.05	25-Nov-97	7.41			42.63
	50.05	19-Dec-97	6.10			43.94
	50.05	20-Jan-98	5.49			44.55
	50.05	3-Mar-98	5.16			44.88
	50.05	18-Mar-98	4.96			45.08
	50.05	24-Apr-98	8.98			41.06
	50.05	21-May-98	9.40			40.64
	50.05	30-Jul-98	10.56			39.48
	50.05	25-Aug-98	9.32			40.72
	50.05	21-Sep-98	7.28			42.76
	50.05	26-Oct-98	8.43			41.61
	50.05	23-Nov-98	6.41			43.63
	50.05	29-Jan-99	5.31			44.73
	50.05	26-Feb-99	5.39			44.65
	50.05	16-Mar-99	6.32			43.72
	50.05	29-Apr-99	6.51			43.53
	50.05	1-Jun-99	6.57			43.47
	50.05	30-Jul-99	8.00			42.04
	50.05	27-Aug-99	6.79			43.25
	50.05	27-Sep-99	11.73			38.31
	50.05	29-Oct-99	12.81			37.23
	50.05	29-Dec-99	12.11			37.93
	50.05	4-Feb-00	14.33			35.71
	50.05	25-Feb-00	11.10			38.94
	50.05	27-Mar-00	9.66			40.38
	50.05	7-Apr-00	9.40			40.64
	50.05	31-May-00	9.50			40.54
	50.05	1-Jun-00	9.30			40.74
	50.05	28-Jul-00	9.47			40.57
	50.05	30-Aug-00	12.44			37.6
	50.05	19-Sep-00	13.74			36.3
	50.05	27-Oct-00	11.01			39.03

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-11A	50.05	21-Nov-00	10.69			39.35
	50.05	1-May-01	8.78			41.26
	50.05	1-Oct-01	9.12			40.93
	50.05	11-Mar-02	5.59			44.45
	50.05	23-Sep-02	5.60			44.44
	50.05	10-Mar-03	4.66			45.39
	50.05	23-Sep-03	5.73			44.32
	50.05	15-Mar-04	4.99			45.06
	50.05	13-Sep-04	10.28			39.77
	50.05	18-Jul-05	6.66			43.39
	50.05	5-Jan-06	10.85			39.2
	50.05	27-Jul-06	5.02			45.03
	50.05	23-Jan-07	4.54			45.51
	50.05	7-Mar-07	4.26			45.79
	50.05	27-Jul-07	6.09			43.96
	50.05	28-Jan-08	4.46			45.59
	50.05	16-Jul-08	9.25			40.8
	50.05	22-Jan-09	8.57			41.48
	50.05	24-Jul-09	NM			NM
	50.05	8-Jan-10	4.97			45.08
	50.05	12-Jul-10	5.51			44.54
	50.07	12-Jan-11	6.21			43.86
	50.07	12-Jul-11	12.02			38.05
	50.07	27-Jan-12	5.31			44.76
	50.07	10-Jul-13	12.01			38.06
	50.07	8-Jan-14	7.46			42.61
	50.07	2-Jul-14	9.02			41.05
MW-11B	50.18	28-Sep-94	8.92			41.27
	50.18	13-Oct-94	9.59			40.6
	50.18	24-Jan-95	5.04			45.15
	50.18	11-Apr-95	5.01			45.18
	50.18	11-Jul-95	7.23			42.96
	50.18	23-Jan-96	8.20			41.99
	50.18	19-Jul-96	8.92			41.27
	50.18	17-Sep-96	10.83			39.36
	50.18	31-Oct-96	9.34			40.85
	50.18	22-Nov-96	11.23			38.96
	50.18	27-Dec-96	8.45			41.74
	50.18	22-Jan-97	6.28			43.91
	50.18	21-Feb-97	5.16			45.03
	50.18	25-Mar-97	5.51			44.68
	50.18	23-Apr-97	6.81			43.38
	50.18	24-Apr-97	6.99			43.2
	50.18	13-May-97	5.46			44.73
	50.18	20-Jun-97	7.40			42.79
	50.18	25-Jun-97	5.06			45.13
	50.18	1-Jul-97	6.52			43.67
	50.18	24-Jul-97	9.36			40.83
	50.18	16-Aug-97	10.36			39.83
	50.18	22-Aug-97	11.11			39.08
	50.18	25-Sep-97	8.96			41.23
	50.18	22-Oct-97	7.61			42.58
	50.18	25-Nov-97	7.63			42.56
	50.18	19-Dec-97	7.11			43.08
	50.18	20-Jan-98	5.70			44.49
	50.18	3-Mar-98	5.35			44.84
	50.18	18-Mar-98	5.14			45.05
	50.18	24-Apr-98	9.19			41
	50.18	21-May-98	9.61			40.58
	50.18	30-Jul-98	10.72			39.47
	50.18	25-Aug-98	9.48			40.71
	50.18	21-Sep-98	7.49			42.7
	50.18	26-Oct-98	8.57			41.62
	50.18	23-Nov-98	6.32			43.87
	50.18	26-Feb-99	5.32			44.87
	50.18	16-Mar-99	6.49			43.7
	50.18	29-Apr-99	6.66			43.53
	50.18	1-Jun-99	6.66			43.53
	50.18	30-Jul-99	8.12			42.07
	50.18	27-Aug-99	6.88			43.31
	50.18	27-Sep-99	12.04			38.15
	50.18	29-Oct-99	13.00			37.19
	50.18	29-Dec-99	12.33			37.86
	50.18	4-Feb-00	15.61			34.58
	50.18	25-Feb-00	11.49			38.7
	50.18	27-Mar-00	9.93			40.26
	50.18	7-Apr-00	9.54			40.65
	50.18	31-May-00	9.61			40.58
	50.18	1-Jun-00	9.51			40.68

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-11B	50.18	28-Jul-00	9.60			40.59
	50.18	30-Aug-00	12.76			37.43
	50.18	19-Sep-00	13.97			36.22
	50.18	27-Oct-00	11.23			38.96
	50.18	21-Nov-00	10.88			39.31
	50.18	1-May-01	5.97			44.22
	50.18	1-Oct-01	9.33			40.86
	50.18	11-Mar-02	5.80			44.39
	50.18	23-Sep-02	5.79			44.4
	50.18	10-Mar-03	4.85			45.33
	50.18	23-Sep-03	5.95			44.23
	50.18	15-Mar-04	5.16			45.02
	50.18	13-Sep-04	10.53			39.65
	50.18	18-Jul-05	5.45			44.73
	50.18	4-Jan-06	11.01			39.17
	50.18	27-Jul-06	5.26			44.92
	50.18	23-Jan-07	4.13			46.05
	50.18	7-Mar-07	4.42			45.76
	50.18	27-Jul-07	6.29			43.89
	50.18	28-Jan-08	4.69			45.49
	50.18	16-Jul-08	9.49			40.69
	50.18	22-Jan-09	8.72			41.46
	50.18	24-Jul-09	NM			NM
	50.18	8-Jan-10	5.15			45.03
	50.18	12-Jul-10	5.67			44.51
	50.23	12-Jan-11	6.37			43.86
	50.23	12-Jul-11	12.23			38.00
	50.23	27-Jan-12	5.38			44.85
	50.23	10-Jul-13	12.22			38.01
	50.23	8-Jan-14	7.82			42.41
	50.23	2-Jul-14	9.14			41.09
MW-12A	49.96	25-Mar-97	5.52			44.44
	49.96	23-Apr-97	6.51			43.45
	49.96	24-Apr-97	6.66			43.3
	49.96	13-May-97	5.47			44.49
	49.96	20-Jun-97	6.81			43.15
	49.96	25-Sep-97	8.08			41.88
	49.96	22-Oct-97	7.10			42.86
	49.96	25-Nov-97	7.12			42.84
	49.96	19-Dec-97	6.96			43
	49.96	20-Jan-98	5.69			44.27
	49.96	4-Mar-98	4.52			45.44
	49.96	18-Mar-98	5.28			44.68
	49.96	24-Apr-98	8.70			41.26
	49.96	21-May-98	9.10			40.86
	49.96	25-Aug-98	10.05			39.91
	49.96	21-Sep-98	7.11			42.85
	49.96	26-Oct-98	9.11			40.85
	49.96	23-Nov-98	6.01			43.95
	49.96	29-Jan-99	5.44			44.52
	49.96	26-Feb-99	5.52			44.44
	49.96	16-Mar-99	6.21			43.75
	49.96	29-Apr-99	6.38			43.58
	49.96	1-Jun-99	6.31			43.65
	49.96	30-Jul-99	7.88			42.08
	49.96	27-Aug-99	6.56			43.4
	49.96	27-Sep-99	11.61			38.35
	49.96	29-Oct-99	12.79			37.17
	49.96	18-Nov-99	13.18			36.78
	49.96	29-Dec-99	12.03			37.93
	49.96	4-Feb-00	15.43			34.53
	49.96	25-Feb-00	11.34			38.62
	49.96	27-Mar-00	9.22			40.74
	49.96	7-Apr-00	8.80			41.16
	49.96	31-May-00	8.84			41.12
	49.96	1-Jun-00	8.81			41.15
	49.96	28-Jul-00	8.87			41.09
	49.96	30-Aug-00	11.76			38.2
	49.96	19-Sep-00	13.22			36.74
	49.96	27-Oct-00	10.54			39.42
	49.96	21-Nov-00	10.16			39.8
	49.96	1-May-01	8.60			41.36
	49.96	1-Oct-01	8.73			41.23
	49.96	11-Mar-02	6.01			43.95
	49.96	23-Sep-02	5.87			44.09
	49.96	10-Mar-03	5.37			44.59
	49.96	23-Sep-03	5.96			44
	49.96	15-Mar-04	5.54			44.42
	49.96	13-Sep-04	10.30			39.66

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-12A	49.96	18-Jul-05	7.01			42.95
	49.96	4-Jan-06	10.57			39.39
	49.96	27-Jul-06	6.60			43.36
	49.96	7-Mar-07	6.94			43.02
	49.96	27-Jul-07	5.79			44.17
	49.96	30-Jan-08	5.29			44.67
	49.96	15-Jul-08	9.19			40.77
	49.96	4-Feb-09	8.81			41.15
	49.96	24-Jul-09	9.13			40.83
	49.96	8-Jan-10	5.47			44.49
	49.96	12-Jul-10	9.72			40.24
	49.96	12-Jan-11	5.59			44.37
	49.96	12-Jul-11	12.46			37.5
	49.96	26-Jan-12	5.78			44.18
	49.96	9-Jul-12	5.96			44
	49.96	7-Jan-13	9.04			40.92
	49.96	22-Jul-13	11.64			38.32
	49.96	7-Jan-14	7.38			42.58
	49.96	16-Jul-14	9.82			40.14
MW-12B	50.02	25-Mar-97	5.60			44.42
	50.02	23-Apr-97	6.64			43.38
	50.02	24-Apr-97	6.74			43.28
	50.02	13-May-97	5.55			44.47
	50.02	20-Jun-97	7.01			43.01
	50.02	25-Sep-97	8.32			41.7
	50.02	22-Oct-97	7.25			42.77
	50.02	25-Nov-97	7.29			42.73
	50.02	19-Dec-97	6.86			43.16
	50.02	20-Jan-98	5.88			44.14
	50.02	4-Mar-98	5.64	44.08	1.72	44.38
	50.02	18-Mar-98	5.38	44.07	1.73	44.64
	50.02	9-Apr-98	7.87		0.98	42.15
	50.02	16-Apr-98	8.31		1.35	41.71
	50.02	24-Apr-98	8.72	43.82	1.98	41.3
	50.02	8-May-98	NM		0.50	NM
	50.02	12-May-98	NM		0.50	NM
	50.02	21-May-98	10.48			39.54
	50.02	25-May-98	NM		1.00	NM
	50.02	9-Jun-98	NM		1.00	NM
	50.02	16-Jun-98	NM		1.20	NM
	50.02	26-Jun-98	NM		1.50	NM
	50.02	2-Jul-98	NM		1.50	NM
	50.02	10-Jul-98	NM		2.00	NM
	50.02	14-Jul-98	NM		2.00	NM
	50.02	23-Jul-98	NM		2.00	NM
	50.02	5-Aug-98	NM		2.00	NM
	50.02	13-Aug-98	NM		2.00	NM
	50.02	18-Aug-98	NM		2.00	NM
	50.02	25-Aug-98	10.22			39.8
	50.02	15-Sep-98	NM		2.00	NM
	50.02	21-Sep-98	7.73			42.29
	50.02	30-Sep-98	NM		4.00	NM
	50.02	8-Oct-98	NM		4.00	NM
	50.02	16-Oct-98	NM		4.00	NM
	50.02	26-Oct-98	8.88			41.14
	50.02	6-Nov-98	NM		4.00	NM
	50.02	13-Nov-98	NM		1.49	NM
	50.02	19-Nov-98	NM		4.00	NM
	50.02	23-Nov-98	6.11			43.91
	50.02	16-Dec-98	NM		4.00	NM
	50.02	7-Jan-99	NM		4.00	NM
	50.02	15-Jan-99	NM		4.00	NM
	50.02	22-Jan-99	NM		4.00	NM
	50.02	26-Jan-99	NM		4.00	NM
	50.02	29-Jan-99	5.70			44.32
	50.02	4-Feb-99	NM		4.00	NM
	50.02	9-Feb-99	NM		3.00	NM
	50.02	26-Feb-99	5.83	39.95	5.85	44.19
	50.02	16-Mar-99	6.30	43.60	2.20	43.72
	50.02	29-Apr-99	6.44	38.90	6.90	43.58
	50.02	21-May-99	7.40	36.90	8.90	42.62
	50.02	27-May-99	7.38	36.90	8.90	42.64
	50.02	1-Jun-99	6.40	37.90	7.90	43.62
	50.02	10-Jun-99	7.36	36.90	8.90	42.66
	50.02	30-Jul-99	7.98			42.04
	50.02	27-Aug-99	6.61	38.90	6.90	43.41
	50.02	27-Sep-99	11.71	42.34	3.46	38.31

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-12B	50.02	29-Oct-99	12.76	41.84	3.96	37.26
	50.02	18-Nov-99	13.22			36.8
	50.02	29-Dec-99	12.01	41.84	3.96	38.01
	50.02	4-Feb-00	13.22	41.84	3.96	36.8
	50.02	25-Feb-00	11.44	41.84	3.96	38.58
	50.02	27-Mar-00	NM			NM
	50.02	7-Apr-00	8.73	41.81	3.99	41.29
	50.02	31-May-00	8.77	41.81	3.99	41.25
	50.02	1-Jun-00	8.73	41.81	3.99	41.29
	50.02	28-Jul-00	8.77	41.89	3.91	41.25
	50.02	30-Aug-00	11.66	41.82	3.98	38.36
	50.02	19-Sep-00	13.33	40.89	4.91	36.69
	50.02	27-Oct-00	11.75	41.80	4.00	38.27
	50.02	21-Nov-00	10.64	43.48	2.32	39.38
	50.02	1-May-01	8.71	43.46	2.34	41.31
	50.02	1-Oct-01	8.37		15.00	41.65
	50.02	14-Mar-02	6.37	36.99	8.81	43.65
	50.02	23-Sep-02	6.10	40.03	5.77	43.92
	50.02	10-Mar-03	5.45			44.57
	50.02	24-Sep-03	6.29	39.85	5.95	43.73
	50.02	15-Mar-04	5.63			44.39
	50.02	13-Sep-04	10.44	38.72	7.08	39.58
	50.02	18-Jul-05	7.14	38.40	7.40	42.88
	50.02	4-Jan-06	10.75	35.98	9.82	39.27
	50.02	27-Jul-06	6.07	35.74	10.06	43.95
	50.02	7-Mar-07	6.96	34.60	11.20	43.06
	50.02	27-Jul-07	5.36	33.45	12.35	44.66
	50.02	31-Jan-08	5.75	33.34	12.46	44.27
	50.02	15-Jul-08	9.38	38.88	6.92	40.64
	50.02	4-Feb-09	8.89	38.14	7.66	41.13
	50.02	24-Jul-09	9.18	38.51	7.29	40.84
	50.02	8-Jan-10	6.81	37.46	8.34	43.21
	50.02	27-May-10	7.29	39.5	6.30	42.73
	50.02	28-Jun-10	7.39	44.1	1.70	42.63
	50.02	12-Jul-10	7.47	44.25	1.55	42.55
	50.02	31-Aug-10	7.26	45.42	0.38	42.76
	50.02	12-Jan-11	7.01	45.39	0.41	43.01
	50.02	12-Jul-11	10.09	45.39	0.41	39.93
	50.02	8-Mar-12	6.87	40.2	5.60	43.15
	50.02	9-Jul-12	7.16	40.1	5.70	42.86
	50.02	7-Jan-13	9.17	39.86	5.94	40.85
	50.02	22-Jul-13	11.16	39.04	6.76	38.86
	50.02	7-Jan-14	11.34	45.12	0.68	38.68
	50.02	15-Jul-14	10.59	44.89	0.91	39.43
MW-12C	50.14	13-May-97	39.34			10.8
	50.14	20-Jun-97	38.94			11.2
	50.14	25-Sep-97	36.70			13.44
	50.14	22-Oct-97	36.09			14.05
	50.14	25-Nov-97	36.13			14.01
	50.14	19-Dec-97	35.34			14.8
	50.14	20-Jan-98	32.60			17.54
	50.14	4-Mar-98	31.56			18.58
	50.14	18-Mar-98	31.64			18.5
	50.14	24-Apr-98	31.06			19.08
	50.14	21-May-98	38.20			11.94
	50.14	25-Aug-98	31.00			19.14
	50.14	21-Sep-98	29.86			20.28
	50.14	26-Oct-98	30.12			20.02
	50.14	23-Nov-98	28.38			21.76
	50.14	29-Jan-99	27.61			22.53
	50.14	26-Feb-99	27.69			22.45
	50.14	16-Mar-99	28.00			22.14
	50.14	29-Apr-99	28.21			21.93
	50.14	1-Jun-99	28.20			21.94
	50.14	30-Jul-99	29.80			20.34
	50.14	27-Aug-99	28.41			21.73
	50.14	27-Sep-99	29.20			20.94
	50.14	29-Oct-99	29.78			20.36
	50.14	18-Nov-99	30.17			19.97
	50.14	29-Dec-99	29.09			21.05
	50.14	4-Feb-00	29.66			20.48
	50.14	25-Feb-00	30.32			19.82
	50.14	27-Mar-00	28.91			21.23
	50.14	7-Apr-00	27.40			22.74
	50.14	31-May-00	27.44			22.7
	50.14	1-Jun-00	27.43			22.71
	50.14	28-Jul-00	27.45			22.69

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-12C	50.14	30-Aug-00	33.61			16.53
	50.14	19-Sep-00	30.03			20.11
	50.14	27-Oct-00	33.94			16.2
	50.14	21-Nov-00	29.12			21.02
	50.14	1-May-01	26.85			23.29
	50.14	1-Oct-01	26.85			23.29
	50.14	11-Mar-02	25.59			24.55
	50.14	23-Sep-02	26.57			23.57
	50.14	10-Mar-03	24.85			25.29
	50.14	23-Sep-03	26.06			24.08
	50.14	15-Mar-04	24.31			25.83
	50.14	13-Sep-04	26.15			23.99
	50.14	18-Jul-05	26.23			23.91
	50.14	4-Jan-06	22.26			27.88
	50.14	27-Jul-06	25.28			24.86
	50.14	7-Mar-07	23.78			26.36
	50.14	27-Jul-07	22.05			28.09
	50.14	30-Jan-08	22.69			27.45
	50.14	15-Jul-08	24.41			25.73
	50.14	4-Feb-09	24.59			25.55
	50.14	24-Jul-09	24.91			25.23
	50.14	8-Jan-10	23.03			27.11
	50.14	12-Jul-10	23.91			26.23
	50.14	12-Jan-11	23.76			26.38
	50.14	12-Jul-11	25.98			24.16
	50.14	26-Jan-12	25.76			24.38
	50.14	9-Jul-12	24.59			25.55
	50.14	7-Jan-13	26.04			24.1
	50.14	22-Jul-13	27.09			23.05
	50.14	7-Jan-14	26.52			23.62
	50.14	16-Jul-14	25.15			24.99
MW-13	50.65	25-Mar-97	9.43			41.22
	50.65	23-Apr-97	9.87			40.78
	50.65	24-Apr-97	9.92			40.73
	50.65	13-May-97	9.30			41.35
	50.65	20-Jun-97	10.11			40.54
	50.65	25-Sep-97	10.75			39.9
	50.65	22-Oct-97	10.09			40.56
	50.65	25-Nov-97	10.11			40.54
	50.65	19-Dec-97	10.01			40.64
	50.65	20-Jan-98	9.32			41.33
	50.65	4-Mar-98	9.23			41.42
	50.65	18-Mar-98	8.90			41.75
	50.65	24-Apr-98	10.74			39.82
	50.65	21-May-98	12.11			38.54
	50.65	25-Aug-98	12.00			38.56
	50.65	21-Sep-98	10.13			40.43
	50.65	26-Oct-98	11.15			39.41
	50.65	23-Nov-98	9.22			41.34
	50.65	29-Jan-99	8.00			42.65
	50.65	26-Feb-99	8.11			42.54
	50.65	16-Mar-99	9.51			41.14
	50.65	29-Apr-99	9.79			40.86
	50.65	1-Jun-99	9.70			40.95
	50.65	30-Jul-99	11.01			39.64
	50.65	27-Aug-99	9.96			40.69
	50.65	27-Sep-99	12.84			37.81
	50.65	29-Oct-99	13.88			36.77
	50.65	17-Nov-99	14.00			36.65
	50.65	29-Dec-99	13.08			37.57
	50.65	4-Feb-00	15.61			35.04
	50.65	25-Feb-00	12.17			38.48
	50.65	27-Mar-00	10.95			39.7
	50.65	7-Apr-00	10.51			40.14
	50.65	31-May-00	10.57			40.08
	50.65	1-Jun-00	10.51			40.14
	50.65	28-Jul-00	10.54			40.11
	50.65	30-Aug-00	13.63			37.02
	50.65	19-Sep-00	14.57			36.08
	50.65	27-Oct-00	11.11			39.54
	50.65	21-Nov-00	11.44			39.21
	50.65	1-May-01	10.70			39.95
	50.65	1-Oct-01	10.31			40.34
	50.65	11-Mar-02	9.62			41.03
	50.65	23-Sep-02	9.17			41.48
	50.65	10-Mar-03	9.17			41.48
	50.65	23-Sep-03	9.14			41.51

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-13	50.65	15-Mar-04	9.30			41.35
	50.65	13-Sep-04	11.98			38.67
	50.65	18-Jul-05	10.25			40.4
	50.65	4-Jan-06	12.03			38.62
	50.65	27-Jul-06	8.82			41.83
	50.65	7-Mar-07	9.95			40.7
	50.65	27-Jul-07	8.90			41.75
	50.65	30-Jan-08	8.85			41.8
	50.65	15-Jul-08	10.89			39.76
	50.65	4-Feb-09	10.59			40.06
	50.65	23-Jul-09	11.07			39.58
	50.65	8-Jan-10	9.22			41.43
	50.65	12-Jul-10	11.12			39.53
	50.65	12-Jan-11	8.89			41.76
	50.65	12-Jul-11	12.96			37.69
	50.65	26-Jan-12	9.31			41.34
	50.65	9-Jul-12	9.14			41.51
	50.65	7-Jan-13	10.68			39.97
	50.65	22-Jul-13	12.13			38.52
	50.65	7-Jan-14	10.13			40.52
	50.65	16-Jul-14	11.04			39.61
MW-14	50.66	25-Mar-97	7.71			42.95
	50.66	23-Apr-97	8.31			42.35
	50.66	24-Apr-97	8.34			42.32
	50.66	13-May-97	7.83			42.83
	50.66	20-Jun-97	8.64			42.02
	50.66	25-Sep-97	9.95			40.71
	50.66	22-Oct-97	8.89			41.77
	50.66	25-Nov-97	8.86			41.8
	50.66	19-Dec-97	8.62			42.04
	50.66	20-Jan-98	8.08			42.58
	50.66	4-Mar-98	7.72			42.94
	50.66	18-Mar-98	7.66			43
	50.66	24-Apr-98	9.75			40.91
	50.66	21-May-98	11.00			39.66
	50.66	25-Aug-98	12.00			38.66
	50.66	21-Sep-98	9.41			41.25
	50.66	26-Oct-98	11.10			39.56
	50.66	23-Nov-98	8.08			42.58
	50.66	29-Jan-99	7.10			43.56
	50.66	26-Feb-99	7.21			43.45
	50.66	16-Mar-99	8.74			41.92
	50.66	29-Apr-99	8.93			41.73
	50.66	1-Jun-99	8.92			41.74
	50.66	30-Jul-99	10.44			40.22
	50.66	27-Aug-99	9.21			41.45
	50.66	27-Sep-99	12.56			38.1
	50.66	29-Oct-99	13.56			37.1
	50.66	17-Nov-99	13.63			37.03
	50.66	29-Dec-99	12.88			37.78
	50.66	4-Feb-00	14.22			36.44
	50.66	25-Feb-00	11.73			38.93
	50.66	27-Mar-00	10.54			40.12
	50.66	7-Apr-00	10.14			40.52
	50.66	31-May-00	10.17			40.49
	50.66	1-Jun-00	10.13			40.53
	50.66	28-Jul-00	10.17			40.49
	50.66	30-Aug-00	13.22			37.44
	50.66	19-Sep-00	14.27			36.39
	50.66	27-Oct-00	11.56			39.1
	50.66	21-Nov-00	11.17			39.49
	50.66	1-May-01	9.71			40.95
	50.66	1-Oct-01	10.64			40.02
	50.66	11-Mar-02	8.45			42.21
	50.66	23-Sep-02	7.90			42.76
	50.66	10-Mar-03	8.59			42.07
	50.66	23-Sep-03	7.70			42.96
	50.66	15-Mar-04	7.96			42.7
	50.66	13-Sep-04	11.05			39.61
	50.66	18-Jul-05	9.55			41.11
	50.66	4-Jan-06	11.83			38.83
	50.66	27-Jul-06	7.80			42.86
	50.66	7-Mar-07	8.96			41.7
	50.66	27-Jul-07	8.01			42.65
	50.66	30-Jan-08	7.66			43
	50.66	15-Jul-08	10.41			40.25
	50.66	4-Feb-09	10.27			40.39

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-14	50.66	23-Jul-09	10.67			39.99
	50.66	8-Jan-10	8.24			42.42
	50.66	12-Jul-10	10.54			40.12
	50.66	12-Jan-11	18.09			32.57
	50.66	12-Jul-11	12.93			37.73
	50.66	26-Jan-12	8.57			42.09
	50.66	9-Jul-12	8.61			42.05
	50.66	7-Jan-13	10.46			40.2
	50.66	22-Jul-13	11.91			38.75
	50.66	7-Jan-14	9.39			41.27
	50.66	16-Jul-14	10.58			40.08
MW-15A	50.41	25-Mar-97	8.22			42.19
	50.41	23-Apr-97	8.28			42.13
	50.41	24-Apr-97	8.51			41.9
	50.41	13-May-97	8.06			42.35
	50.41	20-Jun-97	8.64			41.77
	50.41	25-Sep-97	9.75			40.66
	50.41	22-Oct-97	9.09			41.32
	50.41	25-Nov-97	9.13			41.28
	50.41	19-Dec-97	8.89			41.52
	50.41	20-Jan-98	8.35			42.06
	50.41	4-Mar-98	8.09			42.32
	50.41	18-Mar-98	7.98			42.43
	50.41	24-Apr-98	9.57			40.84
	50.41	21-May-98	11.10			39.31
	50.41	25-Aug-98	11.78			38.63
	50.41	21-Sep-98	9.59			40.82
	50.41	26-Oct-98	10.69			39.72
	50.41	23-Nov-98	8.46			41.95
	50.41	29-Jan-99	7.11			43.3
	50.41	26-Feb-99	7.23			43.18
	50.41	16-Mar-99	9.17			41.24
	50.41	29-Apr-99	9.29			41.12
	50.41	1-Jun-99	9.29			41.12
	50.41	30-Jul-99	10.83			39.58
	50.41	27-Aug-99	9.39			41.02
	50.41	27-Sep-99	12.02			38.39
	50.41	29-Oct-99	13.11			37.3
	50.41	17-Nov-99	13.44			36.97
	50.41	29-Dec-99	12.49			37.92
	50.41	4-Feb-00	15.71			34.7
	50.41	25-Feb-00	11.34			39.07
	50.41	27-Mar-00	10.66			39.75
	50.41	7-Apr-00	10.20			40.21
	50.41	31-May-00	10.23			40.18
	50.41	1-Jun-00	10.22			40.19
	50.41	28-Jul-00	10.23			40.18
	50.41	30-Aug-00	13.34			37.07
	50.41	19-Sep-00	14.01			36.4
	50.41	27-Oct-00	11.77			38.64
	50.41	21-Nov-00	11.09			39.32
	50.41	1-May-01	9.85			40.56
	50.41	1-Oct-01	9.73			40.68
	50.41	11-Mar-02	8.81			41.6
	50.41	23-Sep-02	8.21			42.2
	50.41	10-Mar-03	7.76			42.65
	50.41	23-Sep-03	7.87			42.54
	50.41	15-Mar-04	7.94			42.47
	50.41	13-Sep-04	10.72			39.69
	50.41	18-Jul-05	9.33			41.08
	50.41	4-Jan-06	11.66			38.75
	50.41	27-Jul-06	7.92			42.49
	50.41	7-Mar-07	9.19			41.22
	50.41	27-Jul-07	7.88			42.53
	50.41	30-Jan-08	8.02			42.39
	50.41	15-Jul-08	10.26			40.15
	50.41	4-Feb-09	10.59			39.82
	50.41	23-Jul-09	11.01			39.4
	50.41	8-Jan-10	8.64			41.77
	50.41	12-Jul-10	10.81			39.6
	50.41	12-Jan-11	8.77			41.64
	50.41	12-Jul-11	12.78			37.63
	50.41	26-Jan-12	9.29			41.12
	50.41	9-Jul-12	5.92			44.49
	50.41	7-Jan-13	10.77			39.64
	50.41	22-Jul-13	12.21			38.2
	50.41	7-Jan-14	9.85			40.56
	50.41	16-Jul-14	10.65			39.76

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-15B	50.20	26-Jan-12	10.13			40.07
	50.20	9-Jul-12	8.32			41.88
	50.20	7-Jan-13	10.71			39.49
	50.20	22-Jul-13	11.97			38.23
	50.20	7-Jan-14	9.81			40.39
	50.20	15-Jul-14	10.36			39.84
MW-15C	50.01	13-May-97	33.46			16.55
	50.01	20-Jun-97	34.18			15.83
	50.01	25-Sep-97	33.77			16.24
	50.01	22-Oct-97	32.89			17.12
	50.01	25-Nov-97	32.95			17.06
	50.01	19-Dec-97	32.01			18
	50.01	20-Jan-98	29.90			20.11
	50.01	4-Mar-98	28.56			21.45
	50.01	18-Mar-98	28.53			21.48
	50.01	24-Apr-98	28.46			21.55
	50.01	21-May-98	35.00			15.01
	50.01	25-Aug-98	29.30			20.71
	50.01	21-Sep-98	28.15			21.86
	50.01	26-Oct-98	28.11			21.9
	50.01	23-Nov-98	26.50			23.51
	50.01	29-Jan-99	25.44			24.57
	50.01	26-Feb-99	25.51			24.5
	50.01	16-Mar-99	26.11			23.9
	50.01	29-Apr-99	26.33			23.68
	50.01	1-Jun-99	26.39			23.62
	50.01	30-Jul-99	27.99			22.02
	50.01	27-Aug-99	26.51			23.5
	50.01	27-Sep-99	27.46			22.55
	50.01	29-Oct-99	28.26			21.75
	50.01	17-Nov-99	28.55			21.46
	50.01	29-Dec-99	27.61			22.4
	50.01	4-Feb-00	28.11			21.9
	50.01	25-Feb-00	28.23			21.78
	50.01	27-Mar-00	27.45			22.56
	50.01	7-Apr-00	26.11			23.9
	50.01	31-May-00	26.13			23.88
	50.01	1-Jun-00	26.03			23.98
	50.01	28-Jul-00	26.14			23.87
	50.01	30-Aug-00	29.11			20.9
	50.01	19-Sep-00	28.67			21.34
	50.01	27-Oct-00	27.64			22.37
	50.01	21-Nov-00	27.56			22.45
	50.01	1-May-01	25.24			24.77
	50.01	1-Oct-01	25.40			24.61
	50.01	11-Mar-02	24.17			25.84
	50.01	23-Sep-02	25.35			24.66
	50.01	10-Mar-03	23.52			26.49
	50.01	23-Sep-03	24.88			25.13
	50.01	15-Mar-04	22.97			27.04
	50.01	13-Sep-04	24.80			25.21
	50.01	18-Jul-05	25.17			24.84
	50.01	4-Jan-06	26.23			23.78
	50.01	27-Jul-06	24.31			25.7
	50.01	7-Mar-07	22.76			27.25
	50.01	27-Jul-07	21.03			28.98
	50.01	30-Jan-08	21.80			28.21
	50.01	15-Jul-08	23.63			26.38
	50.01	4-Feb-09	23.73			26.28
	50.01	23-Jul-09	23.96			26.05
	50.01	8-Jan-10	21.88			28.13
	50.01	12-Jul-10	23.08			26.93
	50.01	12-Jan-11	23.04			26.97
	50.01	12-Jul-11	25.09			24.92
	50.01	26-Jan-12	24.37			25.64
	50.01	9-Jul-12	24.41			25.6
	50.01	7-Jan-13	25.21			24.8
	50.01	22-Jul-13	26.10			23.91
	50.01	7-Jan-14	25.26			24.75
	50.01	16-Jul-14	24.15			25.86
MW-16	51.51	25-Mar-97	7.41			44.1
	51.51	23-Apr-97	8.44			43.07
	51.51	24-Apr-97	8.52			42.99
	51.51	13-May-97	8.29			43.22
	51.51	20-Jun-97	8.41			43.1
	51.51	25-Sep-97	10.71			40.8
	51.51	22-Oct-97	9.53			41.98
	51.51	25-Nov-97	9.55			41.96

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-16	51.51	19-Dec-97	9.10			42.41
	51.51	20-Jan-98	8.60			42.91
	51.51	4-Mar-98	8.13			43.38
	51.51	18-Mar-98	8.59			42.92
	51.51	24-Apr-98	9.96			41.55
	51.51	21-May-98	11.43			40.08
	51.51	30-Jul-98	12.56			38.95
	51.51	25-Aug-98	11.53			39.98
	51.51	21-Sep-98	9.81			41.7
	51.51	26-Oct-98	10.44			41.07
	51.51	23-Nov-98	8.98			42.53
	51.51	29-Jan-99	7.12			44.39
	51.51	26-Feb-99	7.23			44.28
	51.51	16-Mar-99	10.06			41.45
	51.51	29-Apr-99	10.16			41.35
	51.51	1-Jun-99	10.16			41.35
	51.51	30-Jul-99	11.76			39.75
	51.51	27-Aug-99	10.33			41.18
	51.51	27-Sep-99	11.79			39.72
	51.51	29-Oct-99	12.93			38.58
	51.51	17-Nov-99	13.71			37.8
	51.51	29-Dec-99	12.20			39.31
	51.51	4-Feb-00	15.11			36.4
	51.51	25-Feb-00	11.10			40.41
	51.51	27-Mar-00	11.48			40.03
	51.51	7-Apr-00	11.09			40.42
	51.51	31-May-00	11.11			40.4
	51.51	1-Jun-00	11.00			40.51
	51.51	28-Jul-00	11.11			40.4
	51.51	30-Aug-00	13.10			38.41
	51.51	19-Sep-00	14.83			36.68
	51.51	27-Oct-00	11.66			39.85
	51.51	21-Nov-00	11.29			40.22
	51.51	1-May-01	9.92			41.59
	51.51	1-Oct-01	9.93			41.58
	51.51	11-Mar-02	9.12			42.39
	51.51	23-Sep-02	8.65			42.86
	51.51	10-Mar-03	7.74			43.77
	51.51	23-Sep-03	8.48			43.03
	51.51	15-Mar-04	8.09			43.42
	51.51	13-Sep-04	10.38			41.13
	51.51	18-Jul-05	10.42			41.09
	51.51	4-Jan-06	12.48			39.03
	51.51	27-Jul-06	9.37			42.14
	51.51	7-Mar-07	9.66			41.85
	51.51	27-Jul-07	7.85			43.66
	51.51	31-Jan-08	8.42	25.40	3.40	43.09
	51.51	15-Jul-08	10.16			41.35
	51.51	5-Feb-09	11.93			39.58
	51.51	23-Jul-09	12.67			38.84
	51.51	8-Jan-10	8.66			42.85
	51.51	12-Jul-10	10.31			41.2
	51.51	12-Jan-11	9.89			41.62
	51.51	12-Jul-11	12.98			38.53
	51.51	26-Jan-12	9.92			41.59
	51.51	9-Jul-12	9.68			41.83
	51.51	7-Jan-13	11.41			40.1
	51.51	22-Jul-13	12.39			39.12
	51.51	7-Jan-14	12.02			39.49
	51.51	15-Jul-14	9.69			41.82
MW-17	50.92	25-Mar-97	9.97			40.95
	50.92	23-Apr-97	10.41			40.51
	50.92	24-Apr-97	10.51			40.41
	50.92	13-May-97	10.32			40.6
	50.92	20-Jun-97	11.07			39.85
	50.92	25-Sep-97	12.39			38.53
	50.92	22-Oct-97	11.19			39.73
	50.92	25-Nov-97	11.21			39.71
	50.92	19-Dec-97	11.01			39.91
	50.92	20-Jan-98	10.25			40.67
	50.92	4-Mar-98	9.93			40.99
	50.92	18-Mar-98	9.94			40.98
	50.92	9-Apr-98	11.32			39.6
	50.92	16-Apr-98	11.52			39.4
	50.92	24-Apr-98	11.80			39.12
	50.92	8-May-98	NM			NM
	50.92	12-May-98	NM			NM

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-17	50.92	21-May-98	13.30			37.62
	50.92	25-May-98	NM			NM
	50.92	9-Jun-98	NM			NM
	50.92	16-Jun-98	NM			NM
	50.92	26-Jun-98	NM			NM
	50.92	2-Jul-98	NM			NM
	50.92	10-Jul-98	NM			NM
	50.92	14-Jul-98	NM			NM
	50.92	23-Jul-98	NM			NM
	50.92	5-Aug-98	NM			NM
	50.92	13-Aug-98	NM			NM
	50.92	25-Aug-98	13.78			37.14
	50.92	15-Sep-98	NM			NM
	50.92	21-Sep-98	11.49			39.43
	50.92	30-Sep-98	NM			NM
	50.92	8-Oct-98	NM			NM
	50.92	16-Oct-98	NM			NM
	50.92	26-Oct-98	12.22			38.7
	50.92	6-Nov-98	NM			NM
	50.92	13-Nov-98	NM			NM
	50.92	19-Nov-98	NM			NM
	50.92	23-Nov-98	10.21			40.71
	50.92	16-Dec-98	NM			NM
	50.92	7-Jan-99	NM			NM
	50.92	15-Jan-99	NM			NM
	50.92	22-Jan-99	NM			NM
	50.92	26-Jan-99	NM			NM
	50.92	29-Jan-99	10.88			40.04
	50.92	4-Feb-99	NM			NM
	50.92	9-Feb-99	NM			NM
	50.92	26-Feb-99	10.93			39.99
	50.92	16-Mar-99	11.18			39.74
	50.92	29-Apr-99	11.00			39.92
	50.92	21-May-99	11.25			39.67
	50.92	27-May-99	11.31			39.61
	50.92	1-Jun-99	11.07			39.85
	50.92	10-Jun-99	11.28			39.64
	50.92	30-Jul-99	12.67			38.25
	50.92	27-Aug-99	11.27			39.65
	50.92	27-Sep-99	14.67			36.25
	50.92	29-Oct-99	15.11			35.81
	50.92	17-Nov-99	16.08			34.84
	50.92	29-Dec-99	14.43			36.49
	50.92	4-Feb-00	17.21			33.71
	50.92	25-Feb-00	13.63			37.29
	50.92	27-Mar-00	13.08	32.60	0.70	37.84
	50.92	7-Apr-00	12.63	32.30	1.00	38.29
	50.92	31-May-00	12.67	32.30	1.00	38.25
	50.92	1-Jun-00	12.61	32.30	1.00	38.31
	50.92	28-Jul-00	12.69	32.30	1.00	38.23
	50.92	30-Aug-00	15.56			35.36
	50.92	19-Sep-00	16.24	32.20	1.10	34.68
	50.92	27-Oct-00	14.10			36.82
	50.92	21-Nov-00	13.12			37.8
	50.92	1-May-01	11.82	32.44	0.86	39.1
	50.92	1-Oct-01	12.55	32.30	1.00	38.37
	50.92	14-Mar-02	10.91	31.79	1.51	40.01
	50.92	23-Sep-02	10.48			40.44
	50.92	10-Mar-03	9.76			41.16
	50.92	24-Sep-03	10.59	32.85	0.45	40.33
	50.92	15-Mar-04	10.15			40.77
	50.92	13-Sep-04	13.09			37.83
	50.92	18-Jul-05	12.06	32.90	0.40	38.86
	50.92	4-Jan-06	13.90	32.90	0.40	37.02
	50.92	27-Jul-06	10.71	33.28	0.02	40.21
	50.92	7-Mar-07	10.91	33.00	0.30	40.01
	50.92	27-Jul-07	9.33	33.02	0.28	41.59
	50.92	31-Jan-08	10.00	31.17	2.13	40.92
	50.92	15-Jul-08	12.95	33.08	0.23	37.97
	50.92	4-Feb-09	12.64	Trace	Trace	38.28
	50.92	12-Jul-10	12.96			37.96
	50.92	8-Jan-10	10.62			40.3
	50.92	12-Jul-10	12.96			37.96
	50.92	12-Jan-11	11.06			39.86
	50.92	12-Jul-11	14.93			35.99
	50.92	26-Jan-12	11.2			39.72

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HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-17	50.92	9-Jul-12	11.02			39.9
	50.92	7-Jan-13	13.14			37.78
	50.92	22-Jul-13	14.62			36.3
	50.92	7-Jan-14	12.36			38.56
	50.92	15-Jul-14	12.54			38.38
MW-17C	50.17	15-Mar-04	22.75			27.42
	50.17	13-Sep-04	24.56			25.61
	50.17	18-Jul-05	25.02			25.15
	50.17	4-Jan-06	26.07			24.1
	50.17	27-Jul-06	24.15			26.02
	50.17	7-Mar-07	22.51			27.66
	50.17	27-Jul-07	20.93			29.24
	50.17	30-Jan-08	21.74			28.43
	50.17	15-Jul-08	23.65			26.52
	50.17	4-Feb-09	23.72			26.45
	50.17	23-Jul-09	24.08			26.09
	50.17	8-Jan-10	21.98			28.19
	50.17	12-Jul-10	23.03			27.14
	50.17	12-Jan-11	23.16			27.01
	50.17	12-Jul-11	25.11			25.06
	50.17	26-Jan-12	24.27			25.9
	50.17	9-Jul-12	24.32			25.85
	50.17	7-Jan-13	24.76			25.41
	50.17	22-Jul-13	25.89			24.28
	50.17	7-Jan-14	25.06			25.11
	50.17	15-Jul-14	23.98			26.19
MW-18A	51.57	25-Mar-97	15.41			36.16
	51.57	23-Apr-97	15.80			35.77
	51.57	13-May-97	14.92			36.65
	51.57	20-Jun-97	16.02			35.55
	51.57	25-Sep-97	15.15			36.42
	51.57	22-Oct-97	16.38			35.19
	51.57	25-Nov-97	16.37			35.2
	51.57	19-Dec-97	16.11			35.46
	51.57	20-Jan-98	15.49			36.08
	51.57	4-Mar-98	15.19			36.38
	51.57	18-Mar-98	14.28			37.29
	51.57	24-Apr-98	17.53			34.04
	51.57	21-May-98	18.41			33.16
	51.57	30-Jul-98	18.59			32.98
	51.57	25-Aug-98	16.95			34.62
	51.57	21-Sep-98	16.39			35.18
	51.57	26-Oct-98	15.77			35.8
	51.57	23-Nov-98	16.26			35.31
	51.57	29-Jan-99	17.02			34.55
	51.57	26-Feb-99	17.11			34.46
	51.57	29-Apr-99	16.01			35.56
	51.57	1-Jun-99	16.11			35.46
	51.57	30-Jul-99	17.55			34.02
	51.57	27-Aug-99	16.39			35.18
	51.57	27-Sep-99	19.13			32.44
	51.57	29-Oct-99	20.50			31.07
	51.57	17-Nov-99	21.63			29.94
	51.57	29-Dec-99	19.83			31.74
	51.57	4-Feb-00	23.71			27.86
	51.57	25-Feb-00	18.80			32.77
	51.57	27-Mar-00	17.98			33.59
	51.57	7-Apr-00	17.61			33.96
	51.57	31-May-00	17.65			33.92
	51.57	1-Jun-00	17.60			33.97
	51.57	28-Jul-00	17.67			33.9
	51.57	30-Aug-00	20.30			31.27
	51.57	19-Sep-00	19.54			32.03
	51.57	27-Oct-00	18.75			32.82
	51.57	21-Nov-00	16.52			35.05
	51.57	1-May-01	17.91	27.85	7.94	33.66
	51.57	1-Oct-01	17.47			34.1
	51.57	11-Mar-02	16.68			34.89
	51.57	23-Sep-02	15.30			36.27
	51.57	10-Mar-03	15.77			35.8
	51.57	23-Sep-03	25.08			26.49
	51.57	15-Mar-04	15.58			35.99
	51.57	13-Sep-04	18.32			33.25
	51.57	18-Jul-05	14.88			36.69
	51.57	4-Jan-06	17.96			33.61
	51.57	27-Jul-06	14.15			37.42
	51.57	7-Mar-07	17.32			34.25
	51.57	27-Jul-07	15.22			36.35

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-18A	51.57	30-Jan-08	15.63			35.94
	51.57	15-Jul-08	17.43			34.14
	51.57	5-Feb-09	18.67			32.9
	51.57	23-Jul-09	19.03			32.54
	51.57	8-Jan-10	16.51			35.06
	51.57	12-Jul-10	18.11			33.46
	51.57	12-Jan-11	15.82			35.75
	51.57	12-Jul-11	19.02			32.55
	51.57	26-Jan-12	16.9			34.67
	51.57	9-Jul-12	15.06			36.51
	51.57	7-Jan-13	18.39			33.18
	51.57	22-Jul-13	18.74			32.83
	51.57	7-Jan-14	18.06			33.51
	51.57	16-Jul-14	18.14			33.43
MW-18C	51.47	13-May-97	29.45			22.02
	51.47	20-Jun-97	30.37			21.1
	51.47	25-Sep-97	31.53			19.94
	51.47	22-Oct-97	30.71			20.76
	51.47	25-Nov-97	30.75			20.72
	51.47	19-Dec-97	30.10			21.37
	51.47	20-Jan-98	28.30			23.17
	51.47	4-Mar-98	27.03			24.44
	51.47	18-Mar-98	26.81			24.66
	51.47	9-Apr-98	27.04			24.43
	51.47	16-Apr-98	27.03			24.44
	51.47	24-Apr-98	27.25			24.22
	51.47	8-May-98	NM			NM
	51.47	12-May-98	NM			NM
	51.47	21-May-98	27.68			23.79
	51.47	25-May-98	NM			NM
	51.47	9-Jun-98	NM			NM
	51.47	16-Jun-98	NM			NM
	51.47	26-Jun-98	NM			NM
	51.47	2-Jul-98	NM			NM
	51.47	10-Jul-98	NM			NM
	51.47	14-Jul-98	NM			NM
	51.47	23-Jul-98	NM			NM
	51.47	30-Jul-98	28.40			23.07
	51.47	5-Aug-98	NM			NM
	51.47	13-Aug-98	NM			NM
	51.47	25-Aug-98	28.88			22.59
	51.47	15-Sep-98	NM			NM
	51.47	21-Sep-98	27.94			23.53
	51.47	30-Sep-98	NM			NM
	51.47	8-Oct-98	NM			NM
	51.47	16-Oct-98	NM			NM
	51.47	26-Oct-98	27.62			23.85
	51.47	6-Nov-98	NM			NM
	51.47	11-Nov-98	26.85		0.67	24.62
	51.47	19-Nov-98	NM			NM
	51.47	23-Nov-98	26.21			25.26
	51.47	16-Dec-98	NM			NM
	51.47	7-Jan-99	NM			NM
	51.47	15-Jan-99	NM			NM
	51.47	22-Jan-99	NM			NM
	51.47	26-Jan-99	NM			NM
	51.47	29-Jan-99	25.36			26.11
	51.47	4-Feb-99	NM			NM
	51.47	9-Feb-99	NM			NM
	51.47	26-Feb-99	25.41			26.06
	51.47	29-Apr-99	26.33			25.14
	51.47	21-May-99	25.75			25.72
	51.47	27-May-99	25.76			25.71
	51.47	1-Jun-99	26.38			25.09
	51.47	10-Jun-99	25.68			25.79
	51.47	30-Jul-99	25.61			25.86
	51.47	27-Aug-99	26.51			24.96
	51.47	27-Sep-99	27.28			24.19
	51.47	29-Oct-99	27.95			23.52
	51.47	17-Nov-99	28.42			23.05
	51.47	29-Dec-99	27.26			24.21
	51.47	4-Feb-00	27.84			23.63
	51.47	25-Feb-00	27.83			23.64
	51.47	27-Mar-00	27.48			23.99
	51.47	7-Apr-00	25.80			25.67
	51.47	31-May-00	25.83			25.64
	51.47	1-Jun-00	25.81			25.66

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-18C	51.47	28-Jul-00	25.86			25.61
	51.47	30-Aug-00	28.42			23.05
	51.47	19-Sep-00	28.77	80.44	0.97	22.7
	51.47	27-Oct-00	28.69			22.78
	51.47	21-Nov-00	27.67			23.8
	51.47	1-May-01	25.20			26.27
	51.47	1-Oct-01	25.59			25.8
	51.47	14-Mar-02	24.35			27.12
	51.47	25-Sep-02	25.45			26.02
	51.47	10-Mar-03	23.60			27.87
	51.47	24-Sep-03	25.15			26.32
	51.47	15-Mar-04	24.23			27.24
	51.47	13-Sep-04	25.12	78.22	1.70	26.35
	51.47	18-Jul-05	25.50	66.20	0.30	25.97
	51.47	4-Jan-06	26.71			24.76
	51.47	27-Jul-06	24.80			26.67
	51.47	7-Mar-07	23.11			28.36
	51.47	27-Jul-07	24.80			26.67
	51.47	30-Jan-08	22.64			28.83
	51.47	15-Jul-08	24.43			27.04
	51.47	5-Feb-09	24.34			27.13
	51.47	23-Jul-09	24.61			26.86
	51.47	8-Jan-10	22.56			28.91
	51.47	12-Jul-10	23.77			27.7
	51.47	12-Jul-11	25.87			25.6
	51.47	26-Jan-12	26.82			24.65
	51.47	12-Jan-11	24.03			27.44
	51.47	9-Jul-12	24.82			26.65
	51.47	7-Jan-13	25.61			25.86
	51.47	22-Jul-13	26.76			24.71
	51.47	7-Jan-14	25.68			25.79
	51.47	16-Jul-14	24.60			26.87
MW-19C	53.05	23-Nov-98	28.84			24.21
	53.05	29-Jan-99	28.21			24.84
	53.05	26-Feb-99	28.28			24.77
	53.05	16-Mar-99	28.31			24.74
	53.05	29-Apr-99	28.56			24.49
	53.05	1-Jun-99	28.48			24.57
	53.05	30-Jul-99	30.00			23.05
	53.05	27-Aug-99	28.61			24.44
	53.05	27-Sep-99	29.72			23.33
	53.05	29-Oct-99	30.46			22.59
	53.05	17-Nov-99	30.76			22.29
	53.05	29-Dec-99	29.44			23.61
	53.05	4-Feb-00	30.22			22.83
	53.05	25-Feb-00	29.93			23.12
	53.05	27-Mar-00	29.80			23.25
	53.05	7-Apr-00	28.40			24.65
	53.05	31-May-00	28.44			24.61
	53.05	1-Jun-00	28.33			24.72
	53.05	28-Jul-00	28.37			24.68
	53.05	30-Aug-00	29.99			23.06
	53.05	19-Sep-00	30.97			22.08
	53.05	27-Oct-00	28.49			24.56
	53.05	21-Nov-00	29.88			23.17
	53.05	1-May-01	27.61	71.55	3.56	25.44
	53.05	1-Oct-01	27.84			25.21
	53.05	11-Mar-02	26.68			26.37
	53.05	23-Sep-02	27.66			25.39
	53.05	10-Mar-03	25.77			27.28
	53.05	23-Sep-03	27.21			25.84
	53.05	15-Mar-04	25.36			27.69
	53.05	13-Sep-04	27.20			25.85
	53.05	18-Jul-05	27.71			25.34
	53.05	4-Jan-06	28.78			24.27
	53.05	27-Jul-06	26.91			26.14
	53.05	7-Mar-07	25.22			27.83
	53.05	27-Jul-07	23.71			29.34
	53.05	31-Jan-08	24.57			28.48
	53.05	15-Jul-08	26.38			26.67
	53.05	4-Feb-09	26.44			26.61
	53.05	23-Jul-09	26.81			26.24
	53.05	9-Jan-10	24.47			28.58
	53.05	12-Jul-10	25.67			27.38
	53.05	12-Jan-11	25.86			27.19
	53.05	12-Jul-11	27.81			25.24
	53.05	26-Jan-12	26.74			26.31

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-19C	53.05	9-Jul-12	27.26			25.79
	53.05	7-Jan-13	27.73			25.32
	53.05	22-Jul-13	28.58			24.47
	53.05	7-Jan-14	27.71			25.34
	53.05	15-Jul-14	26.65			26.40
MW-20A	50.43	23-Nov-98	8.31			42.116
	50.43	29-Jan-99	8.70			41.726
	50.43	26-Feb-99	8.81			41.616
	50.43	16-Mar-99	9.26			41.166
	50.43	29-Apr-99	9.33			41.096
	50.43	1-Jun-99	9.30			41.126
	50.43	30-Jul-99	10.91			39.516
	50.43	27-Aug-99	9.56			40.866
	50.43	27-Sep-99	10.79			39.636
	50.43	29-Oct-99	11.96			38.466
	50.43	17-Nov-99	13.06			37.366
	50.43	29-Dec-99	11.11			39.316
	50.43	4-Feb-00	14.89			35.536
	50.43	25-Feb-00	10.33			40.096
	50.43	27-Mar-00	10.79			39.636
	50.43	7-Apr-00	10.41			40.016
	50.43	31-May-00	10.46			39.966
	50.43	1-Jun-00	10.41			40.016
	50.43	28-Jul-00	10.47			39.956
	50.43	30-Aug-00	12.56			37.866
	50.43	19-Sep-00	13.68			36.746
	50.43	27-Oct-00	11.01			39.416
	50.43	21-Nov-00	10.64			39.786
	50.43	1-May-01	9.40			41.03
	50.43	1-Oct-01	10.42			40.01
	50.43	11-Mar-02	8.59			41.836
	50.43	23-Sep-02	8.51			41.916
	50.43	10-Mar-03	7.42			43.006
	50.43	23-Sep-03	7.95			42.476
	50.43	15-Mar-04	7.72			42.706
	50.43	13-Sep-04	10.22			40.206
	50.43	18-Jul-05	9.88			40.546
	50.43	4-Jan-06	11.72			38.706
	50.43	27-Jul-06	8.59			41.836
	50.43	7-Mar-07	8.91			41.516
	50.43	27-Jul-07	7.63			42.796
	50.43	30-Jan-08	7.91			42.516
	50.43	15-Jul-08	10.05			40.376
	50.43	4-Feb-09	10.18			40.246
	50.43	23-Jul-09	10.47			39.956
	50.43	9-Jan-10	8.23			42.196
	50.43	12-Jul-10	10.62			39.806
	50.43	12-Jan-11	8.76			41.666
	50.43	12-Jul-11	12.53			37.896
	50.43	26-Jan-12	11.61			38.816
	50.43	9-Jul-12	9.18			41.246
	50.43	7-Jan-13	10.66			39.766
	50.43	22-Jul-13	12.17			38.256
	50.43	7-Jan-14	11.62			38.806
	50.43	15-Jul-14	9.83			40.60
MW-21C	49.05	23-Nov-98	27.83			21.223
	49.05	29-Jan-99	27.11			21.943
	49.05	26-Feb-99	27.26			21.793
	49.05	16-Mar-99	27.42			21.633
	49.05	29-Apr-99	27.99			21.063
	49.05	1-Jun-99	27.80			21.253
	49.05	30-Jul-99	29.00			20.053
	49.05	27-Aug-99	27.99			21.063
	49.05	27-Sep-99	28.43			20.623
	49.05	29-Oct-99	29.12			19.933
	49.05	18-Nov-99	29.25			19.803
	49.05	29-Dec-99	10.89			38.163
	49.05	4-Feb-00	28.94			20.113
	49.05	25-Feb-00	11.43			37.623
	49.05	27-Mar-00	28.13			20.923
	49.05	7-Apr-00	26.79			22.263
	49.05	31-May-00	26.83			22.223
	49.05	1-Jun-00	26.83			22.223
	49.05	28-Jul-00	26.88			22.173
	49.05	30-Aug-00	29.91			19.143
	49.05	19-Sep-00	29.15			19.903
	49.05	27-Oct-00	30.21			18.843
	49.05	21-Nov-00	28.33			20.723

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-21C	49.05	1-May-01	26.01			23.04
	49.05	1-Oct-01	26.05			23
	49.05	11-Mar-02	24.80			24.253
	49.05	23-Sep-02	25.50			23.553
	49.05	10-Mar-03	23.82			25.233
	49.05	23-Sep-03	25.08			23.973
	49.05	15-Mar-04	23.48			25.573
	49.05	13-Sep-04	25.44			23.613
	49.05	18-Jul-05	25.33			23.723
	49.05	4-Jan-06	26.44			22.613
	49.05	27-Jul-06	24.55			24.503
	49.05	7-Mar-07	22.91			26.143
	49.05	27-Jul-07	21.29			27.763
	49.05	29-Jan-08	22.09			26.963
	49.05	15-Jul-08	23.31			25.743
	49.05	4-Feb-09	24.03			25.023
	49.05	24-Jul-09	24.29			24.763
	49.05	9-Jan-10	21.89			27.163
	49.05	12-Jul-10	23.01			26.043
	49.05	12-Jan-11	23.21			25.843
	49.05	12-Jul-11	25.09			23.963
	49.05	26-Jan-12	24.48			24.573
	49.05	9-Jul-12	23.39			25.663
	49.05	7-Jan-13	25.17			23.883
	49.05	22-Jul-13	26.49			22.563
	49.05	7-Jan-14	25.94			23.113
	49.05	15-Jul-14	24.61			24.44
MW-22A	46.07	23-Nov-98	NM			NM
	46.07	29-Jan-99	2.10			43.969
	46.07	26-Feb-99	2.21			43.859
	46.07	16-Mar-99	2.65			43.419
	46.07	29-Apr-99	2.71			43.359
	46.07	1-Jun-99	2.68			43.389
	46.07	30-Jul-99	4.12			41.949
	46.07	27-Aug-99	2.81			43.259
	46.07	27-Sep-99	8.53			37.539
	46.07	29-Oct-99	10.23			35.839
	46.07	18-Nov-99	9.92			36.149
	46.07	29-Dec-99	9.56			36.509
	46.07	4-Feb-00	12.31			33.759
	46.07	25-Feb-00	8.72			37.349
	46.07	27-Mar-00	6.30			39.769
	46.07	7-Apr-00	6.03			40.039
	46.07	31-May-00	6.12			39.949
	46.07	1-Jun-00	6.00			40.069
	46.07	28-Jul-00	6.13			39.939
	46.07	30-Aug-00	9.09			36.979
	46.07	19-Sep-00	10.12			35.949
	46.07	27-Oct-00	8.64			37.429
	46.07	21-Nov-00	7.69			38.379
	46.07	1-May-01	5.15			40.92
	46.07	1-Oct-01	5.49			40.58
	46.07	11-Mar-02	2.34			43.729
	46.07	23-Sep-02	2.11			43.959
	46.07	10-Mar-03	1.68			44.389
	46.07	23-Sep-03	2.30			43.769
	46.07	15-Mar-04	2.05			44.019
	46.07	14-Sep-04	6.89			39.179
	46.07	18-Jul-05	3.65			42.419
	46.07	6-Jan-06	7.29			38.779
	46.07	27-Jul-06	1.65			44.419
	46.07	7-Mar-07	NM			NM
	46.07	27-Jul-07	2.84			43.229
	46.07	29-Jan-08	1.05			45.019
	46.07	14-Jul-08	5.33			40.739
	46.07	3-Feb-09	5.24			40.829
	46.07	23-Jul-09	5.91			40.159
	46.07	9-Jan-10	1.32			44.749
	46.07	12-Jul-10	6.52			39.549
	46.07	12-Jan-11	3.21			42.859
	46.07	11-Jul-11	8.39			37.679
	46.07	27-Jan-12	0.98			45.089
	46.07	10-Jul-12	1.74	63.88		44.326
	46.07	8-Jan-13	3.09			42.979
	46.07	22-Jul-13	NM			NM
	46.07	7-Jan-14	3.81			42.259
	46.07	15-Jul-14	3.22			42.85

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-22B	45.86	23-Nov-98	2.25			43.606
	45.86	29-Jan-99	2.28			43.576
	45.86	26-Feb-99	2.34			43.516
	45.86	16-Mar-99	2.42			43.436
	45.86	29-Apr-99	2.56			43.296
	45.86	1-Jun-99	2.60			43.256
	45.86	30-Jul-99	4.31			41.546
	45.86	27-Aug-99	2.83			43.026
	45.86	27-Sep-99	8.45			37.406
	45.86	29-Oct-99	10.11			35.746
	45.86	18-Nov-99	9.75			36.106
	45.86	29-Dec-99	9.43			36.426
	45.86	4-Feb-00	12.56			33.296
	45.86	25-Feb-00	8.63			37.226
	45.86	27-Mar-00	6.00			39.856
	45.86	7-Apr-00	5.64			40.216
	45.86	31-May-00	5.69			40.166
	45.86	1-Jun-00	5.61			40.246
	45.86	28-Jul-00	5.67			40.186
	45.86	30-Aug-00	8.57			37.286
	45.86	19-Sep-00	9.94			35.916
	45.86	27-Oct-00	7.03			38.826
	45.86	21-Nov-00	7.63			38.226
	45.86	1-May-01	4.93			40.93
	45.86	1-Oct-01	5.40			40.46
	45.86	11-Mar-02	1.75			44.106
	45.86	23-Sep-02	2.11			43.746
	45.86	10-Mar-03	1.02			44.836
	45.86	23-Sep-03	2.99			42.866
	45.86	15-Mar-04	1.20			44.656
	45.86	14-Sep-04	NM			NM
	45.86	18-Jul-05	NM			NM
	45.86	6-Jan-06	7.05			38.806
	45.86	27-Jul-06	1.58			44.276
	45.86	7-Mar-07	NM			NM
	45.86	27-Jul-07	2.85			43.006
	45.86	29-Jan-08	0.85			45.006
	45.86	14-Jul-08	5.45			40.406
	45.86	3-Feb-09	4.78			41.076
	45.86	23-Jul-09	5.39			40.466
	45.86	9-Jan-10	3.27			42.586
	45.86	12-Jul-10	6.21			39.646
	45.86	12-Jan-11	0.37			45.486
	45.86	11-Jul-11	8.32			37.536
	45.86	27-Jan-12	0.06			45.796
	45.86	10-Jul-12	1.27			44.586
	45.86	8-Jan-13	NM			NM
	45.86	22-Jul-13	NM			NM
	45.86	7-Jan-14	4.14			41.716
	45.86	15-Jul-14	3.79			42.07
MW-23C	51.91	23-Nov-98	27.41			24.504
	51.91	29-Jan-99	26.80			25.114
	51.91	26-Feb-99	26.88			25.034
	51.91	16-Mar-99	26.93			24.984
	51.91	29-Apr-99	27.09			24.824
	51.91	1-Jun-99	27.00			24.914
	51.91	30-Jul-99	29.55			22.364
	51.91	27-Aug-99	27.29			24.624
	51.91	27-Sep-99	28.40			23.514
	51.91	29-Oct-99	29.11			22.804
	51.91	17-Nov-99	29.49			22.424
	51.91	29-Dec-99	28.46			23.454
	51.91	4-Feb-00	28.96			22.954
	51.91	25-Feb-00	28.96			22.954
	51.91	27-Mar-00	28.61			23.304
	51.91	7-Apr-00	27.10			24.814
	51.91	31-May-00	27.15			24.764
	51.91	1-Jun-00	27.11			24.804
	51.91	28-Jul-00	27.15			24.764
	51.91	30-Aug-00	29.96			21.954
	51.91	19-Sep-00	29.77			22.144
	51.91	27-Oct-00	28.44			23.474
	51.91	21-Nov-00	28.61			23.304
	51.91	1-May-01	26.26			25.65
	51.91	1-Oct-01	26.50		0.60	25.41
	51.91	11-Mar-02	25.33			26.584
	51.91	23-Sep-02	26.43			25.484
	51.91	10-Mar-03	24.53			27.384

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-23C	51.91	23-Sep-03	25.95			25.964
	51.91	15-Mar-04	24.15			27.764
	51.91	13-Sep-04	25.97			25.944
	51.91	18-Jul-05	26.46			25.454
	51.91	4-Jan-06	27.53			24.384
	51.91	7-Mar-07	23.96			27.954
	51.91	27-Jul-07	22.41			29.504
	51.91	31-Jan-08	23.22	75.98	1.71	28.694
	48.89[1]	4-Feb-09	22.11	72.05	1.47	26.78
	48.89[1]	23-Jul-09	22.93	73.01	0.51	25.961
	48.89[1]	9-Jan-10	20.29	71.8	1.72	28.601
	48.89[1]	27-May-10	22.81	71.5	2.02	26.081
	48.89[1]	28-Jun-10	22.93	72.15	1.37	25.961
	48.89[1]	12-Jul-10	21.41	72.4	1.12	27.481
	48.89[1]	31-Aug-10	21.61	72.65	0.87	27.281
	48.89[1]	12-Jan-11	21.7	71.25	1.45	27.191
	48.89	12-Jul-11	23.11	70.65	2.05	25.782
	48.89	26-Jan-12	22.81	71.57	1.13	26.082
	48.89	9-Jul-12	22.31	71.45	1.25	26.582
	48.89	7-Jan-13	23.32	71.06	1.64	25.572
	48.89	22-Jul-13	24.38			24.512
	48.89	7-Jan-14	23.51	70.8	2.30	25.382
	48.89	15-Jul-14	24.06	70.96	2.14	24.83
MW-24A	45.79	27-Mar-00	7.87			37.92
	45.79	7-Apr-00	7.63			38.16
	45.79	31-May-00	7.65			38.14
	45.79	1-Jun-00	7.43			38.36
	45.79	28-Jul-00	7.60			38.19
	45.79	30-Aug-00	10.44			35.35
	45.79	19-Sep-00	10.57			35.22
	45.79	27-Oct-00	NM			NM
	45.79	21-Nov-00	7.09			38.7
	45.79	1-May-01	6.72			39.07
	45.79	1-Oct-01	7.81			37.98
	45.79	11-Mar-02	3.91			41.88
	45.79	23-Sep-02	5.04			40.75
	45.79	10-Mar-03	2.76			43.03
	45.79	23-Sep-03	4.66			41.13
	45.79	15-Mar-04	3.10			42.69
	45.79	14-Sep-04	8.24			37.55
	45.79	18-Jul-05	6.03			39.76
	45.79	6-Jan-06	8.93			36.86
	45.79	27-Jul-06	4.21			41.58
	45.79	7-Mar-07	3.86			41.93
	45.79	30-Jan-08	NM			NM
MW-24AR	45.65	5-Feb-09	5.18			40.47
	45.65	23-Jul-09	7.36			38.29
	45.65	9-Jan-10	3.72			41.93
	45.65	12-Jul-10	4.29			41.36
	45.65	13-Jan-11	3.58			42.07
	45.65	11-Jul-11	6.38			39.27
	45.65	27-Jan-12	4.59			41.06
	45.65	10-Jul-12	4.38			41.27
	45.65	8-Jan-13	5.59			40.06
	45.65	23-Jul-13	10.14	71.06		35.51
	45.65	8-Jan-14	7.11			38.54
MW-24B	46.06	27-Mar-00	11.91			34.15
	46.06	7-Apr-00	11.60			34.46
	46.06	31-May-00	11.63			34.43
	46.06	1-Jun-00	11.51			34.55
	46.06	28-Jul-00	11.69			34.37
	46.06	30-Aug-00	13.91			32.15
	46.06	19-Sep-00	14.72			31.34
	46.06	27-Oct-00	12.44			33.62
	46.06	21-Nov-00	11.38			34.68
	46.06	1-May-01	10.71			35.35
	46.06	1-Oct-01	11.75			34.31
	46.06	11-Mar-02	9.01			37.05
	46.06	23-Sep-02	9.69			36.37
	46.06	10-Mar-03	7.83			38.23
	46.06	23-Sep-03	8.98			37.08
	46.06	15-Mar-04	7.33			38.73
	46.06	14-Sep-04	9.24			36.82
	46.06	18-Jul-05	9.54			36.52
	46.06	6-Jan-06	11.86			34.2
	46.06	27-Jul-06	10.50			35.56
	46.06	7-Mar-07	8.88			37.18

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-24B	46.06	27-Jul-07	9.85			36.21
	46.06	28-Jan-08	7.37			38.69
	46.06	14-Jul-08	11.41			34.65
	46.06	3-Feb-09	11.18			34.88
	46.06	23-Jul-09	12.26			33.8
	46.06	9-Jan-10	9.89			36.17
	46.06	12-Jul-10	12.82			33.24
	46.06	13-Jan-11	11.1			34.96
	46.06	11-Jul-11	14.09			31.97
	46.06	27-Jan-12	11.36			34.7
	46.06	10-Jul-12	10.49			35.57
	46.06	8-Jan-13	12.96			33.1
	46.06	23-Jul-13	8.49			37.57
MW-24C	46.05	27-Mar-00	25.77			20.28
	46.05	7-Apr-00	24.27			21.78
	46.05	31-May-00	24.30			21.75
	46.05	1-Jun-00	24.22			21.83
	46.05	28-Jul-00	24.26			21.79
	46.05	30-Aug-00	27.34			18.71
	46.05	19-Sep-00	26.59			19.46
	46.05	27-Oct-00	27.64			18.41
	46.05	21-Nov-00	25.43			20.62
	46.05	1-May-01	23.90			22.15
	46.05	1-Oct-01	23.71			22.34
	46.05	11-Mar-02	22.40			23.65
	46.05	23-Sep-02	23.04			23.01
	46.05	10-Mar-03	21.71			24.34
	46.05	23-Sep-03	23.04			23.01
	46.05	15-Mar-04	21.45			24.6
	46.05	14-Sep-04	22.45			23.6
	46.05	18-Jul-05	22.19			23.86
	46.05	6-Jan-06	23.57			22.48
	46.05	27-Jul-06	22.61			23.44
	46.05	7-Mar-07	21.07			24.98
	46.05	27-Jul-07	19.62			26.43
	46.05	28-Jan-08	19.43			26.62
	46.05	14-Jul-08	20.63			25.42
	46.05	3-Feb-09	21.68			24.37
	46.05	23-Jul-09	23.07			22.98
	46.05	9-Jan-10	20.46			25.59
	46.05	12-Jul-10	20.44			25.61
	46.05	13-Jan-11	20.26			25.79
	46.05	11-Jul-11	21.59			24.46
	46.05	27-Jan-12	21.23			24.82
	46.05	10-Jul-12	20.81			25.24
	46.05	8-Jan-13	22.42			23.63
	46.05	23-Jul-13	23.81			22.24
MW-25A	44.65	27-Mar-00	9.15			35.5
	44.65	7-Apr-00	8.79			35.86
	44.65	31-May-00	8.81			35.84
	44.65	1-Jun-00	8.86			35.79
	44.65	28-Jul-00	8.84			35.81
	44.65	30-Aug-00	11.43			33.22
	44.65	19-Sep-00	11.12			33.53
	44.65	27-Oct-00	10.09			34.56
	44.65	21-Nov-00	8.10			36.55
	44.65	1-May-01	8.94			35.71
	44.65	1-Oct-01	8.81			35.84
	44.65	11-Mar-02	7.23			37.42
	44.65	23-Sep-02	5.65			39
	44.65	10-Mar-03	5.84			38.81
	44.65	23-Sep-03	5.35			39.3
	44.65	15-Mar-04	5.75			38.9
	44.65	14-Sep-04	7.00			37.65
	44.65	18-Jul-05	6.42			38.23
	44.65	6-Jan-06	9.29			35.36
	44.65	27-Jul-06	5.10			39.55
	44.65	7-Mar-07	4.76			39.89
	44.65	27-Jul-07	4.22			40.43
	44.65	28-Jan-08	4.25			40.4
	44.65	14-Jul-08	8.59			36.06
	44.65	3-Feb-09	8.90			35.75
	44.65	23-Jul-09	8.71			35.94
	44.65	9-Jan-10	6.84			37.81
	44.65	12-Jul-10	7.78			36.87
	44.65	12-Jan-11	6.26			38.39

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-25A	44.65	11-Jul-11	10.22			34.43
	44.65	27-Jan-12	5.24			39.41
	44.65	10-Jul-12	4.56			40.09
	44.65	8-Jan-13	8.62			36.03
	44.65	23-Jul-13	9.37			35.28
	44.65	8-Jan-14	8.92			35.73
	44.65	16-Jul-14	8.61			36.04
MW-25C	44.49	27-Mar-00	19.92			24.57
	44.49	7-Apr-00	19.50			24.99
	44.49	31-May-00	19.56			24.93
	44.49	1-Jun-00	19.51			24.98
	44.49	28-Jul-00	19.54			24.95
	44.49	30-Aug-00	22.14			22.35
	44.49	19-Sep-00	21.30	66.73	0.90	23.19
	44.49	27-Oct-00	20.63			23.86
	44.49	21-Nov-00	27.63			16.86
	44.49	1-May-01	18.14			26.35
	44.49	1-Oct-01	18.29		0.40	26.2
	44.49	14-Mar-02	17.39	64.32	4.13	27.1
	44.49	23-Sep-02	17.81	61.41	6.00	26.68
	44.49	10-Mar-03	16.73			27.76
	44.49	23-Sep-03	22.35			22.14
	44.49	15-Mar-04	16.15			28.34
	44.49	14-Sep-04	17.00	60.14	2.56	27.49
	44.49	18-Jul-05	15.57			28.92
	44.49	6-Jan-06	18.49			26
	44.49	27-Jul-06	15.32	60.64	2.03	29.17
	44.49	7-Mar-07	15.87	59.82	2.18	28.62
	44.49	27-Jul-07	14.25	60.61	1.04	30.24
	44.49	28-Jan-08	14.91	60.88	0.67	29.58
	44.49	14-Jul-08	17.24	60.95	0.60	27.25
	44.49	3-Feb-09	15.97	TRACE	TRACE	28.52
	44.49	23-Jul-09	16.39			28.1
	44.49	9-Jan-10	13.68	61.45	0.65	30.81
	44.49	27-May-10	16.09			28.4
	44.49	28-Jun-10	16.26			28.23
	44.49	12-Jul-10	16.05			28.44
	44.49	31-Aug-10	16.21			28.28
	44.49	12-Jan-11	16.29			28.2
	44.49	11-Jul-11	18.81			25.68
	44.49	27-Jan-12	17.29			27.2
	44.49	10-Jul-12	16.53			27.96
	44.49	8-Jan-13	18.34			26.15
	44.49	23-Jul-13	18.74			25.75
	44.49	8-Jan-14	18.23			26.26
	44.49	16-Jul-14	18.66			25.83
MW-26A	44.62	27-Mar-00	7.40			37.22
	44.62	7-Apr-00	6.99			37.63
	44.62	31-May-00	7.10			37.52
	44.62	1-Jun-00	7.00			37.62
	44.62	28-Jul-00	7.11			37.51
	44.62	30-Aug-00	9.69			34.93
	44.62	19-Sep-00	11.43			33.19
	44.62	27-Oct-00	8.11			36.51
	44.62	21-Nov-00	8.24			36.38
	44.62	1-May-01	6.01			38.61
	44.62	1-Oct-01	6.34			38.28
	44.62	11-Mar-02	4.05			40.57
	44.62	23-Sep-02	4.29			40.33
	44.62	10-Mar-03	2.84			41.78
	44.62	23-Sep-03	4.84			39.78
	44.62	15-Mar-04	3.30			41.32
	44.62	14-Sep-04	6.80			37.82
	44.62	18-Jul-05	6.72			37.9
	44.62	6-Jan-06	9.34			35.28
	44.62	27-Jul-06	4.42			40.2
	44.62	7-Mar-07	4.70			39.92
	44.62	27-Jul-07	3.98			40.64
	44.62	29-Jan-08	2.37			42.25
	44.62	14-Jul-08	7.87			36.75
	44.62	3-Feb-09	6.89			37.73
	44.62	23-Jul-09	7.88			36.74
	44.62	9-Jan-10	4.31			40.31
	44.62	12-Jul-10	8.12			36.5
	44.62	13-Jan-11	2.38			42.24
	44.62	11-Jul-11	10.27			34.35
	44.62	27-Jan-12	3.09			41.53
	44.62	10-Jul-12	2.77			41.85
	44.62	8-Jan-13	7.27			37.35
	44.62	23-Jul-13	9.72			34.9
	44.62	8-Jan-14	6.33			38.29
	44.62	16-Jul-14	7.64			36.98

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-27A	44.90	1-May-01	6.41			38.49
	44.90	1-Oct-01	5.31			39.59
	44.90	11-Mar-02	4.21			40.69
	44.90	23-Sep-02	3.31			41.59
	44.90	10-Mar-03	4.05			40.85
	44.90	23-Sep-03	3.24			41.66
	44.90	15-Mar-04	2.99			41.91
	44.90	14-Sep-04	5.09			39.81
	44.90	18-Jul-05	4.45			40.45
	44.90	6-Jan-06	4.55			40.35
	44.90	27-Jul-06	4.26			40.64
	44.90	7-Mar-07	3.01			41.89
	45.04	27-Jul-07	2.12			42.92
	45.04	28-Jan-08	1.88			43.16
	45.04	14-Jul-08	4.57			40.47
	45.04	3-Feb-09	4.27			40.77
	45.04	23-Jul-09	4.36			40.68
	45.04	9-Jan-10	3.69			41.35
	45.04	12-Jul-10	5.31			39.73
	45.04	12-Jan-11	3.76			41.28
	45.04	12-Jul-11	6.72			38.32
	45.04	26-Jan-12				NM
	45.04	10-Jul-12	well covered			NM
	45.04	7-Jan-13	well covered			NM
	45.04	23-Jul-13	NM			NM
	45.04	-	-			
MW-27C	45.04	1-May-01	17.82			27.22
	45.04	1-Oct-01	17.82			27.22
	45.04	11-Mar-02	16.36			28.68
	45.04	23-Sep-02	16.49			28.55
	45.04	10-Mar-03	18.68			26.36
	45.04	23-Sep-03	16.89			28.15
	45.04	15-Mar-04	14.35			30.69
	45.04	14-Sep-04	14.49			30.55
	45.04	18-Jul-05	16.12			28.92
	45.04	6-Jan-06	18.07			26.97
	45.04	27-Jul-06	17.13			27.91
	45.04	7-Mar-07	15.47			29.57
	44.90	27-Jul-07	14.85			30.05
	45.04	28-Jan-08	14.31			30.73
	45.04	14-Jul-08	17.51			27.53
	45.04	3-Feb-09	15.76			29.28
	45.04	23-Jul-09	16.38			28.66
	45.04	9-Jan-10	14.82			30.22
	45.04	12-Jul-10	16.12			28.92
	45.04	12-Jan-11	15.84			29.2
	45.04	11-Jul-11	18.17			26.87
	45.04	27-Jan-12	17.14			27.9
	45.04	10-Jul-12	16.56			28.48
	45.04	8-Jan-13	17.04			28
	45.04	23-Jul-13	18.61			26.43
	45.04	8-Jan-14	18.12			26.92
	45.04	16-Jul-14	16.94			28.10
MW-28A	43.86	1-May-01	7.45			36.41
	43.86	1-Oct-01	8.26			35.6
	43.86	11-Mar-02	4.90			38.96
	43.86	23-Sep-02	5.71			38.15
	43.86	10-Mar-03	3.11			40.75
	43.86	23-Sep-03	5.81			38.05
	43.86	14-Sep-04	9.34			34.52
	43.86	18-Jul-05	7.52			36.34
	43.86	6-Jan-06	9.32			34.54
	43.86	27-Jul-06	5.54			38.32
	43.86	7-Mar-07	5.06			38.8
	43.86	27-Jul-07	2.86			41
	43.86	29-Jan-08	2.61			41.25
	43.86	14-Jul-08	8.74			35.12
	43.86	3-Feb-09	8.36			35.5
	43.86	23-Jul-09	8.94			34.92
	43.86	9-Jan-10	4.54			39.32
	43.86	12-Jul-10	8.66			35.2
	43.86	12-Jan-11	3.87			39.99
	43.86	11-Jul-11	11.43			32.43
	43.86	27-Jan-12	2.66			41.2
	43.86	10-Jul-12	4.52			39.34
	43.86	8-Jan-13	8.11			35.75
	43.86	23-Jul-13	10.78			33.08
	43.86	8-Jan-14	7.71			36.15
	43.86	16-Jul-14	8.19			35.67

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-28C	43.96	1-May-01	17.14			26.82
	43.96	1-Oct-01	17.51			26.45
	43.96	11-Mar-02	16.29			27.67
	43.96	23-Sep-02	17.75			26.21
	43.96	10-Mar-03	15.84			28.12
	43.96	23-Sep-03	17.48			26.48
	43.96	15-Mar-04	15.56			28.4
	43.96	14-Sep-04	17.20			26.76
	43.96	18-Jul-05	16.60			27.36
	43.96	6-Jan-06	17.61			26.35
	43.96	27-Jul-06	17.73			26.23
	43.96	7-Mar-07	15.59			28.37
	43.96	27-Jul-07	12.90			31.06
	43.96	29-Jan-08	14.35			29.61
	43.96	14-Jul-08	16.26			27.7
	43.96	3-Feb-09	16.03			27.93
	43.96	23-Jul-09	16.53			27.43
	43.96	9-Jan-10	14.89			29.07
	43.96	12-Jul-10	15.89			28.07
	43.96	12-Jan-11	18.37			25.59
	43.96	11-Jul-11	18.16			25.8
	43.96	27-Jan-12	16.12			27.84
	43.96	10-Jul-12	16.79			27.17
	43.96	8-Jan-13	17.62			26.34
	43.96	23-Jul-13	18.87			25.09
	43.96	8-Jan-14	17.59			26.37
	43.96	16-Jul-14	16.98			26.98
MW-29A	46.59	1-May-01	5.01			41.58
	46.59	1-Oct-01	5.38			41.21
	46.59	11-Mar-02	1.51			45.08
	46.59	23-Sep-02	1.65			44.94
	46.59	10-Mar-03	1.42			45.17
	46.59	23-Sep-03	1.50			45.09
	46.59	15-Mar-04	1.85			44.74
	46.59	14-Sep-04	6.35			40.24
	46.59	18-Jul-05	3.12			43.47
	46.59	6-Jan-06	6.57			40.02
	46.59	27-Jul-06	1.44			45.15
	46.59	7-Mar-07	1.95			44.64
	46.59	27-Jul-07	2.49			44.1
	46.59	28-Jan-08	1.28			45.31
	46.59	14-Jul-08	4.14			42.45
	46.59	3-Feb-09	3.50			43.09
	46.59	23-Jul-09	4.09			42.5
	46.59	9-Jan-10	1.76			44.83
	46.59	12-Jul-10	3.62			42.97
	46.59	13-Jan-11	3.07			43.52
	46.59	11-Jul-11	7.14			39.45
	Plugged					NM
	46.59	10-Jul-12	4.17			42.42
	46.59	8-Jan-13	4.91			41.68
	46.59	23-Jul-13	--			--
MW-29B	46.26	1-May-01	19.01			27.25
	46.26	1-Oct-01	19.41			26.85
	46.26	11-Mar-02	18.04			28.22
	46.26	23-Sep-02	18.82			27.44
	46.26	10-Mar-03	17.21			29.05
	46.26	23-Sep-03	18.09			28.17
	46.26	15-Mar-04	17.10			29.16
	46.26	14-Sep-04	17.76			28.5
	46.26	18-Jul-05	18.11			28.15
	46.26	6-Jan-06	18.83			27.43
	46.26	27-Jul-06	18.41			27.85
	46.26	7-Mar-07	17.21			29.05
	46.26	27-Jul-07	15.49			30.77
	46.26	28-Jan-08	15.32			30.94
	46.26	14-Jul-08	18.23			28.03
	46.26	3-Feb-09	17.72			28.54
	46.26	23-Jul-09	16.19			30.07
	46.26	9-Jan-10	16.02			30.24
	46.26	12-Jul-10	19.29			26.97
	46.26	13-Jan-11	17.73			28.53
	46.26	11-Jul-11	20.06			26.2
	Plugged					NM
	46.26	10-Jul-12	9.71			36.55
	46.26	8-Jan-13	9.92			36.34
	46.26	23-Jul-13	--			--

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-29C	46.46	1-May-01	25.51			20.95
	46.46	1-Oct-01	25.04			21.42
	46.46	11-Mar-02	23.51			22.95
	46.46	23-Sep-02	24.10			22.36
	46.46	10-Mar-03	22.71			23.75
	46.46	23-Sep-03	23.48			22.98
	46.46	15-Mar-04	22.24			24.22
	46.46	14-Sep-04	24.12			22.34
	46.46	18-Jul-05	23.75			22.71
	46.46	6-Jan-06	25.12			21.34
	46.46	27-Jul-06	23.35			23.11
	46.46	7-Mar-07	22.38			24.08
	46.46	27-Jul-07	20.42			26.04
	46.46	28-Jan-08	21.08			25.38
	46.46	14-Jul-08	22.38			24.08
	46.46	3-Feb-09	22.86			23.6
	46.46	23-Jul-09	22.81			23.65
	46.46	9-Jan-10	20.71			25.75
	46.46	12-Jul-10	21.32			25.14
	46.46	13-Jan-11	20.39			26.07
	46.46	11-Jul-11	23.17			23.29
	Plugged					NM
	46.46	10-Jul-12	20.69			25.77
	46.46	8-Jan-13	21.27			25.19
	46.46	23-Jul-13	--			--
MW-30A	50.45	15-Mar-04	9.71			40.74
	50.45	13-Sep-04	12.76			37.69
	50.45	18-Jul-05	11.80			38.65
	50.45	4-Jan-06	13.52			36.93
	50.45	27-Jul-06	10.45			40
	50.45	7-Mar-07	10.98			39.47
	50.45	27-Jul-07	9.49			40.96
	50.45	30-Jan-08	9.62			40.83
	50.45	15-Jul-08	12.52			37.93
	50.45	4-Feb-09	13.01			37.44
	50.45	23-Jul-09	13.71			36.74
	50.45	9-Jan-10	10.87			39.58
	50.45	12-Jul-10	12.61			37.84
	50.45	12-Jan-11	10.06			40.39
	50.45	12-Jul-11	14.76			35.69
	50.45	26-Jan-12	10.78			39.67
	50.45	9-Jul-12	11.13			39.32
	50.45	8-Jan-13	12.91			37.54
	50.45	23-Jul-13	14.16			36.29
	50.45	8-Jan-14	13.81			36.64
	50.45	15-Jul-14	12.10			38.35
MW-31A	52.08	15-Mar-04	10.97			41.11
	52.08	13-Sep-04	13.00			39.08
	52.08	18-Jul-05	13.05			39.03
	52.08	4-Jan-06	14.77			37.31
	52.08	27-Jul-06	11.83			40.25
	52.08	7-Mar-07	12.43			39.65
	52.08	27-Jul-07	10.83			41.25
	52.08	31-Jan-08	10.99			41.09
	52.08	15-Jul-08	13.68			38.4
	52.08	4-Feb-09	14.23			37.85
	52.08	23-Jul-09	14.73			37.35
	52.08	9-Jan-10	12.31			39.77
	52.08	12-Jul-10	14.06			38.02
	52.08	12-Jan-11	11.62			40.46
	52.08	12-Jul-11	15.92			36.16
	52.08	26-Jan-12	12.24			39.84
	52.08	9-Jul-12	12.79			39.29
	52.08	8-Jan-13	14.14			37.94
	52.08	23-Jul-13	16.24			35.84
	52.08	8-Jan-14	15.96			36.12
	52.08	15-Jul-14	13.19			38.89
MW-32A	43.77	15-Mar-04	1.00			42.77
	43.77	14-Sep-04	6.03	29.00	3.48	37.74
	43.77	18-Jul-05	5.82	26.56	5.92	37.95
	43.77	6-Jan-06	6.93	24.92	7.57	36.84
	43.77	27-Jul-06	12.96	25.71	6.74	30.81
	43.77	7-Mar-07	4.03	25.26	7.19	39.74
	43.77	27-Jul-07	1.95	30.76	1.70	41.82
	43.77	28-Jan-08	2.18			41.59
	43.77	14-Jul-08	6.14	26.25	6.20	37.63
	43.77	3-Feb-09	5.71	26.29	6.16	38.06
	43.77	23-Jul-09	6.29	26.51	5.94	37.48
	43.77	9-Jan-10	3.55	25.41	7.04	40.22
	43.77	27-May-10	5.86	26.2	6.25	37.91
	43.77	28-Jun-10	6.02	29.1	3.35	37.75

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-32A	43.77	12-Jul-10	6.12	29.45	3.00	37.65
	43.77	31-Aug-10	5.43	30.67	1.78	38.34
	43.77	13-Jan-11	2.63	29.15	3.30	41.14
	43.77	11-Jul-11	5.92	28.82	3.63	37.85
	Plugged					
MW-32AR	44.56	27-Jan-12	3.22			41.34
	44.56	10-Jul-12	3.73			40.83
	44.56	8-Jan-13	6.64			37.92
	44.56	23-Jul-13	9.42			35.14
	44.56	8-Jan-14	5.64			38.92
	44.56	16-Jul-14	6.74			37.82
MW-32B	44.41	27-Jan-12	3.11	30.52	5.77	41.3
	44.41	10-Jul-12	3.81	30.16	6.13	40.6
	44.41	8-Jan-13	6.34	30.02	6.38	38.07
	44.41	23-Jul-13	7.14			37.27
	44.41	8-Jan-14	6.72	34.82	1.58	37.69
	44.41	16-Jul-14	6.72	34.29	2.11	37.69
MW-33A	44.25	15-Mar-04	3.90			40.35
	44.25	14-Sep-04	7.85			36.4
	44.25	18-Jul-05	6.35			37.9
	44.25	6-Jan-06	8.00			36.25
	44.25	27-Jul-06	4.73			39.52
	44.25	7-Mar-07	5.22			39.03
	44.25	27-Jul-07	3.48			40.77
	44.25	29-Jan-08	3.34			40.91
	44.25	14-Jul-08	7.42	25.19	0.03	36.83
	44.25	3-Feb-09	7.28			36.97
	44.25	23-Jul-09	7.63			36.62
	44.25	9-Jan-10	4.79			39.46
	44.25	12-Jul-10	7.61			36.64
	44.25	13-Jan-11	3.19			41.06
	44.25	11-Jul-11	9.87			34.38
	44.25	27-Jan-12	2.69			41.56
	44.25	10-Jul-12	3.86			40.39
	44.25	8-Jan-13	6.76			37.49
	44.25	23-Jul-13	9.83			34.42
	44.25	8-Jan-14	6.71			37.54
	44.25	16-Jul-14	7.09			37.16
MW-33B	44.35	7-Mar-07	4.21			40.04
	44.35	27-Jul-07	3.72			40.53
	44.35	29-Jan-08	2.37	39.12	3.37	41.88
	44.35	14-Jul-08	5.74	37.44	5.05	38.51
	44.35	3-Feb-09	9.28	36.91	5.58	34.97
	44.35	23-Jul-09	NM			NM
	44.35	9-Jan-10	4.61	35.21	7.28	39.74
	44.35	27-May-10	6.82			37.53
	44.35	28-Jun-10	6.91			37.44
	44.35	12-Jul-10	7.02			37.33
	44.35	31-Aug-10	7.22			37.13
	44.35	13-Jan-11	3.11	29.7		41.24
	44.35	11-Jul-11	10.19	29.75		34.16
	Plugged					
MW-33BR	44.35	27-Jan-12	4.07			40.28
	44.35	10-Jul-12	2.59			41.76
	44.35	8-Jan-13	3.86			40.49
	44.35	23-Jul-13	9.68			34.67
	44.35	8-Jan-14	7.41			36.94
	44.35	16-Jul-14	6.72			37.63
MW-34C	45.31	15-Mar-04	17.40			27.91
	45.31	14-Sep-04	18.82			26.49
	45.31	18-Jul-05	19.41	65.29	7.19	25.9
	45.31	6-Jan-06	20.54	65.27	8.38	24.77
	45.31	27-Jul-06	18.55	63.84	8.61	26.76
	45.31	9-Apr-07	16.34	62.06	10.39	28.97
	45.31	27-Jul-07	NM			NM
	45.31	29-Jan-08	16.32			28.99
	45.31	15-Jul-08	18.13	43.49	29.01	27.18
	45.31	5-Feb-09	18.08	61.79	10.71	27.23
	45.31	23-Jul-09	NM			NM
	45.31	9-Jan-10	16.41	69.20	3.30	28.9
	45.31	12-Jul-10	NM			NM
	45.31	12-Jan-11	16.41	64.90		28.9
	45.31	11-Jul-11	19.08	65.26		26.23
	45.31	8-Feb-12	18.41			26.9
	45.31	10-Jul-12	NM			NM
	45.31	8-Jan-13	NM			NM
	45.31	23-Jul-13	NM			NM
MW-34CR	46.47	16-Jul-14	19.17			27.30
MW-35A	45.31	7-Mar-07	3.49			41.82
	45.31	27-Jul-07	3.05			42.26
	45.31	29-Jan-08	1.82			43.49
	45.31	14-Jul-08	6.21			39.1
	45.31	3-Feb-09	5.54			39.77
	45.31	23-Jul-09	5.76			39.55

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-35A	45.31	9-Jan-10	4.14			41.17
	45.31	12-Jul-10	6.04			39.27
	45.31	13-Jan-11	2.46			42.85
	45.31	11-Jul-11	8.44			36.87
	45.31	27-Jan-12	1.35			43.96
	45.31	10-Jul-12	2.33			42.98
	45.31	8-Jan-13	5.37			39.94
	45.31	23-Jul-13	9.18			36.13
	45.31	8-Jan-14	5.06			40.25
	45.31	15-Jul-14	6.51			38.80
MW-35B	44.83	7-Mar-07	3.31			41.52
	44.83	27-Jul-07	3.29			41.54
	44.83	29-Jan-08	1.95			42.88
	44.83	14-Jul-08	6.40			38.43
	44.83	3-Feb-09	5.79			39.04
	44.83	23-Jul-09	6.42			38.41
	44.83	9-Jan-10	3.51			41.32
	44.83	12-Jul-10	6.39			38.44
	44.83	13-Jan-11	2.96			41.87
	44.83	11-Jul-11	8.67			36.16
	44.83	27-Jan-12	1.59			43.24
	44.83	10-Jul-12	2.74			42.09
	44.83	8-Jan-13	6.09			38.74
	44.83	23-Jul-13	9.22			35.61
	44.83	8-Jan-14	5.31			39.52
	44.83	15-Jul-14	6.75			38.08
MW-36A	44.53	7-Mar-07	8.71			35.82
	44.53	27-Jul-07	6.54			37.99
	44.53	29-Jan-08	5.59			38.94
	44.53	14-Jul-08	9.33			35.2
	44.53	3-Feb-09	10.69			33.84
	44.53	23-Jul-09	12.03			32.5
	44.53	9-Jan-10	9.23			35.3
	44.53	12-Jul-10	9.14			35.39
	44.53	13-Jan-11	8.62			35.91
	44.53	11-Jul-11	12.16			32.37
	44.53	27-Jan-12	6.82			37.71
	44.53	10-Jul-12	6.68			37.85
	44.53	8-Jan-13	7.61			36.92
	44.53	23-Jul-13	11.36			33.17
	44.53	8-Jan-14	9.23			35.3
	44.53	16-Jul-14	8.62			35.91
MW-36B	44.07	12-Jul-10	1.32			42.75
	44.07	13-Jan-11	9.71			34.36
	44.07	11-Jul-11	11.57			32.5
	44.07	27-Jan-12	0.46			43.61
	44.07	10-Jul-12	6.64			37.43
	44.07	8-Jan-13	6.71			37.36
	44.07	23-Jul-13	9.39			34.68
	44.07	8-Jan-14	4.09			39.98
	44.07	16-Jul-14	3.61			40.46
MW-36D	44.33	12-Jul-10	85.39			-41.06
	44.33	13-Jan-11	85.03			-40.7
	44.33	11-Jul-11	85.33			-41
	44.33	27-Jan-12	85.62			-41.29
	44.33	10-Jul-12	85.17			-40.84
	44.33	8-Jan-13	85.37			-41.04
	44.33	23-Jul-13	85.93			-41.6
	44.33	8-Jan-14	85.32			-40.99
	44.33	16-Jul-14	84.77			-40.44
MW-38A	46.39	7-Mar-07	3.26			43.13
	46.39	27-Jul-07	3.08			43.31
	46.39	29-Jan-08	1.85			44.54
	46.39	14-Jul-08	5.84			40.55
	46.39	3-Feb-09	5.15			41.24
	46.39	23-Jul-09	5.06			41.33
	46.39	9-Jan-10	2.27			44.12
	46.39	12-Jul-10	6.42			39.97
	46.39	13-Jan-11	1.76			44.63
	46.39	11-Jul-11	8.16			38.23
	46.39	27-Jan-12	1.8			44.59
	46.39	10-Jul-12	2.52			43.87
	46.39	8-Jan-13	4.62			41.77
	46.39	23-Jul-13	8.34			38.05
	46.39	8-Jan-14	4.77			41.62
	46.39	15-Jul-14	6.20			40.19
MW-38B	45.51	15-Mar-04	1.07			44.44
	45.51	14-Sep-04	6.10			39.41
	45.51	18-Jul-05	2.41			43.1
	45.51	6-Jan-06	6.33			39.18
	45.51	27-Jul-06	1.27			44.24
	45.51	7-Mar-07	2.38			43.13
	45.51	27-Jul-07	2.25			43.26
	45.51	29-Jan-08	0.61			44.9
	45.51	14-Jul-08	4.86			40.65

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-38B	45.51	3-Feb-09	4.33			41.18
	45.51	23-Jul-09	4.47			41.04
	45.51	9-Jan-10	1.44			44.07
	45.51	12-Jul-10	5.72			39.79
	45.51	13-Jan-11	0.68			44.83
	45.51	11-Jul-11	7.82			37.69
	45.51	27-Jan-12	0.85			44.66
	45.51	10-Jul-12	0.74			44.77
	45.51	8-Jan-13	3.97			41.54
	45.51	23-Jul-13	7.51			38
	45.51	8-Jan-14	3.47			42.04
	45.51	15-Jul-14	5.50			40.01
MW-39B	49.58	15-Mar-04	5.48			44.1
	49.58	13-Sep-04	10.02			39.56
	49.58	18-Jul-05	7.21			42.37
	49.58	4-Jan-06	10.37			39.21
	49.58	27-Jul-06	6.08			43.5
	49.58	7-Mar-07	6.91			42.67
	49.58	27-Jul-07	5.74			43.84
	49.58	30-Jan-08	6.34			43.24
	49.58	15-Jul-08	8.96			40.62
	49.58	4-Feb-09	8.60			40.98
	49.58	24-Jul-09	9.13			40.45
	49.58	8-Jan-10	5.61			43.97
	49.58	12-Jul-10	9.31			40.27
	49.58	12-Jan-11	5.64			43.94
	49.58	12-Jul-11	11.97			37.61
	49.58	26-Jan-12	5.84			43.74
	49.58	9-Jul-12	5.77			43.81
	49.58	7-Jan-13	8.68			40.9
	49.58	22-Jul-13	11.17			38.41
	49.58	7-Jan-14	7.23			42.35
	49.58	16-Jul-14	9.46			40.12
MW-40B	49.59	15-Mar-04	5.46			44.13
	49.59	13-Sep-04	9.72			39.87
	49.59	18-Jul-05	7.19			42.4
	49.59	4-Jan-06	10.25			39.34
	49.59	27-Jul-06	6.18			43.41
	49.59	7-Mar-07	6.81			42.78
	49.59	27-Jul-07	5.00			44.59
	49.59	30-Jan-08	5.23			44.36
	49.59	15-Jul-08	8.76			40.83
	49.59	4-Feb-09	8.57			41.02
	49.59	24-Jul-09	9.06			40.53
	49.59	8-Jan-10	5.37			44.22
	49.59	12-Jul-10	9.17			40.42
	49.59	12-Jan-11	5.81			43.78
	49.59	12-Jul-11	11.46			38.13
	49.59	26-Jan-12	5.68			43.91
	49.59	9-Jul-12	5.74			43.85
	49.59	7-Jan-13	8.63			40.96
	49.59	22-Jul-13	11.06			38.53
	49.59	7-Jan-14	7.24			42.35
	49.59	16-Jul-14	9.27			40.32
MW-41B	49.37	15-Mar-04	4.66			44.71
	49.37	13-Sep-04	9.76	35.01	9.80	39.61
	49.37	18-Jul-05	5.96	32.23	12.58	43.41
	49.37	4-Jan-06	10.03	32.21	12.60	39.34
	49.37	27-Jul-06	5.65	29.55	15.26	43.72
	49.37	7-Mar-07	4.41	29.13	15.68	44.96
	49.37	27-Jul-07	5.27	12.00	32.81	44.1
	49.37	22-Feb-08	5.04	25.14	19.67	44.7
	49.37	15-Jul-08	8.87	25.09	19.72	40.5
	49.37	4-Feb-09	8.93	23.79	21.02	40.44
	49.37	24-Jul-09	9.46	23.91	20.90	39.91
	49.37	8-Jan-10	5.92	23.65	21.16	43.45
	49.37	27-May-10	6.13	25.45	19.36	43.24
	49.37	28-Jun-10	6.21	38.2	6.61	43.16
	49.37	12-Jul-10	6.32	38.45	6.36	43.05
	49.37	31-Aug-10	6.26	39.22	5.59	43.11
	49.37	12-Jan-11	6.02	39.6	5.21	43.35
	49.37	12-Jul-11	8.86	39.75	5.06	40.51
	49.37	8-Mar-12	6.31	20.67	24.14	43.06
	49.37	9-Jul-12	8.23			41.14
	49.37	7-Jan-13	9.09	41.13	3.68	40.28
	49.37	22-Jul-13	10.31	39.29	5.52	39.06
	49.37	7-Jan-14	9.06	39.17	5.64	40.31
	49.37	15-Jul-14	8.62	37.86	6.95	40.75
MW-42B	50.52	7-Mar-07	7.31			43.21
	50.52	27-Jul-07	5.74			44.78
	50.52	30-Jan-08	6.62			43.9
	50.52	15-Jul-08	8.73			41.79
	50.52	4-Feb-09	9.32			41.2

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-42B	50.52	24-Jul-09	9.61			40.91
	50.52	8-Jan-10	6.02			44.5
	50.52	12-Jul-10	7.13			43.39
	50.52	12-Jan-11	6.33			44.19
	50.52	12-Jul-11	11.76			38.76
	50.52	26-Jan-12	6.62			43.9
	50.52	9-Jul-12	6.81			43.71
	50.52	7-Jan-13	9.23			41.29
	50.52	22-Jul-13	11.08			39.44
	50.52	7-Jan-14	8.02			42.5
	50.52	15-Jul-14	7.37			43.15
MW-44A	45.11	7-Mar-07	10.86			34.25
	45.11	27-Jul-07	7.46			37.65
	45.11	30-Jan-08	8.44			36.67
	45.11	14-Jul-08	10.75			34.36
	45.11	3-Feb-09	12.55			32.56
	45.11	23-Jul-09	12.76			32.35
	45.11	9-Jan-10	10.23			34.88
	45.11	12-Jul-10	11.24			33.87
	45.11	12-Jan-11	9.63			35.48
	45.11	11-Jul-11	12.59			32.52
	45.11	27-Jan-12	9.27			35.84
	45.11	10-Jul-12	10.11			35
	45.11	8-Jan-13	11.01			34.1
	45.11	23-Jul-13	12.24			32.87
	45.11	8-Jan-14	11.91			33.2
	45.11	16-Jul-14	11.32			33.79
MW-44C	45.03	15-Mar-04	17.54			27.49
	45.03	14-Sep-04	18.35			26.68
	45.03	18-Jul-05	18.90	64.77	5.35	26.13
	45.03	6-Jan-06	20.03	66.50	5.37	25
	45.03	27-Jul-06	18.47	63.35	6.75	26.56
	45.03	7-Mar-07	16.02	62.30	7.75	29.01
	45.03	27-Jul-07	14.83	65.45	5.50	30.2
	45.03	29-Jan-08	15.95			29.08
	45.03	14-Jul-08	17.91	64.95	6.18	27.12
	45.03	3-Feb-09	16.72	64.15	6.98	28.31
	45.03	23-Jul-09	17.12	64.05	6.75	27.91
	45.03	9-Jan-10	15.57	63.81	6.99	29.46
	45.03	27-May-10	16.67	64.7	6.10	28.36
	45.03	28-Jun-10	16.77	67.85	2.95	28.26
	45.03	12-Jul-10	16.91	70.35	0.45	28.12
	45.03	31-Aug-10	16.89	70.63	0.17	28.14
	45.03	12-Jan-11	16.77	70.05	0.75	28.26
	45.03	11-Jul-11	19.31	70.05	0.75	25.72
	45.03	27-Jan-12	17.91	63.88	6.92	27.12
	45.03	10-Jul-12	17.61	63.7	7.10	27.42
	45.03	8-Jan-13	19.02	62.94	7.86	26.01
	45.03	23-Jul-13	20.36	70.26	0.54	24.67
	45.03	8-Jan-14	19.67	70.42	0.38	25.36
	45.03	16-Jul-14	18.72	69.31	1.49	26.31
MW-45C	44.73	15-Mar-04	17.15			27.58
	44.73	14-Sep-04	17.82	61.66	9.02	26.91
	44.73	18-Jul-05	18.38	60.76	9.89	26.35
	44.73	6-Jan-06	19.51	62.87	8.87	25.22
	44.73	27-Jul-06	17.92	61.64	8.94	26.81
	44.73	7-Mar-07	15.95	60.81	9.79	28.78
	44.73	27-Jul-07	14.38			30.35
	44.73	29-Jan-08	14.86	61.39	9.46	29.87
	44.73	14-Jul-08	17.22	61.25	9.88	27.51
	44.73	3-Feb-09	17.00	61.24	9.61	27.73
	44.73	23-Jul-09	17.46	61.30	9.55	27.27
	44.73	9-Jan-10	14.98	61.56	9.29	29.75
	44.73	27-May-10	16.31	61.1	9.75	28.42
	44.73	28-Jun-10	16.42	63.45	7.40	28.31
	44.73	12-Jul-10	16.61	68.8	2.05	28.12
	44.73	31-Aug-10	16.46	69.62	1.23	28.27
	44.73	12-Jan-11	16.31	69.1	1.75	28.42
	44.73	11-Jul-11	18.29	69.3	1.55	26.44
	44.73	8-Mar-12	16.31	70.6	0.25	28.42
	44.73	10-Jul-12	20.69	70.21	0.64	24.04
	44.73	8-Jan-13	21.39	69.91	0.69	23.34
	44.73	23-Jul-13	22.72	70.39	0.21	22.01
	44.73	8-Jan-14	22.13	70.35	0.25	22.6
	44.73	16-Jul-14	21.32	69.91	0.69	23.41
MW-46C	44.94	15-Mar-04	16.16	ND	ND	28.78
	44.94	14-Sep-04	17.97	ND	ND	26.97
	44.94	18-Jul-05	18.50	69.05	3.78	26.44
	44.94	13-Jan-06	19.66	70.20	3.22	25.28
	44.94	27-Jul-06	17.96	68.89	3.90	26.98
	44.94	7-Mar-07	16.01	69.32	3.43	28.93
	44.94	27-Jul-07	14.54	69.31	3.59	30.4
	44.94	30-Jan-08	15.68	70.81	2.00	29.26

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-46C	44.94	14-Jul-08	17.38	69.97	2.84	27.56
	44.94	3-Feb-09	16.78	69.28	3.53	28.16
	44.94	23-Jul-09	17.59	69.35	3.55	27.35
	44.94	9-Jan-10	14.53	68.74	4.16	30.41
	44.94	27-May-10	16.26	69.4	3.50	28.68
	44.94	28-Jun-10	16.39	70.85	2.05	28.55
	44.94	12-Jul-10	16.29	72.25	0.65	28.65
	44.94	31-Aug-10	16.13	72.46	0.44	28.81
	44.94	12-Jan-11	15.96	71.75	1.15	28.98
	44.94	11-Jul-11	18.07	71.65	1.25	26.87
	44.94	26-Jan-12	16.54	ND	ND	28.4
	44.94	10-Jul-12	20.34	72.8	0.10	24.6
	44.94	8-Jan-13	21.18	71.31	1.59	23.76
	44.94	23-Jul-13	21.96	72.16	0.74	22.98
	44.94	8-Jan-14	21.81	72.55	0.35	23.13
	44.94	16-Jul-14	20.86	71.39	1.51	24.08
MW-47C	45.61	27-Jul-07	16.62			28.99
	45.61	29-Jan-08	16.04			29.57
	45.61	14-Jul-08	18.15			27.46
	45.61	4-Feb-09	18.39			27.22
	45.61	23-Jul-09	18.61			27
	45.61	9-Jan-10	16.46			29.15
	45.61	12-Jul-10	18.33			27.28
	45.61	12-Jan-11	17.86			27.75
	45.61	11-Jul-11	19.94			25.67
	45.61	26-Jan-12	18.77			26.84
	45.61	9-Jul-12	18.17			27.44
	45.61	8-Jan-13	19.47			26.14
	45.61	23-Jul-13	20.61			25
	45.61	8-Jan-14	19.57			26.04
	45.61	16-Jul-14	19.02			26.59
MW-48C	44.68	15-Mar-04	17.31			27.37
	44.68	14-Sep-04	18.60			26.08
	44.68	18-Jul-05	19.17			25.51
	44.68	6-Jan-06	20.33			24.35
	44.68	27-Jul-06	18.73			25.95
	44.68	7-Mar-07	16.52			28.16
	44.68	27-Jul-07	15.22			29.46
	44.68	29-Jan-08	16.32			28.36
	44.68	14-Jul-08	17.63			27.05
	44.68	4-Feb-09	17.97			26.71
	44.68	24-Jul-09	18.39			26.29
	44.68	9-Jan-10	15.81			28.87
	44.68	12-Jul-10	17.42			27.26
	44.68	12-Jan-11	17.52			27.16
	44.68	11-Jul-11	19.58			25.1
	44.68	26-Jan-12	18.52			26.16
	44.68	9-Jul-12	17.12			27.56
	44.68	8-Jan-13	18.26			26.42
	44.68	23-Jul-13	20.17			24.51
	44.68	8-Jan-14	19.19			25.49
	44.68	16-Jul-14	18.38			26.30
MW-49A	46.18	7-Mar-07	12.91			33.27
	46.18	27-Jul-07	8.86			37.32
	46.18	31-Jan-08	12.02			34.16
	46.18	15-Jul-08	12.99			33.19
	46.18	4-Feb-09	13.29			32.89
	46.18	24-Jul-09	13.71			32.47
	46.18	9-Jan-10	11.07			35.11
	46.18	12-Jul-10	11.62			34.56
	46.18	12-Jan-11	10.82			35.36
	46.18	11-Jul-11	12.31			33.87
	46.18	26-Jan-12	9.48			36.7
	46.18	9-Jul-12	9.79			36.39
	46.18	8-Jan-13	11.31			34.87
	46.18	23-Jul-13	11.92			34.26
	46.18	8-Jan-14	11.56			34.62
	46.18	16-Jul-14	10.57			35.61
MW-49B	46.22	4-Feb-09	11.65			34.57
	46.22	24-Jul-09	11.93			34.29
	46.22	9-Jan-10	9.73			36.49
	46.22	12-Jul-10	11.36			34.86
	46.22	12-Jan-11	8.04			38.18
	46.22	11-Jul-11	12.29			33.93
	46.22	26-Jan-12	10.74			35.48
	46.22	9-Jul-12	7.38			38.84
	46.22	8-Jan-13	11.27	33.56	1.19	34.95
	46.22	23-Jul-13	11.83	33.91	0.84	34.39
	46.22	8-Jan-14	11.24			34.98
	46.22	16-Jul-14	9.62			36.60
MW-50A	46.96	7-Mar-07	8.16			38.8
	46.96	27-Jul-07	4.70			42.26
	46.96	31-Jan-08	5.68			41.28
	46.96	16-Jul-08	7.99			38.97

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-50A	46.96	4-Feb-09	9.31			37.65
	46.96	24-Jul-09	9.49			37.47
	46.96	9-Jan-10	7.02			39.94
	46.96	12-Jul-10	8.74			38.22
	46.96	12-Jan-11	5.61			41.35
	46.96	11-Jul-11	9.86			37.1
	46.96	26-Jan-12	7.21			39.75
	46.96	9-Jul-12	4.63			42.33
	46.96	8-Jan-13	5.91			41.05
	46.96	23-Jul-13	7.13			39.83
	46.96	8-Jan-14	6.71			40.25
	46.96	16-Jul-14	6.29			40.67
MW-51A	47.80	7-Mar-07	6.96			40.84
	47.80	27-Jul-07	5.45			42.35
	47.80	31-Jan-08	5.92			41.88
	47.80	15-Jul-08				NM
	47.80	4-Feb-09	9.98			37.82
	47.80	24-Jul-09	10.34			37.46
	47.80	9-Jan-10	7.83			39.97
	47.80	12-Jul-10	9.16			38.64
	47.80	12-Jan-11	8.56			39.24
	47.80	11-Jul-11	12.74			35.06
	47.80	26-Jan-12	7.33			40.47
	47.80	9-Jul-12	7.26			40.54
	47.80	8-Jan-13	7.62			40.18
	47.80	23-Jul-13	10.54			37.26
	47.80	8-Jan-14	10.21			37.59
	47.80	16-Jul-14	8.51			39.29
MW-51C	47.48	16-Jul-14	22.21			25.27
MW-52A	51.91	7-Mar-07	13.66			38.25
	51.91	27-Jul-07	11.76			40.15
	51.91	31-Jan-08	12.60			39.31
	51.91	15-Jul-08	14.42			37.49
	51.91	5-Feb-09	15.52			36.39
	51.91	23-Jul-09	16.39			35.52
	51.91	9-Jan-10	12.57			39.34
	51.91	12-Jul-10	14.19			37.72
	51.91	12-Jan-11	9.06			42.85
	51.91	12-Jul-11	16.53			35.38
	51.91	26-Jan-12	12.99			38.92
	51.91	9-Jul-12	12.43			39.48
	51.91	7-Jan-13	14.94			36.97
	51.91	22-Jul-13	16.29			35.62
	51.91	7-Jan-14	16.01			35.9
	51.91	15-Jul-14	15.39			36.52
MW-53C	45.49	7-Mar-07	16.12			29.37
	45.49	27-Jul-07	14.55			30.94
	45.49	29-Jan-08	15.12			30.37
	45.49	14-Jul-08	16.86			28.63
	45.49	3-Feb-09	16.69			28.8
	45.49	23-Jul-09	17.62			27.87
	45.49	9-Jan-10	15.19			30.3
	45.49	12-Jul-10	15.71			29.78
	45.49	12-Jan-11	16.58			28.91
	45.49	11-Jul-11	18.61			26.88
	45.49	27-Jan-12	17.54			27.95
	45.49	10-Jul-12	17.73			27.76
	45.49	8-Jan-13	18.14			27.35
	45.49	23-Jul-13	19.28			26.21
	45.49	8-Jan-14	21.12			24.37
	45.49	16-Jul-14	17.37			28.12
MW-54C	44.99	7-Mar-07	15.74			29.25
	44.99	27-Jul-07	14.63			30.36
	44.99	28-Jan-08	15.28			29.71
	44.99	14-Jul-08	16.68			28.31
	44.99	3-Feb-09	16.87			28.12
	44.99	23-Jul-09	17.84			27.15
	44.99	9-Jan-10	15.46			29.53
	44.99	12-Jul-10	16.49			28.5
	44.99	12-Jan-11	16.46			28.53
	44.99	11-Jul-11	18.23			26.76
	44.99	27-Jan-12	17.42			27.57
	44.99	10-Jul-12	17.36			27.63
	44.99	8-Jan-13	17.81			27.18
	44.99	23-Jul-13	18.89			26.1
	44.99	8-Jan-14	18.14			26.85
	44.99	16-Jul-14	17.49			27.50
MW-55A	52.01	4-Feb-09	13.79			38.22
	52.01	23-Jul-09	14.06			37.95
	52.01	9-Jan-10	10.83			41.18
	52.01	12-Jul-10	12.72			39.29
	52.01	12-Jan-11	10.13			41.88
	52.01	12-Jul-11	15.18			36.83
	52.01	26-Jan-12	11.71			40.3
	52.01	9-Jul-12	12.29			39.72

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
	52.01	7-Jan-13	13.34			38.67
	52.01	22-Jul-13	14.19			37.82
	52.01	7-Jan-14	12.73			39.28
	52.01	15-Jul-14	11.30			40.71
MW-55B	52.04	26-Jan-12	13.28			38.76
	52.04	9-Jul-12	13.93			38.11
	52.04	7-Jan-13	13.73			38.31
	52.04	22-Jul-13	14.59			37.45
	52.04	7-Jan-14	12.89			39.15
	52.04	15-Jul-14	12.49			39.55
MW-57A	47.72	5-Feb-09	12.73		0.00	34.99
	47.72	23-Jul-09	12.91		0.00	34.81
	47.72	9-Jan-10	9.78		0.00	37.94
	47.72	12-Jul-10	8.56	24.55	2.55	39.16
	47.72	12-Jan-11	9.83	22.76	4.14	37.89
	47.72	12-Jul-11	13.88	22.79	4.11	33.84
	47.72	26-Jan-12	10.54	22.78	4.12	37.18
	47.72	9-Jul-12	9.72	22.65	4.25	38
	47.72	7-Jan-13	10.61	22.14	4.76	37.11
	47.72	22-Jul-13	13.21	23.05	3.85	34.51
	47.72	7-Jan-14	11.79	26.15	0.75	35.93
	47.72	15-Jul-14	10.42	26.09	0.81	37.30
MW-57B	50.90	26-Jan-12	28.83	42.51	0.44	22.07
	50.90	9-Jul-12	27.93	42.45	0.50	22.97
	50.90	7-Jan-13	28.63	41.36	1.59	22.27
	50.90	22-Jul-13	16.34	41.67	1.28	34.56
	50.90	7-Jan-14	15.04			35.86
	50.90	15-Jul-14	15.71			35.19
MW-58A	47.76	5-Feb-09	14.55			33.21
	47.76	23-Jul-09	14.04			33.72
	47.76	9-Jan-10	12.29			35.47
	47.76	12-Jul-10	14.03			33.73
	47.76	12-Jan-11	11.88			35.88
	47.76	12-Jul-11	16.16			31.6
	47.76	26-Jan-12	12.26			35.5
	47.76	9-Jul-12	11.62			36.14
	47.76	7-Jan-13	11.91			35.85
	47.76	22-Jul-13	13.71			34.05
	47.76	7-Jan-14	13.26			34.5
	47.76	15-Jul-14	13.06			34.70
MW-59A	44.18	5-Feb-09	10.71			33.47
	44.18	23-Jul-09	9.96			34.22
	44.18	9-Jan-10	8.62			35.56
	44.18	12-Jul-10	9.97			34.21
	44.18	12-Jan-11	8.06			36.12
	44.18	11-Jul-11	10.54			33.64
	44.18	26-Jan-12	6.36			37.82
	44.18	9-Jul-12	7.63			36.55
	44.18	8-Jan-13	9.09			35.09
	44.18	23-Jul-13	9.76			34.42
	44.18	8-Jan-14	9.34			34.84
	44.18	16-Jul-14	9.17			35.01
MW-59B	44.36	12-Jul-10	7.43			36.93
	44.36	12-Jan-11	6.89			37.47
	44.36	11-Jul-11	11.03			33.33
	44.36	26-Jan-12	4.44			39.92
	44.36	9-Jul-12	7.48			36.88
	44.36	8-Jan-13	9.36			35
	44.36	23-Jul-13	9.94			34.42
	44.36	8-Jan-14	9.52			34.84
	44.36	16-Jul-14	8.67			35.69
MW-59D	44.22	5-Feb-09	84.17			-39.95
	44.22	23-Jul-09	83.53			-39.31
	44.22	9-Jan-10	81.73			-37.51
	44.22	12-Jul-10	82.16			-37.94
	44.22	12-Jan-11	82.83			-38.61
	44.22	11-Jul-11	82.89			-38.67
	44.22	26-Jan-12	82.93			-38.71
	44.22	9-Jul-12	82.36			-38.14
	44.22	8-Jan-13	82.81			-38.59
	44.22	23-Jul-13	83.04			-38.82
	44.22	8-Jan-14	83.14			-38.92
	44.22	16-Jul-14	82.67			-38.45
MW-60A	46.79	4-Feb-09	9.56			37.23
	46.79	23-Jul-09	9.71			37.08
	46.79	9-Jan-10	7.72			39.07
	46.79	12-Jul-10	8.61			38.18
	46.79	12-Jan-11	5.82			40.97
	46.79	11-Jul-11	9.86			36.93
	46.79	26-Jan-12	4.34			42.45
	46.79	9-Jul-12	5.42			41.37
	46.79	8-Jan-13	6.91			39.88
	46.79	23-Jul-13	10.42			36.37
	46.79	8-Jan-14	8.06			38.73
	46.79	16-Jul-14	7.29			39.50
MW-61A	44.67	3-Feb-09	8.35			36.32
	44.67	23-Jul-09	8.47			36.2
	44.67	9-Jan-10	6.49			38.18

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-61A	44.67	12-Jul-10	8.09			36.58
	44.67	12-Jan-11	6.56			38.11
	44.67	11-Jul-11	9.67			35
	44.67	26-Jan-12	2.48			42.19
	44.67	9-Jul-12	4.55			40.12
	44.67	8-Jan-13	6.72			37.95
	44.67	23-Jul-13	9.16			35.51
	44.67	8-Jan-14	7.04			37.63
	44.67	16-Jul-14	6.34			38.33
MW-62B	48.16	4-Feb-09	6.99			41.17
	48.16	24-Jul-09	7.39			40.77
	48.16	8-Jan-10	5.13			43.03
	48.16	12-Jul-10	5.79			42.37
	48.16	12-Jan-11	4.21			43.95
	48.16	12-Jul-11	11.06			37.1
	48.16	26-Jan-12	3.18			44.98
	48.16	9-Jul-12	4.87			43.29
	48.16	8-Jan-13	5.92			42.24
	48.16	23-Jul-13	7.01			41.15
	48.16	8-Jan-14	6.52			41.64
	48.16	15-Jul-14	6.06			42.10
MW-63B	44.48	5-Feb-09	31.54			12.94
	44.48	23-Jul-09	9.52			34.96
	44.48	9-Jan-10	1.34			43.14
	44.48	12-Jul-10	5.71			38.77
	44.48	13-Jan-11	7.13			37.35
	44.48	11-Jul-11	4.21			40.27
	44.48	27-Jan-12	2.96			41.52
	44.48	10-Jul-12	1.32			43.16
	44.48	8-Jan-13	8.54			35.94
	44.48	23-Jul-13	9.43			35.05
	44.48	8-Jan-14	7.72			36.76
	44.48	16-Jul-14	7.03			37.45
MW-64A	48.31	4-Feb-09	9.02			39.29
	48.31	24-Jul-09	9.13			39.18
	48.31	9-Jan-10	6.52			41.79
	48.31	12-Jul-10	6.82			41.49
	48.31	12-Jan-11	4.77			43.54
	48.31	12-Jul-11	8.17			40.14
	48.31	26-Jan-12	4.81			43.5
	48.31	9-Jul-12	5.93			42.38
	48.31	7-Jan-13	7.03			41.28
	48.31	22-Jul-13	8.79			39.52
	48.31	7-Jan-14	8.39			39.92
	48.31	15-Jul-14	7.72			40.59
MW-65D	44.55	5-Feb-09	86.72			-42.17
	44.55	23-Jul-09	86.47			-41.92
	44.55	9-Jan-10	84.39			-39.84
	44.55	12-Jul-10	84.39			-39.84
	44.55	12-Jan-11	83.96			-39.41
	44.55	11-Jul-11	85.81			-41.26
	44.55	27-Jan-12	85.76			-41.21
	44.55	8-Jan-13	85.81			-41.26
	44.55	23-Jul-13	85.83			-41.28
	44.55	8-Jan-14	85.78			-41.23
	44.55	16-Jul-14	84.91			-40.36
MW-66D	46.51	5-Feb-09	86.18			-39.67
	46.51	23-Jul-09	85.82			-39.31
	46.51	9-Jan-10	84.02			-37.51
	46.51	12-Jul-10	84.86			-38.35
	46.51	12-Jan-11	NM			NM
	46.51	11-Jul-11	84.93			-38.42
	46.51	26-Jan-12	84.88			-38.37
	46.51	9-Jul-12	85.02			-38.51
	46.51	8-Jan-13	86.09			-39.58
	46.51	23-Jul-13	86.42			-39.91
	46.51	8-Jan-14	86.09			-39.58
	46.51	16-Jul-14	85.26			-38.75
MW-67B	43.93	12-Jul-10	5.76			38.17
	43.93	13-Jan-11	10.62			33.31
	43.93	11-Jul-11	17.64			26.29
	43.93	27-Jan-12	9.87			34.06
	43.93	10-Jul-12	11.19			32.74
	43.93	8-Jan-13	11.72			32.21
	43.93	23-Jul-13	10.69			33.24
	43.93	8-Jan-14	10.64			33.29
	43.93	16-Jul-14	11.22			32.71
MW-68B	44.63	27-Jan-12	1.16			43.47
	44.63	10-Jul-12	3.82			40.81
	44.63	8-Jan-13	6.76			37.87
	44.63	23-Jul-13	10.33			34.3
	44.63	8-Jan-14	5.82			38.81
	44.63	16-Jul-14	7.41			37.22
MW-68C	44.80	12-Jul-10	16.52			28.28
	44.80	13-Jan-11	16.92			27.88
	44.80	11-Jul-11	19.34			25.46
	44.80	27-Jan-12	17.66			27.14

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
MW-68C	44.80	10-Jul-12	17.96			26.84
	44.80	8-Jan-13	19.39			25.41
	44.80	23-Jul-13	19.87			24.93
	44.80	8-Jan-14	19.29			25.51
	44.80	16-Jul-14	18.39			26.41
MW-69A	45.71	12-Jul-10	11.81			33.9
	45.71	12-Jan-11	11.16			34.55
	45.71	11-Jul-11	NM			--
	45.71	26-Jan-12	10.44			35.27
	45.71	9-Jul-12	4.21			41.5
	45.71	8-Jan-13	5.31			40.4
	45.71	23-Jul-13	7.34			38.37
	45.71	8-Jan-14	7.02			38.69
	45.71	16-Jul-14	6.34			39.37
MW-70B	44.86	27-Jan-12	6.51	34.26	1.21	38.35
	44.86	10-Jul-12	6.06	34.17	1.30	38.8
	44.86	8-Jan-13	6.67	34.02	1.68	38.19
	44.86	23-Jul-13	8.22	34.07	1.63	36.64
	44.86	8-Jan-14	7.89	35.51	0.14	36.97
	44.86	16-Jul-14	6.16	34.71	0.94	38.70
MW-71B	44.59	27-Jan-12	7.08			37.51
	44.59	10-Jul-12	8.16			36.43
	44.59	8-Jan-13	4.09			40.5
	44.59	23-Jul-13	8.61			35.98
	44.59	8-Jan-14	16.36			28.23
	44.59	16-Jul-14	16.02			28.57
MW-72B	51.97	26-Jan-12	38.76			13.21
	51.97	9-Jul-12	27.27			24.7
	51.97	7-Jan-13	20.08			31.89
	51.97	22-Jul-13	18.39			33.58
	51.97	7-Jan-14	17.31			34.66
	51.97	15-Jul-14	16.91			35.06
MW-73B	51.42	26-Jan-12	25.48			25.94
	51.42	9-Jul-12	25.03			26.39
	51.42	7-Jan-13	26.11			25.31
	51.42	22-Jul-13	26.87			24.55
	51.42	7-Jan-14	26.19			25.23
	51.42	15-Jul-14	25.14			26.28
MW-74B	47.58	26-Jan-12	7.63			39.95
	47.58	9-Jul-12	7.15			40.43
	47.58	8-Jan-13	9.62			37.96
	47.58	23-Jul-13	11.72			35.86
	47.58	8-Jan-14	9.59			37.99
	47.58	16-Jul-14	9.01			38.57
MW-75B	46.78	26-Jan-12	9.07	35.26	1.84	37.71
	46.78	9-Jul-12	9.32	35.2	1.90	37.46
	46.78	8-Jan-13	10.16	34.13	2.97	36.62
	46.78	23-Jul-13	9.74	35.71	1.39	37.04
	46.78	8-Jan-14	10.13	36.72	0.43	36.65
	46.78	16-Jul-14	11.41	35.71	1.44	35.37
MW-76C	47.84	16-Jul-14	22.68			25.16
MW-77A	49.05	16-Jul-14	6.62			42.43
MW-78A	48.68	16-Jul-14	8.02	28.72	1.38	40.66
MW-79A	48.95	16-Jul-14	7.26			41.69
MW-80B	47.11	16-Jul-14	5.29			41.82
MW-81B	46.77	16-Jul-14	6.47			40.30
P-10	47.69	2-Sep-93	6.87			40.85
	47.69	21-Dec-93	3.32			44.4
	47.69	24-Mar-94	3.88			43.84
	47.69	22-Jun-94	4.98			42.74
	47.69	28-Sep-94	6.38			41.34
	47.69	13-Oct-94	7.07			40.65
	47.69	24-Jan-95	2.67			45.05
	47.69	11-Apr-95	2.59			45.13
	47.69	11-Jul-95	4.69			43.03
	47.69	23-Jan-96	5.84			41.88
	47.69	19-Jul-96	10.04			37.68
	47.69	17-Sep-96	8.34			39.38
	47.69	31-Oct-96	6.97			40.75
	47.69	22-Nov-96	8.84			38.88
	47.69	27-Dec-96	6.20			41.52
	47.69	22-Jan-97	4.10			43.62
	47.69	21-Feb-97	2.86			44.86
	47.69	25-Mar-97	3.19			44.53
	47.69	23-Apr-97	4.42			43.3
	47.69	24-Apr-97	4.57			43.15
	47.69	13-May-97	3.14			44.58
	47.69	20-Jun-97	4.94			42.78
	47.69	25-Jun-97	2.74			44.98
	47.69	1-Jul-97	4.13			43.59
	47.69	24-Jul-97	7.91			39.81
	47.69	16-Aug-97	7.86			39.86
	47.69	22-Aug-97	8.67			39.05
	47.69	25-Sep-97	6.54			41.18
	47.69	22-Oct-97	5.36			42.36
	47.69	25-Nov-97	5.36			42.36
	47.69	19-Dec-97	4.72			43

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
P-10	47.69	20-Jan-98	3.40			44.32
	47.69	29-Jan-98	3.11			44.61
	47.69	18-Mar-98	2.84			44.88
	47.69	24-Apr-98	6.80			40.92
	47.69	21-May-98	7.35			40.37
	47.69	30-Jul-98	8.23			39.49
	47.69	25-Aug-98	7.34			40.38
	47.69	21-Sep-98	5.25			42.47
	47.69	26-Oct-98	6.11			41.61
	47.69	23-Nov-98	4.10			43.62
	47.69	26-Feb-99	3.21			44.51
	47.69	16-Mar-99	4.21			43.51
	47.69	29-Apr-99	4.53			43.19
	47.69	1-Jun-99	4.53			43.19
	47.69	30-Jul-99	6.00			41.72
	47.69	27-Aug-99	4.72			43
	47.69	27-Sep-99	9.58			38.14
	47.69	29-Oct-99	10.61			37.11
	47.69	29-Dec-99	11.55			36.17
	47.69	4-Feb-00	13.71			34.01
	47.69	25-Feb-00	10.44			37.28
	47.69	27-Mar-00	7.53			40.19
	47.69	7-Apr-00	7.09			40.63
	47.69	31-May-00	7.14			40.58
	47.69	1-Jun-00	7.11			40.61
	47.69	28-Jul-00	7.15			40.57
	47.69	30-Aug-00	10.15			37.57
	47.69	19-Sep-00	11.56			36.16
	47.69	27-Oct-00	8.66			39.06
	47.69	21-Nov-00	9.64			38.08
	47.69	1-May-01	6.52			41.2
	47.69	1-Oct-01	6.85			40.87
	47.69	11-Mar-02	3.41			44.31
	47.69	23-Sep-02	3.54			44.18
	47.69	10-Mar-03	2.43			45.26
	47.69	23-Sep-03	1.61			46.08
	47.69	15-Mar-04	2.85			44.84
	47.69	13-Sep-04	7.99			39.7
	47.69	18-Jul-05	4.20			43.49
	47.69	4-Jan-06	8.58			39.11
	47.69	27-Jul-06	3.46			44.23
	47.69	23-Jan-07	2.36			45.33
	47.69	7-Mar-07	NM			NM
	47.69	27-Jul-07	3.75			43.94
	47.69	29-Jan-08	2.30			45.39
	47.69	16-Jul-08	6.91			40.78
	47.69	22-Jan-09	6.35			41.34
	47.69	23-Jul-09	NM			NM
	47.69	8-Jan-10	4.06			43.63
	47.69	12-Jul-10	2.06			45.63
	47.73	12-Jan-11	4.13			43.60
	47.73	12-Jul-11	9.84			37.89
	47.73	27-Jan-12	3.12			44.61
	47.73	10-Jul-13	10.79			36.94
	47.73	8-Jan-14	5.51			42.22
	47.73	2-Jul-14	7.74			39.99
P-11	48.98	2-Sep-93	7.87			41.15
	48.98	21-Dec-93	4.57			44.45
	48.98	24-Mar-94	5.04			43.98
	48.98	22-Jun-94	6.19			42.83
	48.98	28-Sep-94	7.40			41.62
	48.98	13-Oct-94	8.14			40.88
	48.98	24-Jan-95	3.90			45.12
	48.98	11-Apr-95	3.77			45.25
	48.98	11-Jul-95	5.69			43.33
	48.98	23-Jan-96	6.81			42.21
	48.98	19-Jul-96	7.81			41.21
	48.98	17-Sep-96	9.15			39.87
	48.98	31-Oct-96	7.52			41.5
	48.98	22-Nov-96	9.46			39.56
	48.98	27-Dec-96	6.64			42.38
	48.98	22-Jan-97	4.70			44.32
	48.98	21-Feb-97	3.88			45.14
	48.98	25-Mar-97	4.09			44.93
	48.98	23-Apr-97	5.27			43.75
	48.98	24-Apr-97	5.41			43.61
	48.98	13-May-97	4.12			44.9
	48.98	20-Jun-97	5.79			43.23
	48.98	25-Jun-97	3.83			45.19
	48.98	1-Jul-97	5.01			44.01
	48.98	24-Jul-97	7.56			41.46
	48.98	16-Aug-97	8.74			40.28
	48.98	22-Aug-97	9.37			39.65
	48.98	25-Sep-97	7.24			41.78
	48.98	22-Oct-97	5.98			43.04
	48.98	25-Nov-97	6.00			43.02

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
P-11	48.98	19-Dec-97	5.52			43.5
	48.98	20-Jan-98	4.30			44.72
	48.98	4-Mar-98	4.08			44.94
	48.98	18-Mar-98	3.92			45.1
	48.98	24-Apr-98	7.61			41.41
	48.98	21-May-98	8.10			40.92
	48.98	30-Jul-98	9.21			39.81
	48.98	25-Aug-98	8.44			40.58
	48.98	21-Sep-98	5.91			43.11
	48.98	26-Oct-98	7.59			41.43
	48.98	23-Nov-98	5.41			43.61
	48.98	29-Jan-99	4.11			44.91
	48.98	26-Feb-99	4.22			44.8
	48.98	16-Mar-99	4.96			44.06
	48.98	29-Apr-99	5.15			43.87
	48.98	1-Jun-99	5.15			43.87
	48.98	30-Jul-99	6.66			42.36
	48.98	27-Aug-99	5.23			43.79
	48.98	27-Sep-99	10.49			38.53
	48.98	29-Oct-99	11.91			37.11
	48.98	29-Dec-99	11.12			37.9
	48.98	4-Feb-00	12.13			36.89
	48.98	25-Feb-00	10.46			38.56
	48.98	27-Mar-00	8.32			40.7
	48.98	7-Apr-00	7.91			41.11
	48.98	31-May-00	7.96			41.06
	48.98	1-Jun-00	7.93			41.09
	48.98	28-Jul-00	7.97			41.05
	48.98	30-Aug-00	10.88			38.14
	48.98	19-Sep-00	12.32			36.7
	48.98	27-Oct-00	10.94			38.08
	48.98	21-Nov-00	9.77			39.25
	48.98	1-May-01	7.48			41.54
	48.98	1-Oct-01	7.74			41.28
	48.98	11-Mar-02	4.51			44.51
	48.98	23-Sep-02	4.46			44.56
	48.98	10-Mar-03	3.69			45.29
	48.98	23-Sep-03	4.54			44.44
	48.98	15-Mar-04	4.51			44.47
	48.98	13-Sep-04	9.14			39.84
	48.98	18-Jul-05	5.27			43.71
	48.98	4-Jan-06	9.56			39.42
	48.98	27-Jul-06	4.54			44.44
	48.98	7-Mar-07	NM			NM
	48.98	27-Jul-07	4.61			44.37
	48.98	30-Jan-08	2.71			46.27
	48.98	15-Jul-08	7.93			41.05
	48.98	4-Feb-09	7.82			41.16
	48.98	24-Jul-09	7.74			41.24
	48.98	8-Jan-10	5.67			43.31
	48.98	12-Jul-10	6.78			42.2
	48.98	12-Jan-11	4.21			44.77
	48.98	12-Jul-11	11.51			37.47
	48.98	26-Jan-12	4.25			44.73
	48.98	7-Jan-13	7.96			41.02
	48.98	22-Jul-13	10.96			38.02
	48.98	7-Jan-14	6.52			42.46
	48.98	16-Jul-14	8.87			40.11
P-12	48.78	2-Sep-93	7.02			41.8
	48.78	21-Dec-93	4.30			44.52
	48.78	24-Mar-94	4.45			44.37
	48.78	22-Jun-94	5.06			43.76
	48.78	28-Sep-94	6.46			42.36
	48.78	13-Oct-94	7.19			41.63
	48.78	24-Jan-95	3.63			45.19
	48.78	11-Apr-95	3.25			45.57
	48.78	11-Jul-95	4.62			44.2
	48.78	23-Jan-96	6.62			42.2
	48.78	19-Jul-96	8.64			40.18
	48.78	17-Sep-96	8.12			40.7
	48.78	31-Oct-96	6.81			42.01
	48.78	22-Nov-96	8.70			40.12
	48.78	27-Dec-96	6.57			42.25
	48.78	22-Jan-97	4.93			43.89
	48.78	21-Feb-97	3.61			45.21
	48.78	25-Mar-97	3.70			45.12
	48.78	23-Apr-97	4.58			44.24
	48.78	24-Apr-97	4.74			44.08
	48.78	13-May-97	3.69			45.13
	48.78	20-Jun-97	4.86			43.96
	48.78	25-Jun-97	3.35			45.47

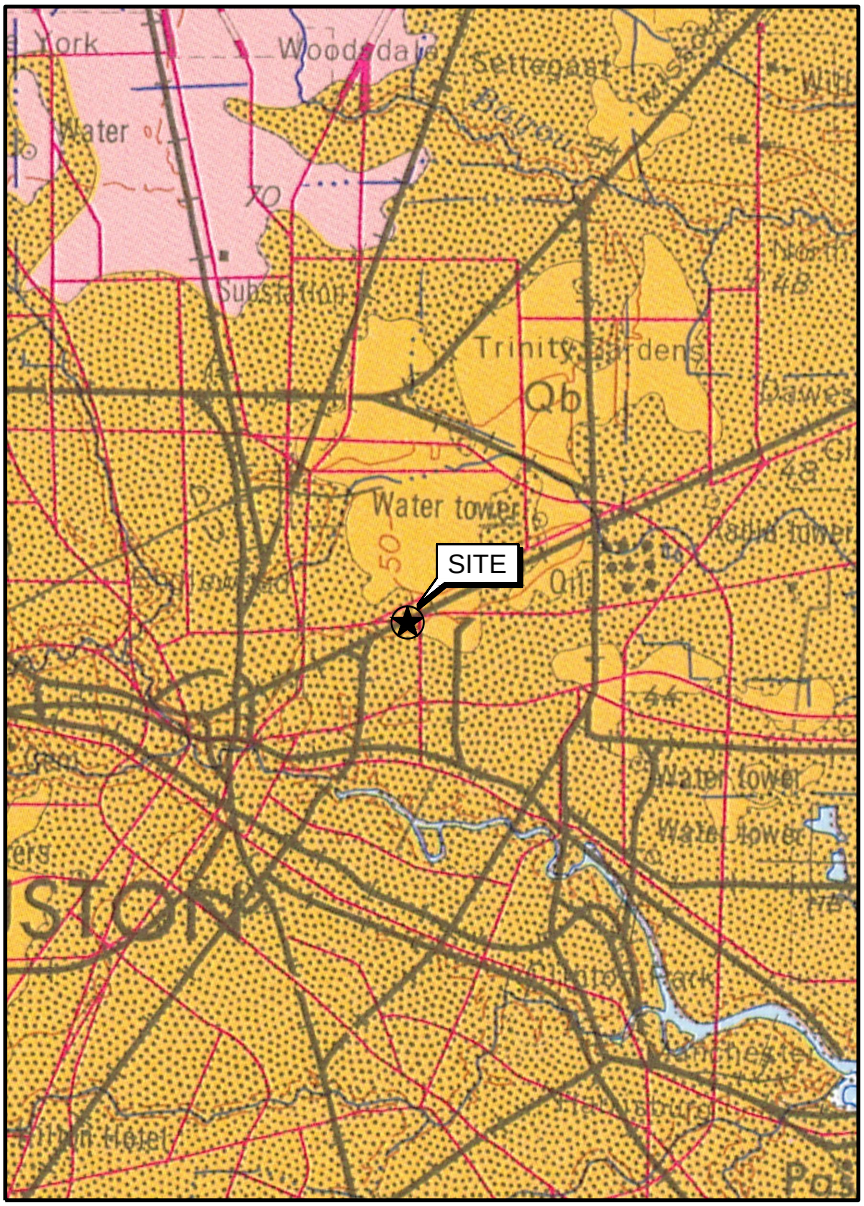
TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
P-12	48.78	1-Jul-97	4.11			44.71
	48.78	24-Jul-97	6.58			42.24
	48.78	16-Aug-97	7.80			41.02
	48.78	22-Aug-97	8.22			40.6
	48.78	25-Sep-97	6.54			42.28
	48.78	22-Oct-97	5.66			43.16
	48.78	25-Nov-97	5.70			43.12
	48.78	19-Dec-97	5.13			43.69
	48.78	20-Jan-98	4.15			44.67
	48.78	4-Mar-98	3.78			45.04
	48.78	18-Mar-98	3.61			45.21
	48.78	24-Apr-98	6.90			41.92
	48.78	21-May-98	7.80			41.02
	48.78	30-Jul-98	8.15			40.67
	48.78	25-Aug-98	8.31			40.51
	48.78	21-Sep-98	5.64			43.18
	48.78	26-Oct-98	7.66			41.16
	48.78	23-Nov-98	5.65			43.17
	48.78	29-Jan-99	4.20			44.62
	48.78	26-Feb-99	4.31			44.51
	48.78	16-Mar-99	4.99			43.83
	48.78	29-Apr-99	5.10			43.72
	48.78	1-Jun-99	5.10			43.72
	48.78	30-Jul-99	6.75			42.07
	48.78	27-Aug-99	5.34			43.48
	48.78	27-Sep-99	9.36			39.46
	48.78	29-Oct-99	10.11			38.71
	48.78	29-Dec-99	9.44			39.38
	48.78	4-Feb-00	12.10			36.72
	48.78	25-Feb-00	8.63			40.19
	48.78	27-Mar-00	7.76			41.06
	48.78	7-Apr-00	7.35			41.47
	48.78	31-May-00	7.39			41.43
	48.78	1-Jun-00	7.34			41.48
	48.78	28-Jul-00	7.37			41.45
	48.78	30-Aug-00	10.66			38.16
	48.78	19-Sep-00	11.45			37.37
	48.78	27-Oct-00	10.94			37.88
	48.78	21-Nov-00	8.93			39.89
	48.78	1-May-01	6.70			42.12
	48.78	1-Oct-01	6.93			41.89
	48.78	11-Mar-02	4.15			44.67
	48.78	23-Sep-02	3.90			44.92
	48.78	10-Mar-03	3.13			45.65
	48.78	23-Sep-03	3.86			44.92
	48.78	15-Mar-04	NM			NM
	48.78	13-Sep-04	7.93			40.85
	48.78	18-Jul-05	5.06			43.72
	48.78	4-Jan-06	8.98			39.8
	48.78	27-Jul-06	4.35			44.43
	48.78	22-Jan-07	3.19			45.59
	48.78	7-Mar-07	NM			NM
	48.78	27-Jul-07	4.22			44.56
	48.78	29-Jan-08	3.03			45.75
	48.78	16-Jul-08	6.78			42
	48.78	22-Jan-09	6.99			41.79
	48.78	24-Jul-09	NM			NM
	48.78	8-Jan-10	4.13			44.65
	48.78	12-Jul-10	3.93			44.85
	48.80	12-Jan-11	4.83			43.97
	48.80	12-Jul-11	10.02			38.78
	48.80	27-Jan-12	4.52			44.28
	48.80	9-Jul-12	5.15			43.65
	48.80	10-Jul-13	9.73			39.07
	48.80	8-Jan-14	6.41			42.39
	48.80	2-Jul-14	6.46			42.34

TABLE VI.D
HISTORICAL WATER LEVELS FOR CURRENT SITE MONITORING WELLS
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Well ID	TOC Elevation (ft)	Date	Depth to Water (ft)	Depth to DNAPL (ft BTOC)	DNAPL Thickness (ft)	GW Elevation (ft)
TW-01		27-Jul-07	8.45			
		31-Jan-08	8.17			
		23-Jul-09	12.16			
		8-Jan-10	10.03			
		12-Jul-10	NM			
TW-02		27-Jul-07	11.64	10.04[2]	1.57[2]	
		31-Jan-08	10.96	9.81[2]	1.15[2]	
		15-Jul-08	11.42			
		4-Feb-09	12.31			
		24-Jul-09	NM			
		8-Jan-10	NM			
		12-Jul-10	NM			
TW-41B	49.67	4-Feb-09	8.44			41.23
	49.67	24-Jul-09	8.34			41.33
	49.67	8-Jan-10	4.86			44.81
	49.67	12-Jul-10	6.12			43.55
	49.67	12-Jan-11	5.17			44.5
	49.67	12-Jul-11	12.02			37.65
	49.67	26-Jan-12	5.27			44.4
	49.67	9-Jul-12	6.23			43.44
	49.67	7-Jan-13	8.54			41.13
	49.67	22-Jul-13	11.53			38.14
	49.67	7-Jan-14	7.32			42.35
	49.67	16-Jul-14	9.65			40.02
TW-55A	49.67	9-Jul-12	13.44			36.23
TW-56A	51.89	5-Feb-09	17.48			34.41
	51.89	23-Jul-09	17.17			34.72
	51.89	8-Jan-10	14.53			37.36
	51.89	12-Jul-10	15.78			36.11
	51.89	12-Jan-11	14.09			37.8
	51.89	12-Jul-11	17.89			34
	51.89	26-Jan-12	15.06			36.83
	51.89	7-Jan-13	16.92			34.97
	51.89	22-Jul-13	18.12			33.77
	51.89	7-Jan-14	-			-
	51.89	15-Jul-14	16.05			35.84

FIGURES



EXPLANATION

QUATERNARY

Pleistocene

Qb Qb
Beaumont Formation

Ql
Lissie Formation

N

Scale 1:250,000

0 2

Statute Miles

Source: Geologic Atlas of Texas, Houston Sheet (1982).

UNION PACIFIC RAILROAD CO.

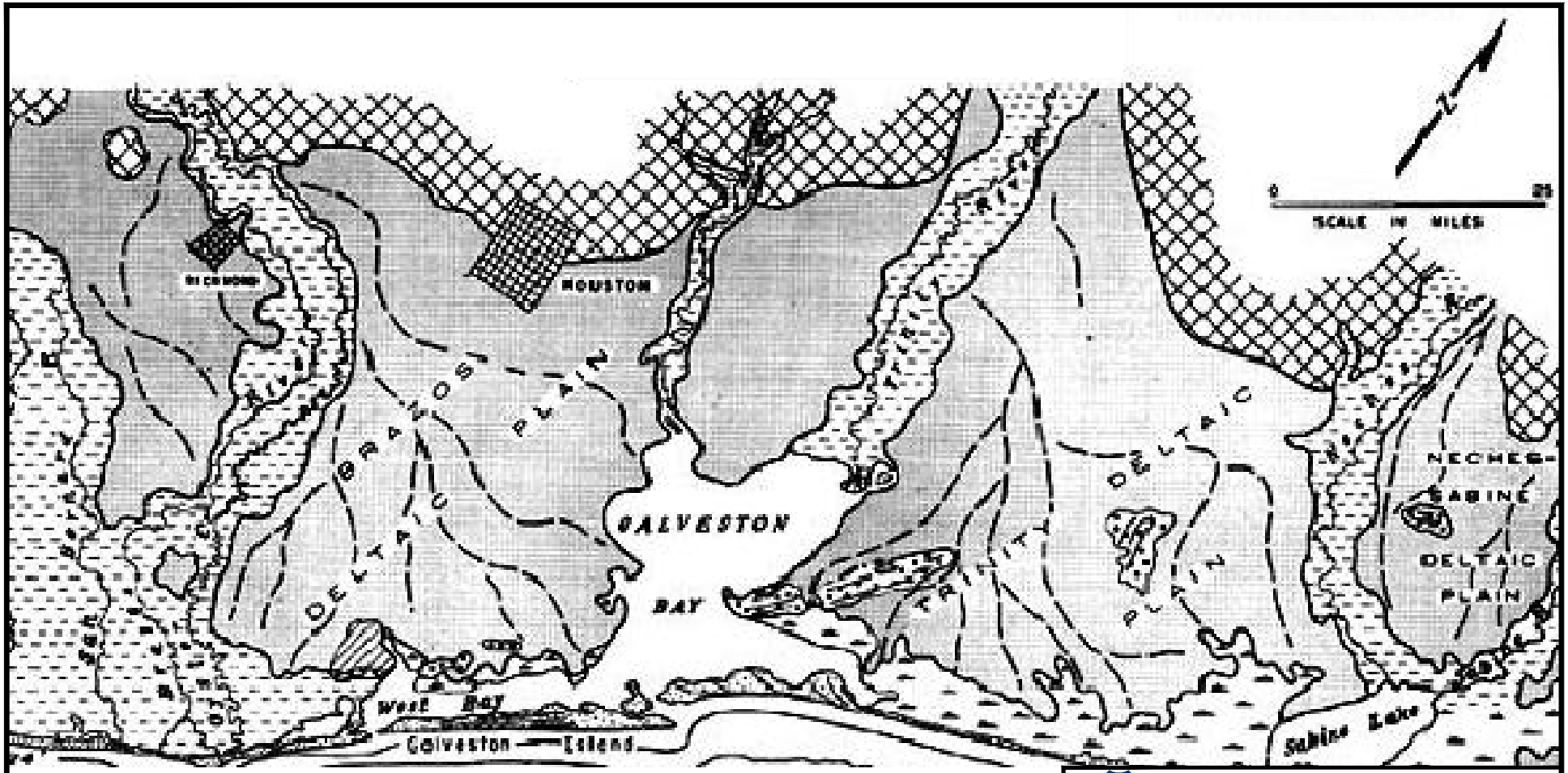
HOUSTON WOOD PRESERVING WORKS

Figure VI.A

GEOLOGIC MAP

PROJECT: 1358	BY: AJD	REVISIONS
DATE: OCT., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



SYMBOLS
- Abandoned beaches
- Abandoned Pleistocene distributaries
- Recent Streams

RECENT
- Sand beach and mud flat accretions
- Lagoonal marsh deposits
- Fluviatile and deltaic deposits

LATE PLEISTOCENE
- Sand beach and mud flat accretions
- Lagoonal marsh deposits
- Fluviatile and deltaic deposits

OLDER PLEISTOCENE
- Fluviatile, deltaic, etc

(Contour interval in feet)

Source:
Bernard, H.A. and Major, C.F., 1956. Sedimentary Features Diagnostic of Alluvial Point Bar Sands.
EPR Memorandum Report 23, October.

UNION PACIFIC RAILROAD CO.

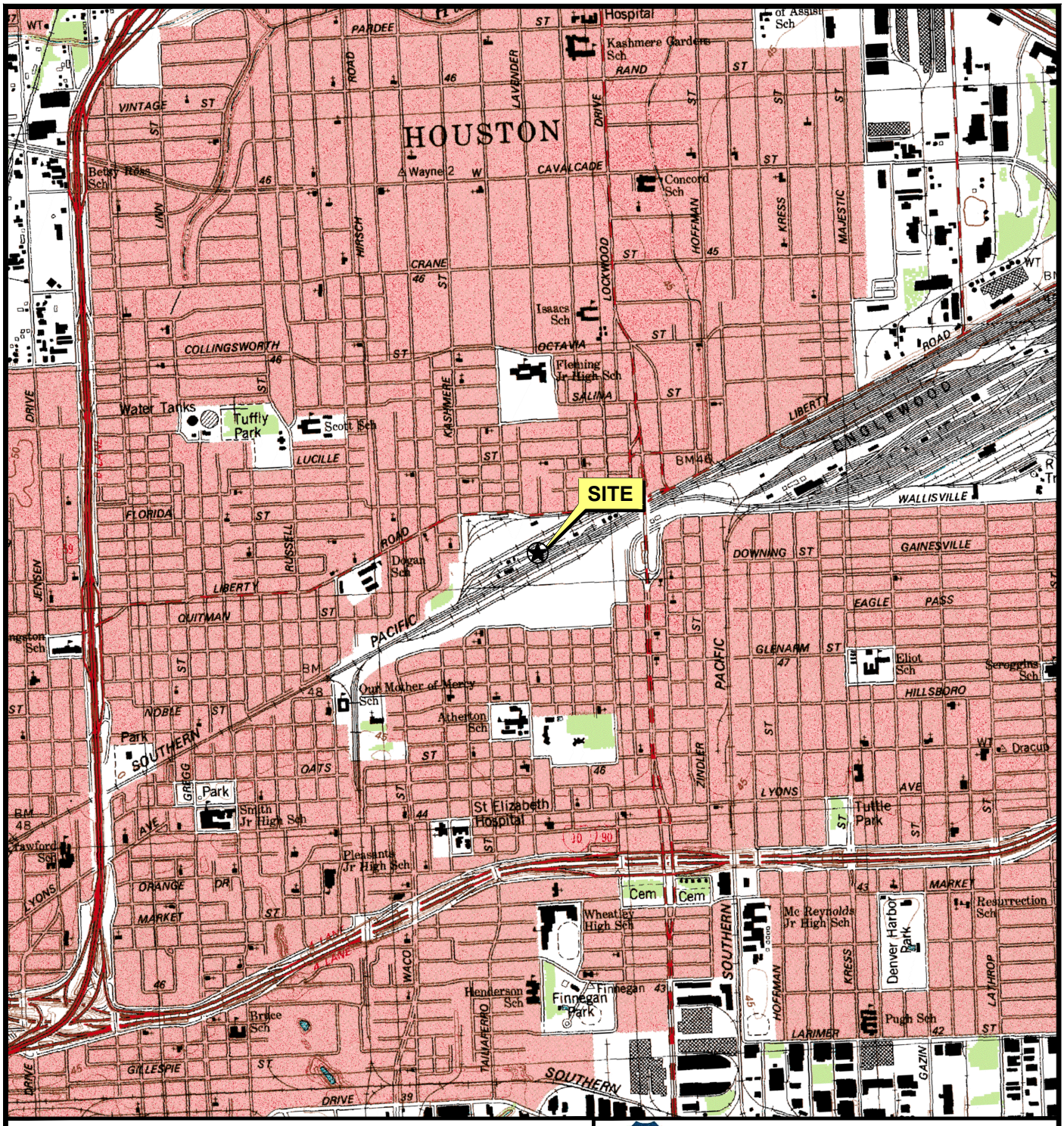
HOUSTON WOOD PRESERVING WORKS

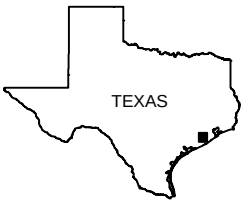
Figure VI.B

REGIONAL PHYSIOGRAPHIC MAP

PROJECT: 1358	BY: AJD	REVISIONS
DATE: OCT., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS





QUADRANGLE LOCATIONS

Scale in Feet

0 1000 2000

SOURCE:
Base map from www.tnris.gov, Settegast, TX 7.5 min. USGS quadrangle dated 1982.

UNION PACIFIC RAILROAD CO.

HOUSTON WOOD PRESERVING WORKS

Figure VI.C

TOPOGRAPHIC MAP

PROJECT: 1358	BY: AJD	REVISIONS
DATE: OCT., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Geologic units					Hydrogeologic units
Erathem	**System**	**Series**	**Group**	**Formation**	**Aquifers and confining units**
Cenozoic	Quaternary	Holocene	Houston	Alluvium	Chicot aquifer
		Pleistocene	Houston	Beaumont Clay	
				Montgomery Formation	
				Bentley Formation	
				Willis Sand	
	Tertiary	Pliocene	Citronelle	Goliad Sand	Evangeline aquifer
		Miocene	Fleming	Fleming Formation	Burkeville confining unit
					Jasper aquifer

Source:
Kasmarek, M.C. and Storm, E.W., 2002. Hydrogeology and Simulation of Ground-Water Flow and Land-Surface Subsidence in the Chicot and Evangeline Aquifers, Houston Area, Texas. U.S. Geological Survey Water Reources Investigation Report 02-4022.

UNION PACIFIC RAILROAD CO.

HOUSTON WOOD PRESERVING WORKS

Figure VI.D

GENERALIZED STRATIGRAPHIC COLUMN OF THE GULF COAST AQUIFER

PROJECT: 1358	BY: AJD	REVISIONS
DATE: OCT., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- A-TZ Monitoring Well Location
- B-CZ/B-TZ Monitoring Well Location
- C-TZ Monitoring Well Location
- D-TZ Monitoring Well Location
- A-TZ Temporary Monitoring Well Location
- CPT with Rost Location
- CPT Location
- Hydropunch Sample Location
- Soil Boring Location
- Soil Affected Property
- Groundwater Affected Property
- A A' Cross Section Location

Note:
* Soil analytical data rejected by validator.

Source:
Base map from ERM-Southwest, Inc APAR Addendum, Fig 3-1, dated June 2004.

N

Approx. Scale in Feet
0 200 400

SWMU/AOC AREAS

No.	Description
SWMU 1	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 4	Recent Process Area
SWMU 5	Original Process Area
SWMU 6	Water Treatment and Boiler System
SWMU 7	Tank Car Storage Area
SWMU 8	Aboveground Storage Tank Area
SWMU 9	Location of Former UST No. 44-023-05
SWMU 10	Location of Former Sap Water Treatment Tank
SWMU 11	Oil/Water Separators
SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
AOC 3	Contaminated Portion of City Water Line
AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21

Note:
Locations of SWMU-9 and AOCs 1, 3, 5 and 7 area approximate.

UNION PACIFIC RAILROAD CO.

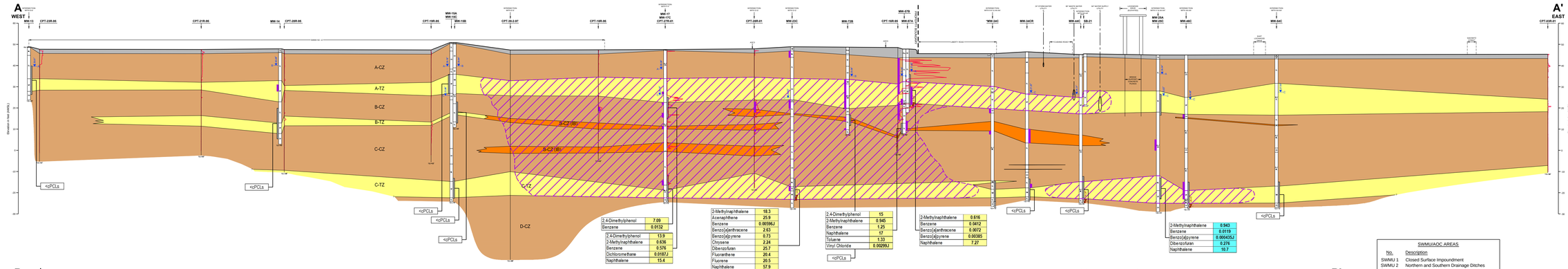
HOUSTON WOOD PRESERVING WORKS

Figure VI.E

CROSS SECTION LOCATION MAP

PROJECT: 1358	BY: AJD	REVISIONS
DATE: SEPT., 2015	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Fill: Sand, Silt, Clay & Gravel, wood fragments, bricks, scrap metal
- Transmissive Zone (TZ): Sand & Silty Sand
- Cohesive Zone (CZ): Clay, Silty Clay & Silt
- B-CZ Interbedded Zone B-CZ (IB): Interbedded Carbonate Seams and Calcareous Nodules with Clay & Silty Clay, within the B-CZ
- Groundwater Affected Property/PCLE Zone
- Elevation of Top of DNAPL (Ft HVD), and Measured DNAPL Thickness in Well (Ft) (July 2014)
- NAPL or Sheen/Staining Noted in Soils for Boring Log, or for CPT/ROST Location
- ROST Result >25% RE

MONITORING WELL CONSTRUCTION

- Boring
- Water Level (Ft HVD) Measured July 2014 (A=ATZ, B=B-CZ/B-TZ, C=C-TZ)
- Well Screen
- Well Sump

ROST LOGS

ROST (% RE) 0 50 100

SWMU/AOC AREAS

No.	Description
SWMU 1	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 4	Recent Process Area
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SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
AOC 3	Contaminated Portion of City Water Line
AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21

Protective Concentration Levels (PCLs)

Parameter	RAL (mg/L)	cPCL (mg/L)
1,2-Dichloroethane	0.005	0.005
2,4-Dimethylphenol	0.49	1.5
2-Methylnaphthalene	0.098	0.29
Acenaphthene	1.5	4.4
Benzene	0.005	0.005
Benzo[a]anthracene	0.0013	0.0028
Benzo[a]pyrene	0.0002	0.0002
Bis(2-Ethylhexyl)phthalate	0.006	0.006
Chrysene	0.13	0.28
Dibenzofuran	0.098	0.29
Dichloromethane	0.005	0.005
Fluoranthene	0.98	2.9
Fluorene	0.98	2.9
Naphthalene	0.49	1.5
Pentachlorophenol	0.001	0.001
Phenanthrene	0.73	2.2
Pyrene	0.73	2.2
Toluene	1	1
Vinyl Chloride	0.002	0.002

Notes:
1. Topography is estimated.
2. See Figure 1B for cross section location.
3. Concentration are in mg/L.
4. Blue and yellow highlighted and bolded concentrations exceed RALs and C/I PCLs, respectively.
5. Utility locations based on drawings provided by the City of Houston Department of Public Works & Engineering.
6. Vertical datum based on City of Houston Monument System (HVD), Ft HVD.
7. Monitoring wells that have been plugged & abandoned, are denoted with an asterisk.

Vertical Exaggeration 5X

100 0 100 200

scale in feet

UNION PACIFIC RAILROAD CO.

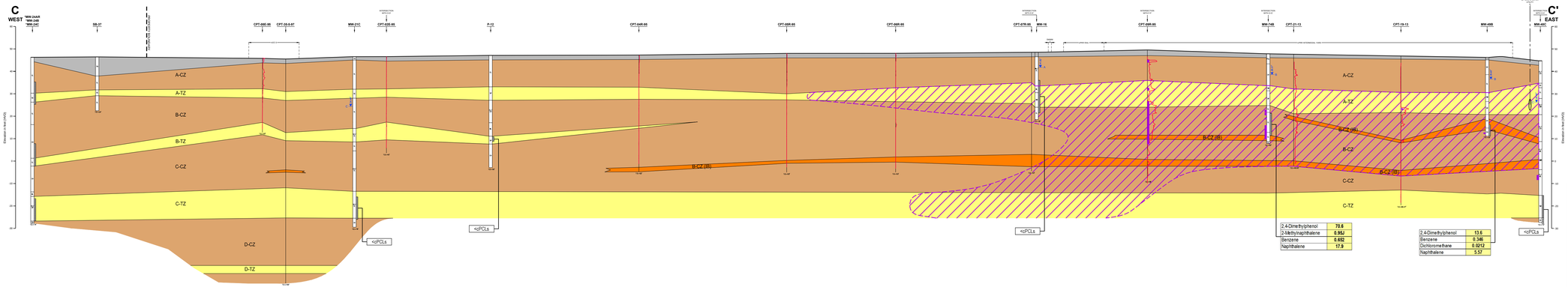
HOUSTON WOOD PRESERVING WORKS

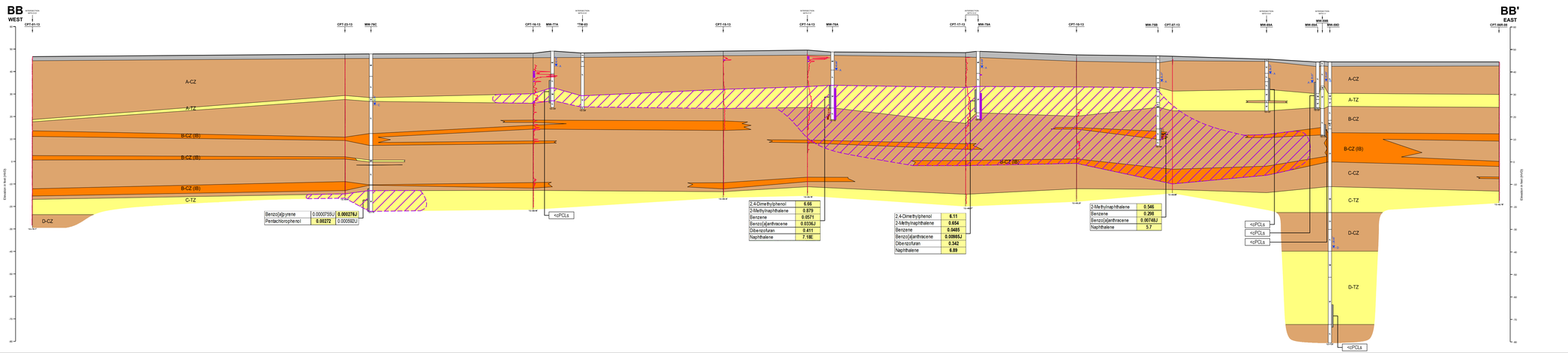
Figure VI.E.1

CROSS SECTIONS A-A' & B-B'

PROJECT: 1358	BY: ADJ	REVISIONS
DATE: OCT., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS





EXPLANATION

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Transmissive Zone (TZ): Sand & Silty Sand

Cohesive Zone (CZ): Clay, Silty Clay & Silt

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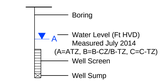
Groundwater Affected Property/PCLE Zone

Elevation of Top of DNAPL (Ft HVD), and Measured DNAPL Thickness in Well (Ft) (July 2014)

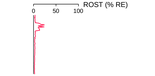
NAPL or Sheen/Staining Noted in Soils for Boring Log, or for CPT/ROST Location

ROST Result >25% RE

MONITORING WELL CONSTRUCTION



ROST LOGS



SWMU/AOC AREAS

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SWMU 1	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 4	Recent Process Area
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AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21

Protective Concentration Levels (PCLs)

Parameter	RAL (mg/L)	cPCL (mg/L)
1,2-Dichloroethane	0.005	0.005
2,4-Dimethylphenol	0.49	1.5
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Acenaphthene	1.5	4.4
Benzene	0.005	0.005
Benzo[a]anthracene	0.0013	0.0028
Benzo[a]pyrene	0.0002	0.0002
Bis(2-Ethylhexyl)phthalate	0.006	0.006
Chrysene	0.13	0.28
Dibenzofuran	0.098	0.29
Dichloromethane	0.005	0.005
Fluoranthene	0.98	2.9
Fluorene	0.98	2.9
Naphthalene	0.49	1.5
Pentachlorophenol	0.001	0.001
Phenanthrene	0.73	2.2
Pyrene	0.73	2.2
Toluene	1	1
Vinyl Chloride	0.002	0.002

Notes:
1. Topography is estimated.
2. See Figure 1B for cross section location.
3. Concentration are in mg/L.
4. Blue and yellow highlighted and bolded concentrations exceed RALs and C/I PCLs, respectively.
5. Utility locations based on drawings provided by the City of Houston Department of Public Works & Engineering.
6. Vertical datum based on City of Houston Monument System (HVD), Ft HVD.
7. Monitoring wells that have been plugged & abandoned, are denoted with an asterisk.

Vertical Exaggeration 5X

100 0 100 200

scale in feet

UNION PACIFIC RAILROAD CO.

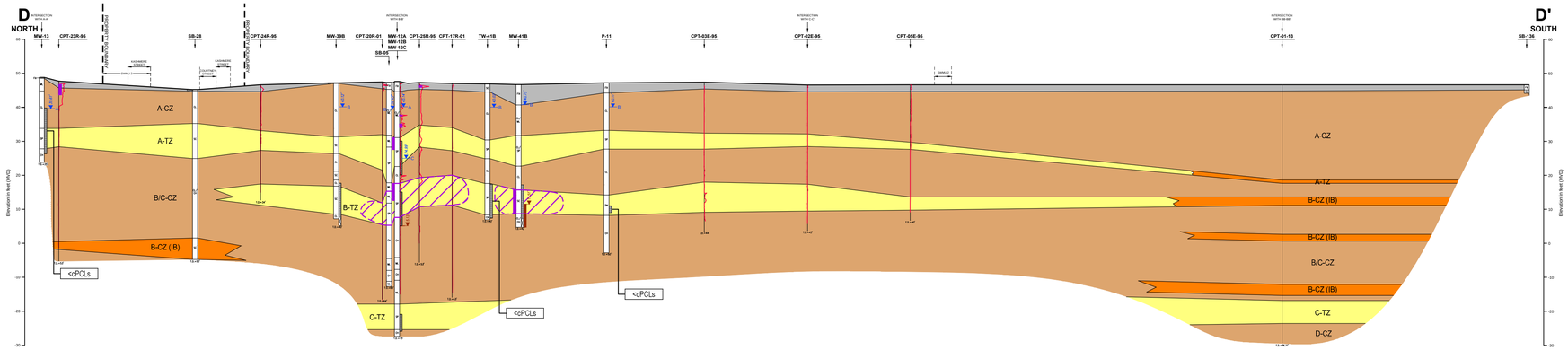
HOUSTON WOOD PRESERVING WORKS

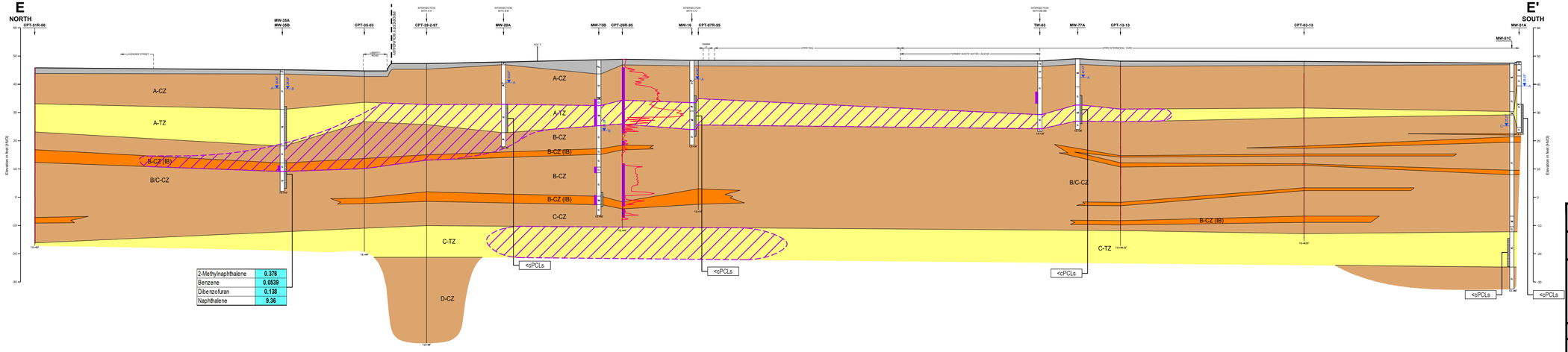
Figure VI.E.2

CROSS SECTIONS C-C' & BB-BB'

PROJECT: 1358	BY: ADJ	REVISIONS
DATE: OCT., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS





2-Methylnaphthalene	0.376
Benzene	0.0539
Dibenzofuran	0.138
Naphthalene	9.36

Protective Concentration Levels (PCLs)

Parameter	RAL (mg/L)	cPCL (mg/L)
1,2-Dichloroethane	0.005	0.005
2,4-Dimethylphenol	0.49	1.5
2-Methylnaphthalene	0.098	0.29
Acenaphthene	1.5	4.4
Benzene	0.005	0.005
Benzo[a]anthracene	0.0013	0.0028
Benzo[a]pyrene	0.0002	0.0002
Bis(2-Ethylhexyl)phthalate	0.006	0.006
Chrysene	0.13	0.28
Dibenzofuran	0.098	0.29
Dichloromethane	0.005	0.005
Fluoranthene	0.98	2.9
Fluorene	0.98	2.9
Naphthalene	0.49	1.5
Pentachlorophenol	0.001	0.001
Phenanthrene	0.73	2.2
Pyrene	0.73	2.2
Toluene	1	1
Vinyl Chloride	0.002	0.002

SWMU/AOC AREAS

No.	Description
SWMU 1	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 4	Recent Process Area
SWMU 5	Original Process Area
SWMU 6	Water Treatment and Boiler System
SWMU 7	Tank Car Storage Area
SWMU 8	Aboveground Storage Tank Area
SWMU 9	Location of Former UST No. 44-023-05
SWMU 10	Location of Former Sap Water Treatment Tank
SWMU 11	Oil/Water Separators
SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
AOC 3	Contaminated Portion of City Water Line
AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21

EXPLANATION

Fill: Sand, Silt, Clay & Gravel, wood fragments, bricks, scrap metal

Transmissive Zone (TZ): Sand & Silty Sand

Cohesive Zone (CZ): Clay, Silty Clay & Silt

B-CZ Interbedded Zone B-CZ (IB): Interbedded Carbonate Seams and Calcareous Nodules with Clay & Silty Clay, within the B-CZ

Groundwater Affected Property/PCLE Zone

Elevation of Top of DNAPL (Ft HVD), and Measured DNAPL Thickness in Well (Ft) (July 2014)

NAPL or Sheen/Staining Noted in Soils for Boring Log, or for CPT/ROST Location ROST Result >25% RE

MONITORING WELL CONSTRUCTION

Boring

Water Level (Ft HVD) Measured July 2014 (A=ATZ, B=B-CZ/B-TZ, C=C-TZ)

Well Screen

Well Sump

ROST LOGS

ROST (% RE)

0 50 100

Notes:

1. Topography is estimated.
2. See Figure 1B for cross section location.
3. Concentration are in mg/L.
4. Blue and yellow highlighted and bolded concentrations exceed RALs and C/I PCLs, respectively.
5. Utility locations based on drawings provided by the City of Houston Department of Public Works & Engineering.
6. Vertical datum based on City of Houston Monument System (HVD), Ft HVD.
7. Monitoring wells that have been plugged & abandoned, are denoted with an asterisk.

Vertical Exaggeration 5X

100 0 100 200

scale in feet

UNION PACIFIC RAILROAD CO.

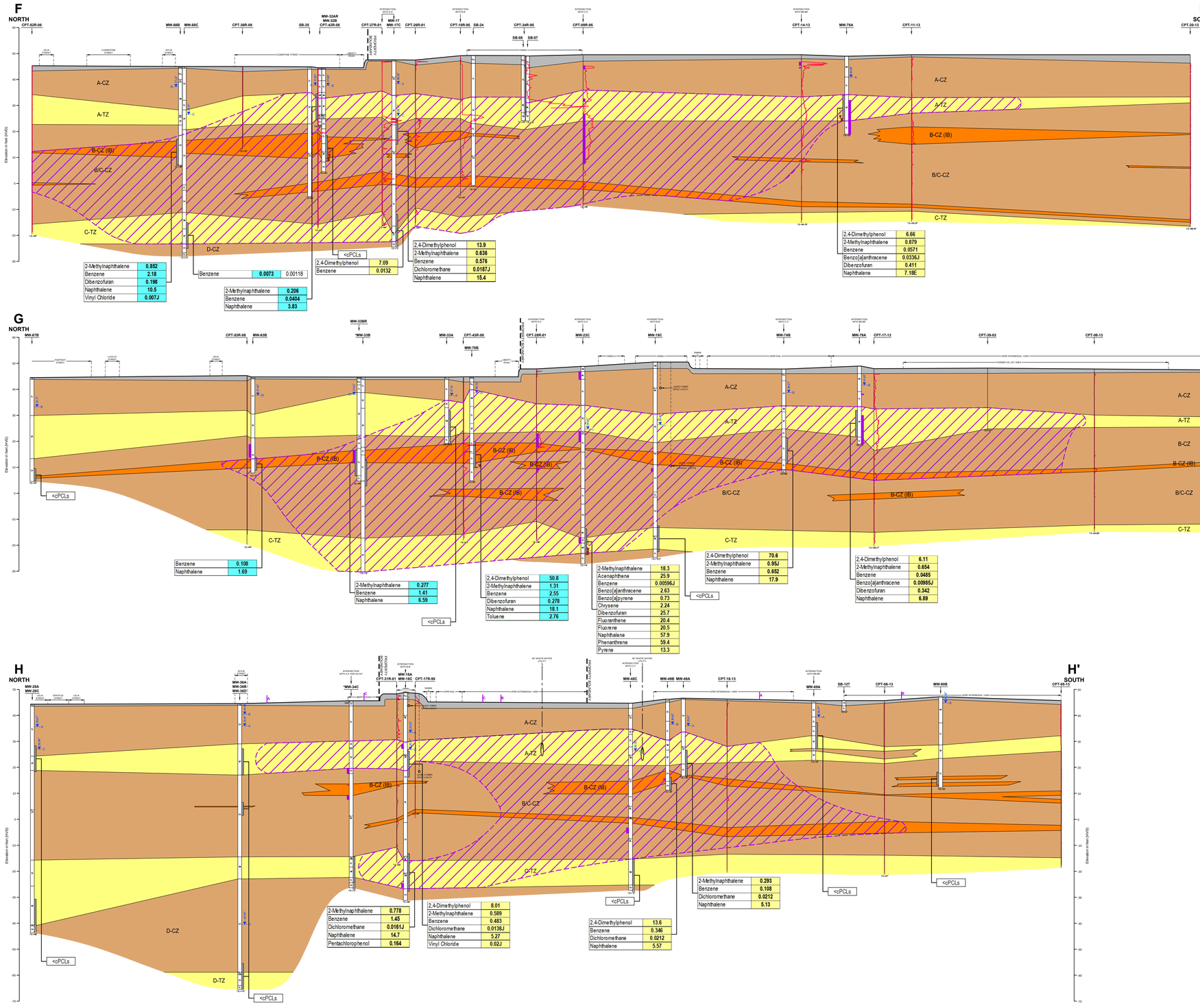
HOUSTON WOOD PRESERVING WORKS

Figure VI.E.3

CROSS SECTIONS D-D' & E-E'

PROJECT: 1358	BY: ADJ	REVISIONS
DATE: OCT., 2014	CHECKED: ECM	

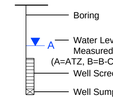
PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



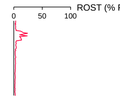
EXPLANATION

- Fill: Sand, Silt, Clay & Gravel, wood fragments, bricks, scrap metal
- Transmissive Zone (TZ): Sand & Silty Sand
- Cohesive Zone (CZ): Clay, Silty Clay & Silt
- B-CZ Interbedded Zone B-CZ (IB): Interbedded Carbonate Seams and Calcareous Nodules with Clay & Silty Clay, within the B-CZ
- Groundwater Affected Property/PCLE Zone
- 22.28' — Elevation of Top of DNAPL (Ft HVD), and Measured DNAPL Thickness in Well (Ft) (July 2014)
- NAPL or Sheen/Staining Noted in Soils for Boring Log, or for CPT/ROST Location ROST Result >25% RE

MONITORING WELL CONSTRUCTION



ROST LOGS



Notes:
1. Topography is estimated.
2. See Figure 1B for cross section location.
3. Concentration are in mg/L.
4. Blue and yellow highlighted and bolded concentrations exceed RALs and C/I PCLs, respectively.
5. Utility locations based on drawings provided by the City of Houston Department of Public Works & Engineering.
6. Vertical datum based on City of Houston Monument System (HVD), Ft HVD.
7. Monitoring wells that have been plugged & abandoned, are denoted with an asterisk.

SWMU/AOC AREAS

No.	Description
SWMU 1	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 4	Recent Process Area
SWMU 5	Original Process Area
SWMU 6	Water Treatment and Boiler System
SWMU 7	Tank Car Storage Area
SWMU 8	Aboveground Storage Tank Area
SWMU 9	Location of Former UST No. 44-023-05
SWMU 10	Location of Former Sap Water Treatment Tank
SWMU 11	Oil/Water Separators
SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
AOC 3	Contaminated Portion of City Water Line
AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21

Protective Concentration Levels (PCLs)

Parameter	RAL (mg/L)	cPCL (mg/L)
1,2-Dichloroethane	0.005	0.005
2,4-Dimethylphenol	0.49	1.5
2-Methylnaphthalene	0.098	0.29
Acenaphthene	1.5	4.4
Benzene	0.005	0.005
Benzo[a]anthracene	0.0013	0.0028
Benzo[a]pyrene	0.0002	0.0002
Bis(2-Ethylhexyl)phthalate	0.006	0.006
Chrysene	0.13	0.28
Dibenzofuran	0.098	0.29
Dichloromethane	0.005	0.005
Fluoranthene	0.98	2.9
Fluorene	0.98	2.9
Naphthalene	0.49	1.5
Pentachlorophenol	0.001	0.001
Phenanthrene	0.73	2.2
Pyrene	0.73	2.2
Toluene	1	1
Vinyl Chloride	0.002	0.002

Vertical Exaggeration 5X

100 0 100 200

scale in feet

UNION PACIFIC RAILROAD CO.

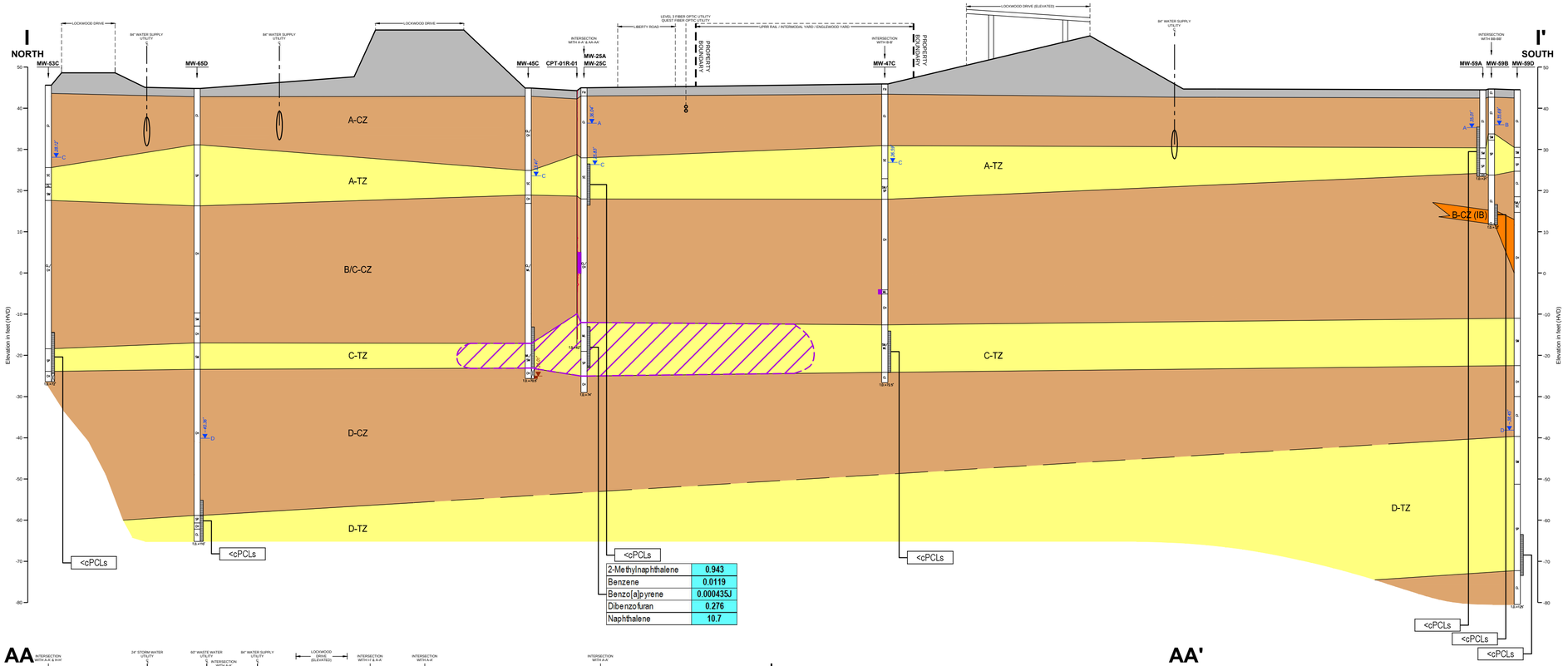
HOUSTON WOOD PRESERVING WORKS

Figure VI.E.4

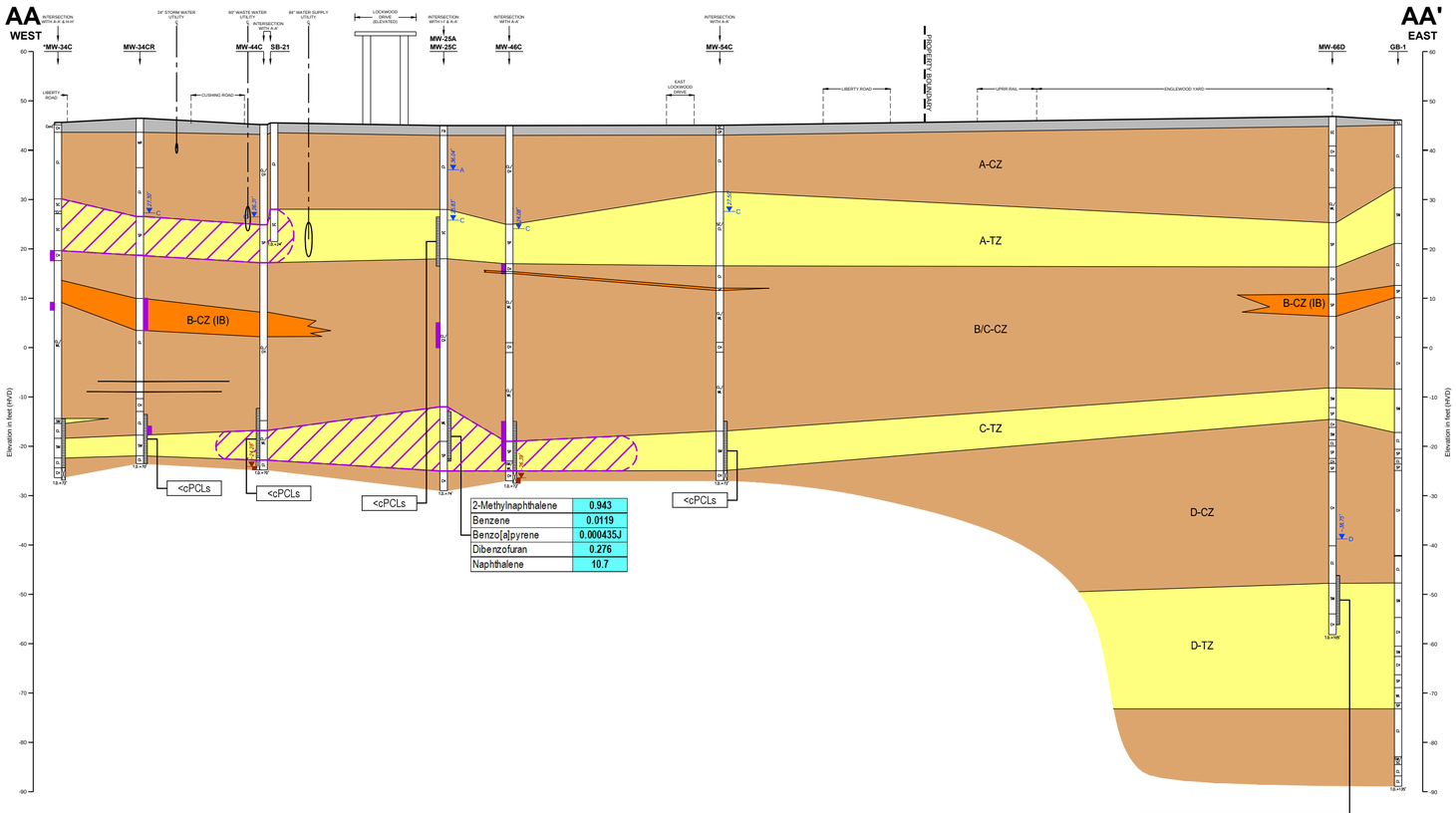
CROSS SECTIONS F-F', G-G' & H-H'

PROJECT: 1358	BY: ADJ	REVISIONS
DATE: OCT., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



2-Methylnaphthalene	0.943
Benzene	0.0119
Benzo[a]pyrene	0.000435J
Dibenzofuran	0.276
Naphthalene	10.7



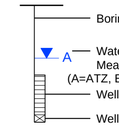
2-Methylnaphthalene	0.943
Benzene	0.0119
Benzo[a]pyrene	0.000435J
Dibenzofuran	0.276
Naphthalene	10.7

Benzo[a]pyrene	0.000436J	0.000439J

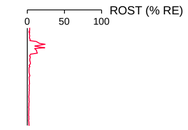
EXPLANATION

- Fill: Sand, Silt, Clay & Gravel, wood fragments, bricks, scrap metal
- Transmissive Zone (TZ): Sand & Silty Sand
- Cohesive Zone (CZ): Clay, Silty Clay & Silt
- B-CZ Interbedded Zone B-CZ (IB): Interbedded Carbonate Seams and Calcareous Nodules with Clay & Silty Clay, within the B-CZ
- Groundwater Affected Property/PCLE Zone
- -22.28 — Elevation of Top of DNAPL (Ft HVD), and Measured DNAPL Thickness in Well (Ft) (July 2014)
- NAPL or Sheen/Staining Noted in Soils for Boring Log, or for CPT/ROST Location ROST Result >25% RE

MONITORING WELL CONSTRUCTION



ROST LOGS



Notes:
1. Topography is estimated.
2. See Figure 1B for cross section location.
3. Concentration are in mg/L.
4. Blue and yellow highlighted and bolded concentrations exceed RALs and C/I PCLs, respectively.
5. Utility locations based on drawings provided by the City of Houston Department of Public Works & Engineering.
6. Vertical datum based on City of Houston Monument System (HVD), Ft HVD.
7. Monitoring wells that have been plugged & abandoned, are denoted with an asterisk.

Protective Concentration Levels (PCLs)

Parameter	RAL (mg/L)	cPCL (mg/L)
1,2-Dichloroethane	0.005	0.005
2,4-Dimethylphenol	0.49	1.5
2-Methylnaphthalene	0.098	0.29
Acenaphthene	1.5	4.4
Benzene	0.005	0.005
Benzo[a]anthracene	0.0013	0.0028
Benzo[a]pyrene	0.0002	0.0002
Bis(2-Ehylhexyl)phthalate	0.006	0.006
Chrysene	0.13	0.28
Dibenzofuran	0.098	0.29
Dichloromethane	0.005	0.005
Fluoranthene	0.98	2.9
Fluorene	0.98	2.9
Naphthalene	0.49	1.5
Pentachlorophenol	0.001	0.001
Phenanthrene	0.73	2.2
Pyrene	0.73	2.2
Toluene	1	1
Vinyl Chloride	0.002	0.002

Vertical Exaggeration 5X

100 0 100 200

scale in feet

SWMU/AOC AREAS

No.	Description
SWMU 1	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 4	Recent Process Area
SWMU 5	Original Process Area
SWMU 6	Water Treatment and Boiler System
SWMU 7	Tank Car Storage Area
SWMU 8	Aboveground Storage Tank Area
SWMU 9	Location of Former UST No. 44-023-05
SWMU 10	Location of Former Sap Water Treatment Tank
SWMU 11	Oil/Water Separators
SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
AOC 3	Contaminated Portion of City Water Line
AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21

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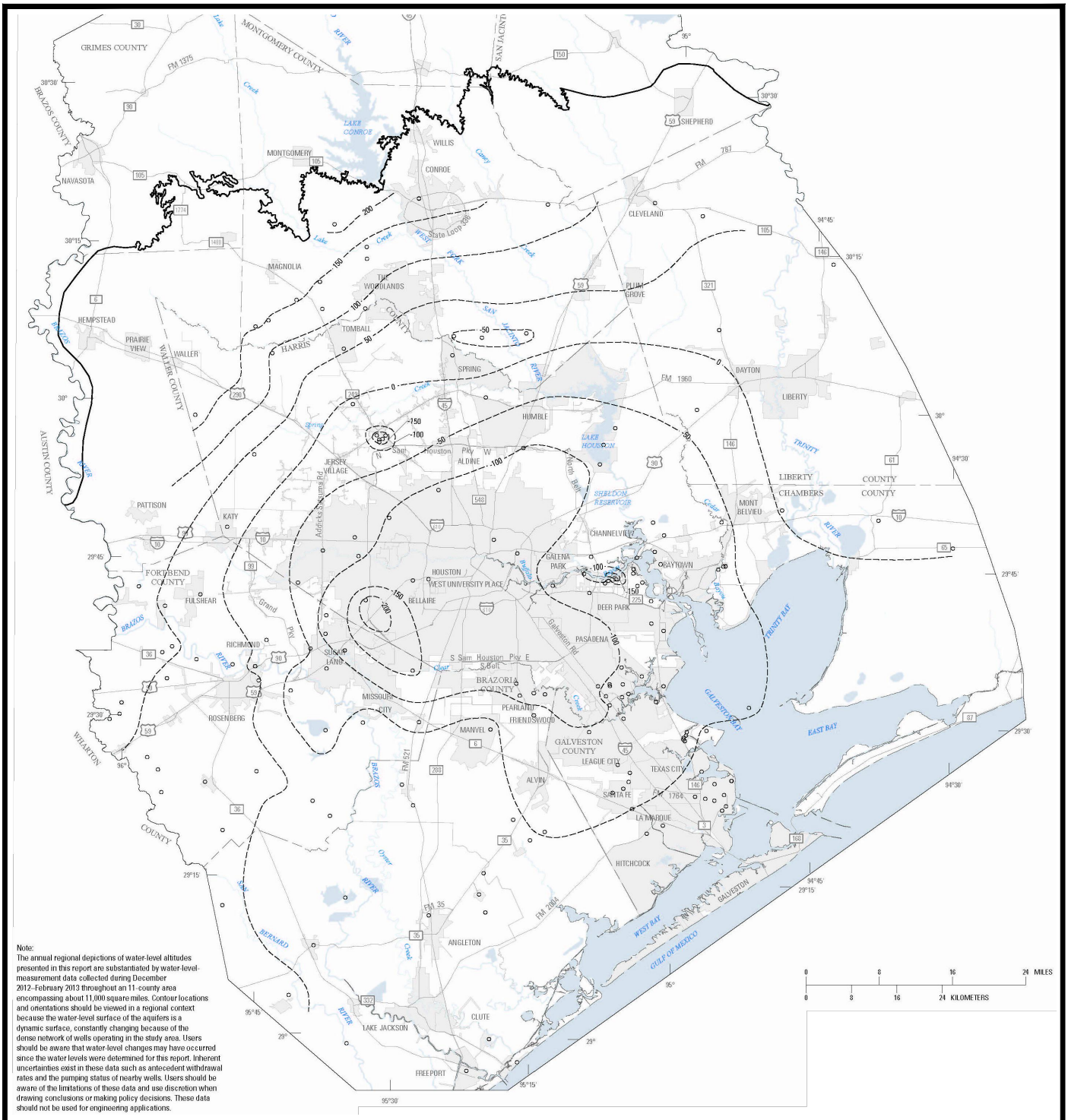
HOUSTON WOOD PRESERVING WORKS

Figure VI.E.5

CROSS SECTIONS I-I' & AA-AA'

PROJECT: 1358	BY: ADJ	REVISIONS
DATE: OCT., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



Note:
The annual regional depictions of water-level altitudes presented in this report are substantiated by water-level-measurement data collected during December 2012–February 2013 throughout an 11-county area encompassing about 11,000 square miles. Contour locations and orientations should be viewed in a regional context because the water-level surface of the aquifers is a dynamic surface, constantly changing because of the dense network of wells operating in the study area. Users should be aware that water-level changes may have occurred since the water levels were determined for this report. Inherent uncertainties exist in these data such as antecedent withdrawal rates and the pumping status of nearby wells. Users should be aware of the limitations of these data and use discretion when drawing conclusions or making policy decisions. These data should not be used for engineering applications.

EXPLANATION

---- -50 ---- **Water-level contour**—Shows altitude at which water level would have stood in tightly cased well. Contour intervals 50 and 100 feet. Datum is North American Vertical Datum of 1988

Boundary of study area

Updip limit of Chicot aquifer (Baker, 1979; University of Texas, Bureau of Economic Geology, 1968)

Data point—Well in which water-level measurement was made. One point can represent more than one well

Source:
Kasmarek, M.C., Johnson, M.R., and Ramage, J.K., 2013. Water-level altitudes 2013 and water-level changes in the Chicot, Evangeline, and Jasper aquifers and compaction 1973-2012 in the Chicot and Evangeline aquifers, Houston-Galveston region, Texas. U.S. Geological Survey Scientific Investigation Map 3263, 19 p., 16 sheets.

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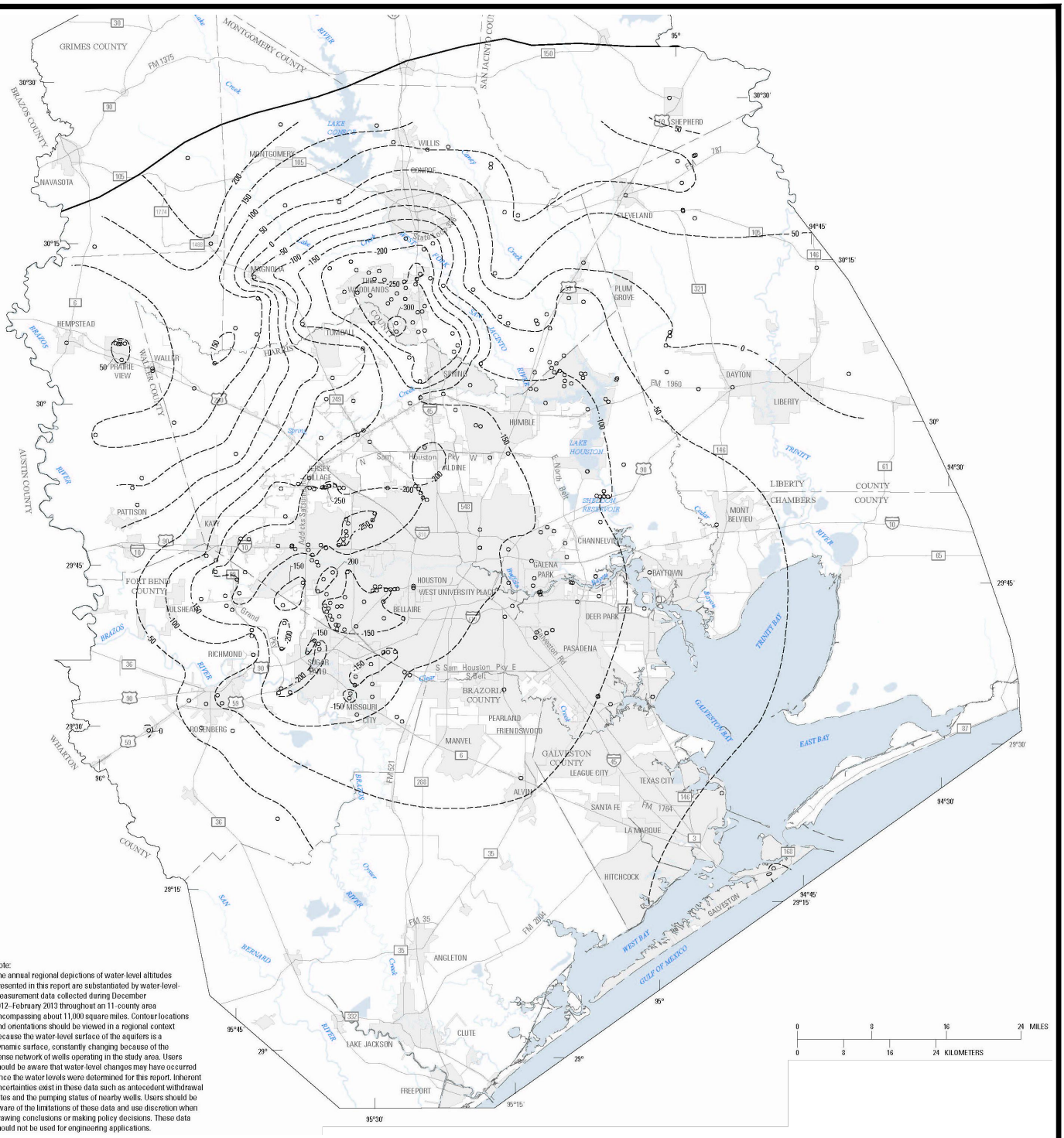
HOUSTON WOOD PRESERVING WORKS

Figure VI.F.1

APPROXIMATE 2013 WATER-LEVEL ALTITUDES IN THE CHICOT AQUIFER

PROJECT: 1358	BY: AJD	REVISIONS
DATE: OCT., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



Note:
The annual regional depictions of water-level altitudes presented in this report are substantiated by water-level-measurement data collected during December 2012–February 2013 throughout an 11-county area encompassing about 11,000 square miles. Contour locations and orientations should be viewed in a regional context because the water-level surface of the aquifers is a dynamic surface, constantly changing because of the dense network of wells operating in the study area. Users should be aware that water-level changes may have occurred since the water levels were determined for this report. Inherent uncertainties exist in these data such as antecedent withdrawal rates and the pumping status of nearby wells. Users should be aware of the limitations of these data and use discretion when drawing conclusions or making policy decisions. These data should not be used for engineering applications.

EXPLANATION

- 200 — **Water-level contour**—Shows altitude at which water level would have stood in tightly cased well. Contour interval 50 feet. Datum is North American Vertical Datum of 1988
- **Boundary of study area**
- **Updip limit of Evangeline aquifer (Baker, 1979)**
- **Data point**—Well in which water-level measurement was made. One point can represent more than one well

Source:
Kasmarek, M.C., Johnson, M.R., and Ramage, J.K., 2013. Water-level altitudes 2013 and water-level changes in the Chicot, Evangeline, and Jasper aquifers and compaction 1973-2012 in the Chicot and Evangeline aquifers, Houston-Galveston region, Texas. U.S. Geological Survey Scientific Investigation Map 3263, 19 p., 16 sheets.

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HOUSTON WOOD PRESERVING WORKS

Figure VI.F.2

APPROXIMATE 2013 WATER-LEVEL ALTITUDES IN THE EVANGELINE AQUIFER

PROJECT: 1358	BY: AJD	REVISIONS
DATE: OCT., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

- Burkeville confining system (basal part of Fleming Formation, area of little or no recharge)
- Recharge area of the Evangeline aquifer system (includes the landward Willis Formation and coastward part of Fleming Formation)
- Recharge area of the Chicot aquifer system (includes Montgomery and Bentley Formations and coastward Willis Formation)
- Beaumont Clay (area of little or no recharge)
- Coastward extent of incision in the Beaumont Clay

SOURCE:
Department of the Interior, United States Geological Survey, Report 77-754, R.K. Gabrysch, November 1977.

UNION PACIFIC RAILROAD CO.

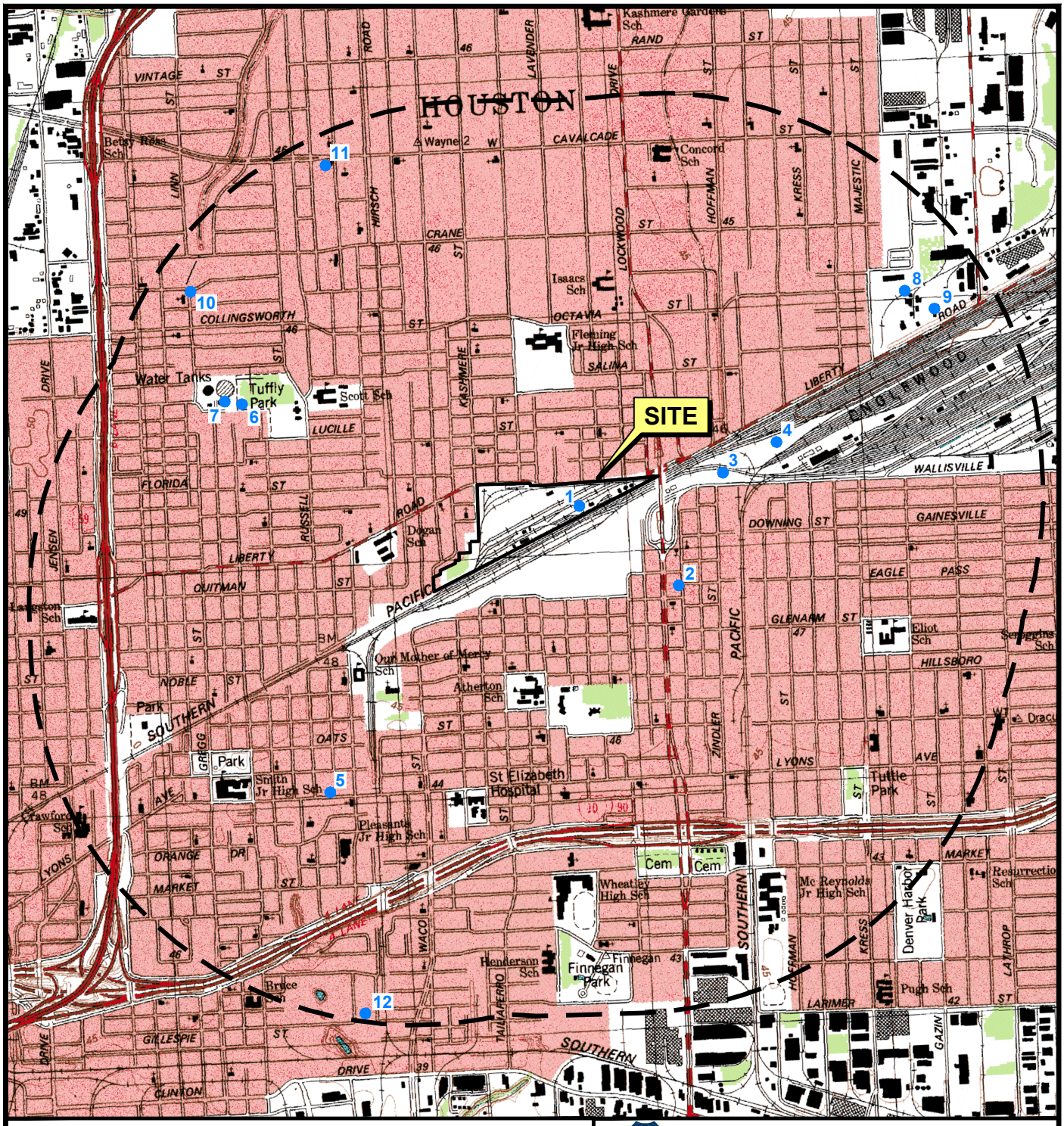
HOUSTON WOOD PRESERVING WORKS

Figure VI.G

APPROXIMATE RECHARGE AREAS OF THE CHICOT AND EVANGELINE AQUIFERS

PROJECT: 1358	BY: AJD	REVISIONS
DATE: OCT., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

1 ● Water Well Location

Note:
Water well inventory within 1 mile of Site (Banks, 2014).

QUADRANGLE LOCATION

Scale in Feet
0 1000 2000

SOURCE:
Base map from www.tnris.gov, Settegast, TX 7.5 min. USGS quadrangle dated 1982.

UNION PACIFIC RAILROAD CO.

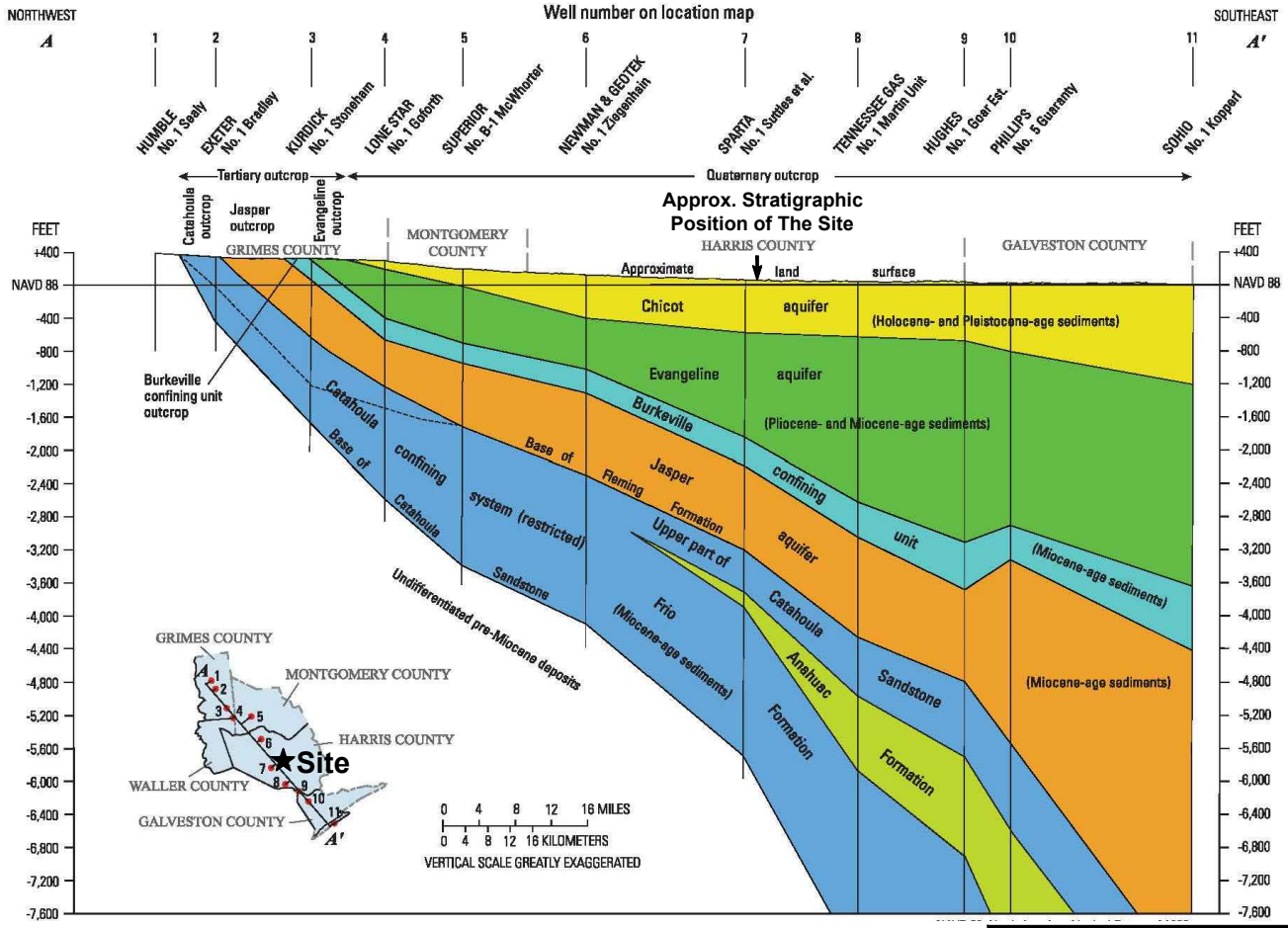
HOUSTON WOOD PRESERVING WORKS

Figure VI.H

WATER WELL MAP

PROJECT: 1358	BY: AJD	REVISIONS
DATE: NOV., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



Source: modified from Baker, 1979.

UNION PACIFIC RAILROAD CO.

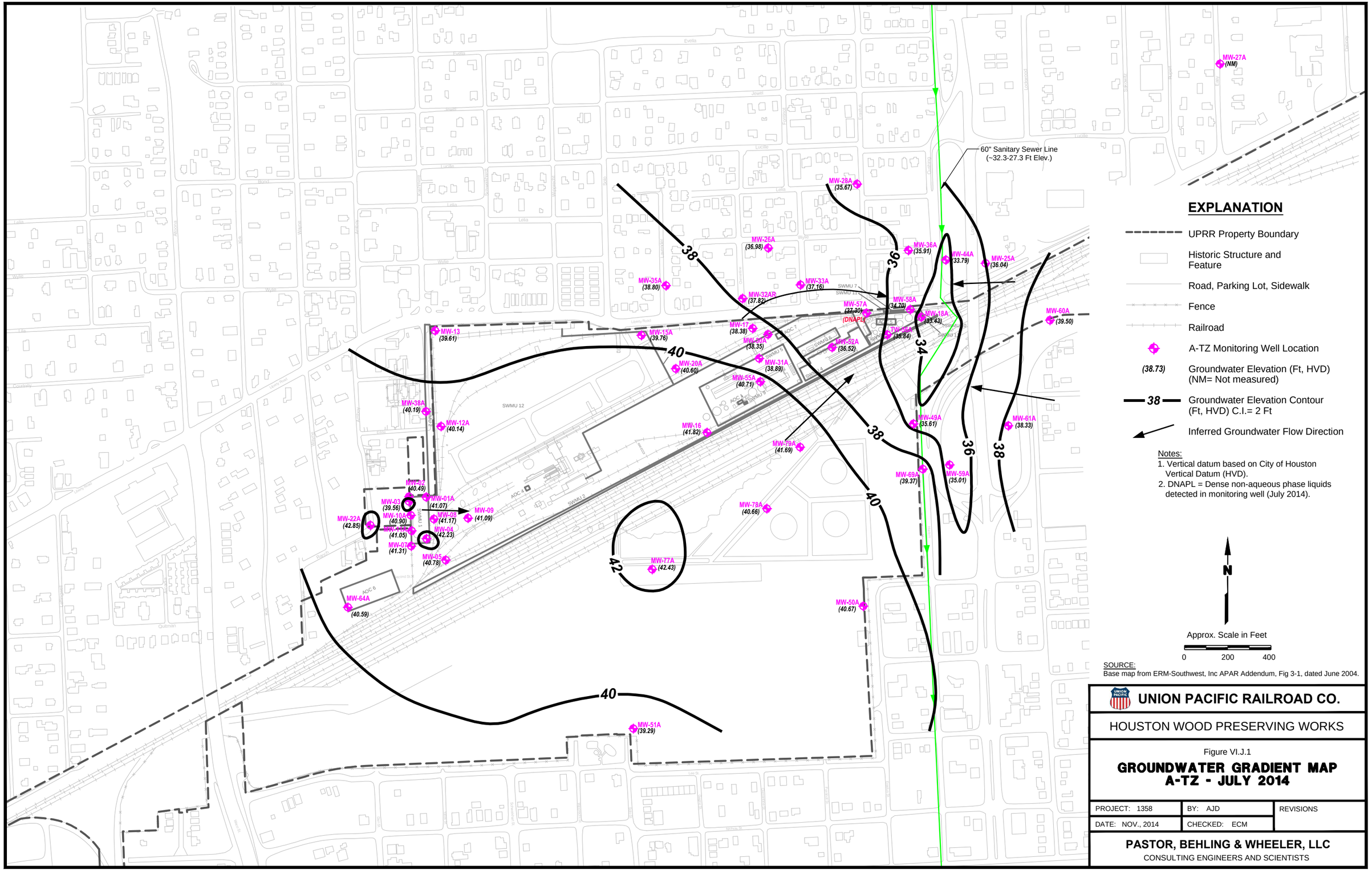
HOUSTON WOOD PRESERVING WORKS

Figure VI.I

HYDROGEOLOGIC CROSS SECTION OF THE GULF COAST AQUIFER SYSTEM IN HARRIS COUNTY

PROJECT: 1358	BY: AJD	REVISIONS
DATE: OCT., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- A-TZ Monitoring Well Location
- *(38.73)* Groundwater Elevation (Ft, HVD) (NM= Not measured)
- *38* Groundwater Elevation Contour (Ft, HVD) C.I.= 2 Ft
- Inferred Groundwater Flow Direction

Notes:

1. Vertical datum based on City of Houston Vertical Datum (HVD).
2. DNAPL = Dense non-aqueous phase liquids detected in monitoring well (July 2014).

N

Approx. Scale in Feet

0 200 400

SOURCE:
Base map from ERM-Southwest, Inc APAR Addendum, Fig 3-1, dated June 2004.

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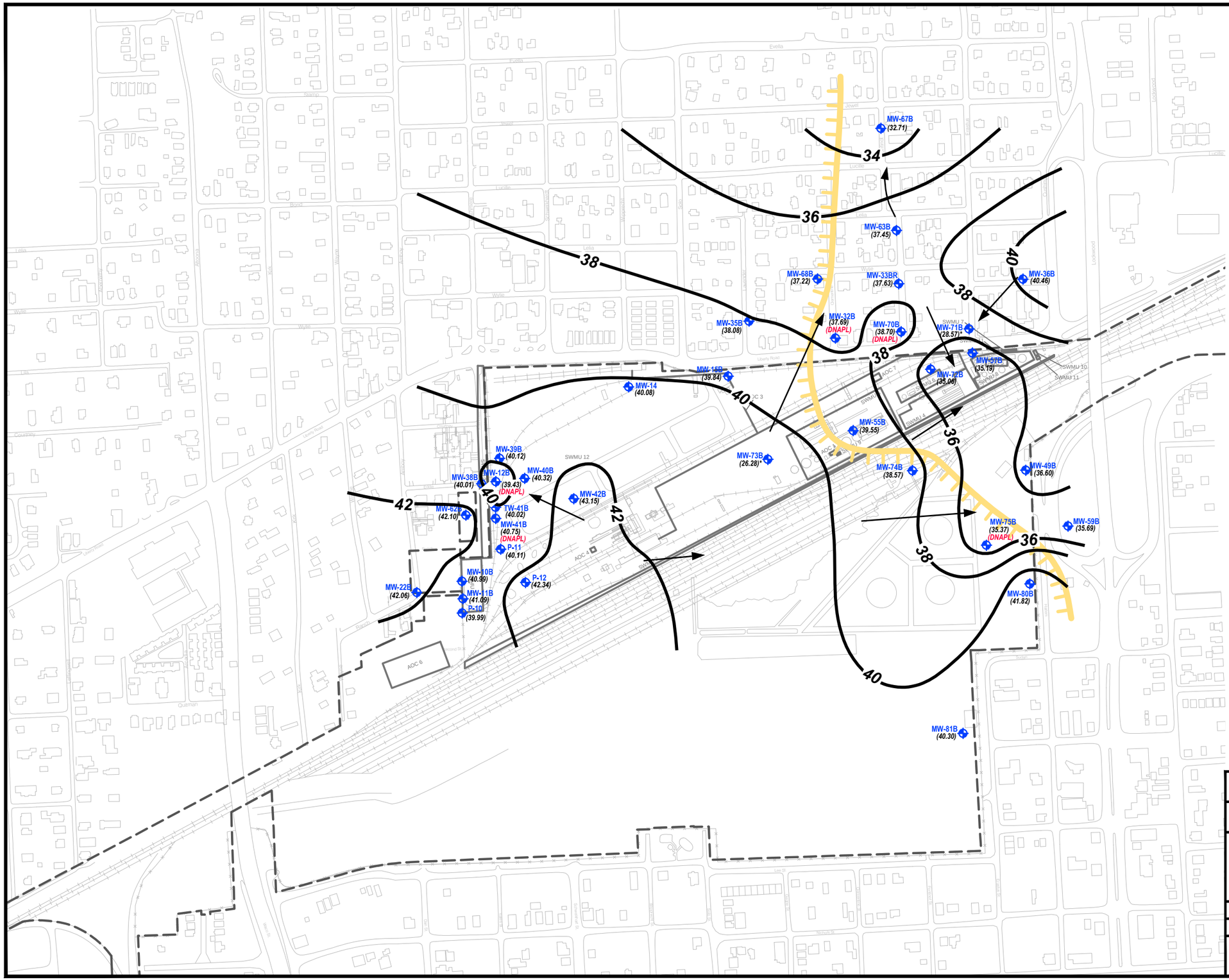
HOUSTON WOOD PRESERVING WORKS

Figure VI.J.1

GROUNDWATER GRADIENT MAP A-TZ - JULY 2014

PROJECT: 1358	BY: AJD	REVISIONS
DATE: NOV., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- B-TZ Monitoring Well Location
- B-CZ / B-TZ Boundary
- (39.98) Groundwater Elevation (Ft, HVD) (NM= Not measured) (* Not used for contour)
- 36 Groundwater Elevation Contour (Ft, HVD) C.I.= 2 Ft (Dashed where inferred)
- Inferred Groundwater Flow Direction

Notes:
1. Vertical datum based on City of Houston Vertical Datum (HVD).
2. DNAPL = Dense non-aqueous phase liquids detected in monitoring well (July 2014).

N

Approx. Scale in Feet

0 200 400

SOURCE:
Base map from ERM-Southwest, Inc APAR Addendum, Fig 3-1, dated June 2004.

UNION PACIFIC RAILROAD CO.

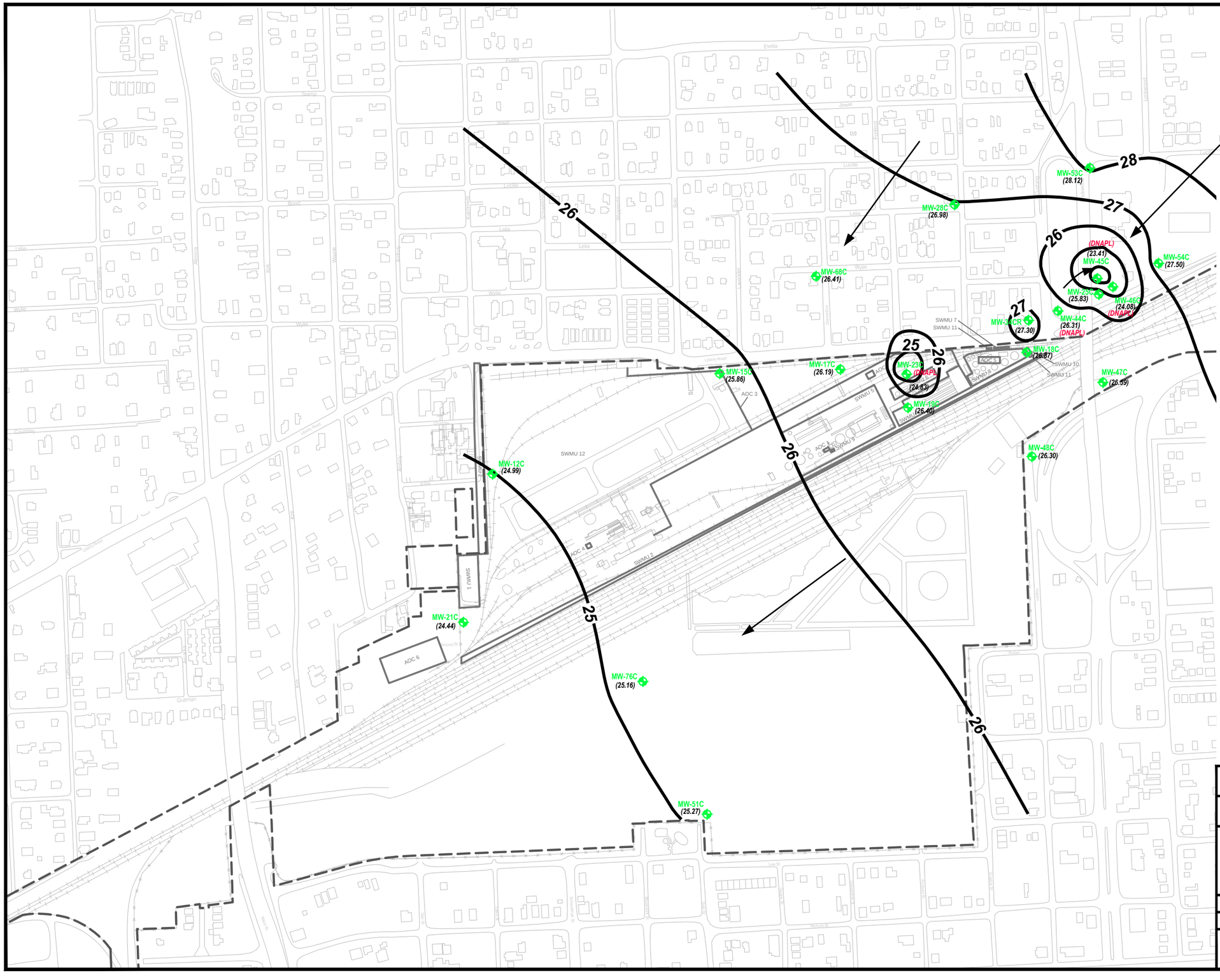
HOUSTON WOOD PRESERVING WORKS

Figure VI.J.2

GROUNDWATER GRADIENT MAP B-TZ AND B-CZ - JULY 2014

PROJECT: 1358	BY: AJD	REVISIONS
DATE: NOV., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- C-TZ Monitoring Well Location
- *(26.04)* Groundwater Elevation (Ft, HVD) (NM = Not Measured)
- 26 Groundwater Elevation Contour (Ft, HVD) C.I.= 1 Ft
- Inferred Groundwater Flow Direction

Notes:
1. Vertical datum based on City of Houston Vertical Datum (HVD).
2. DNAPL = Dense non-aqueous phase liquids detected in monitoring well (July 2014).

N

Approx. Scale in Feet

0 200 400

SOURCE:
Base map from ERM-Southwest, Inc APAR Addendum, Fig 3-1, dated June 2004.

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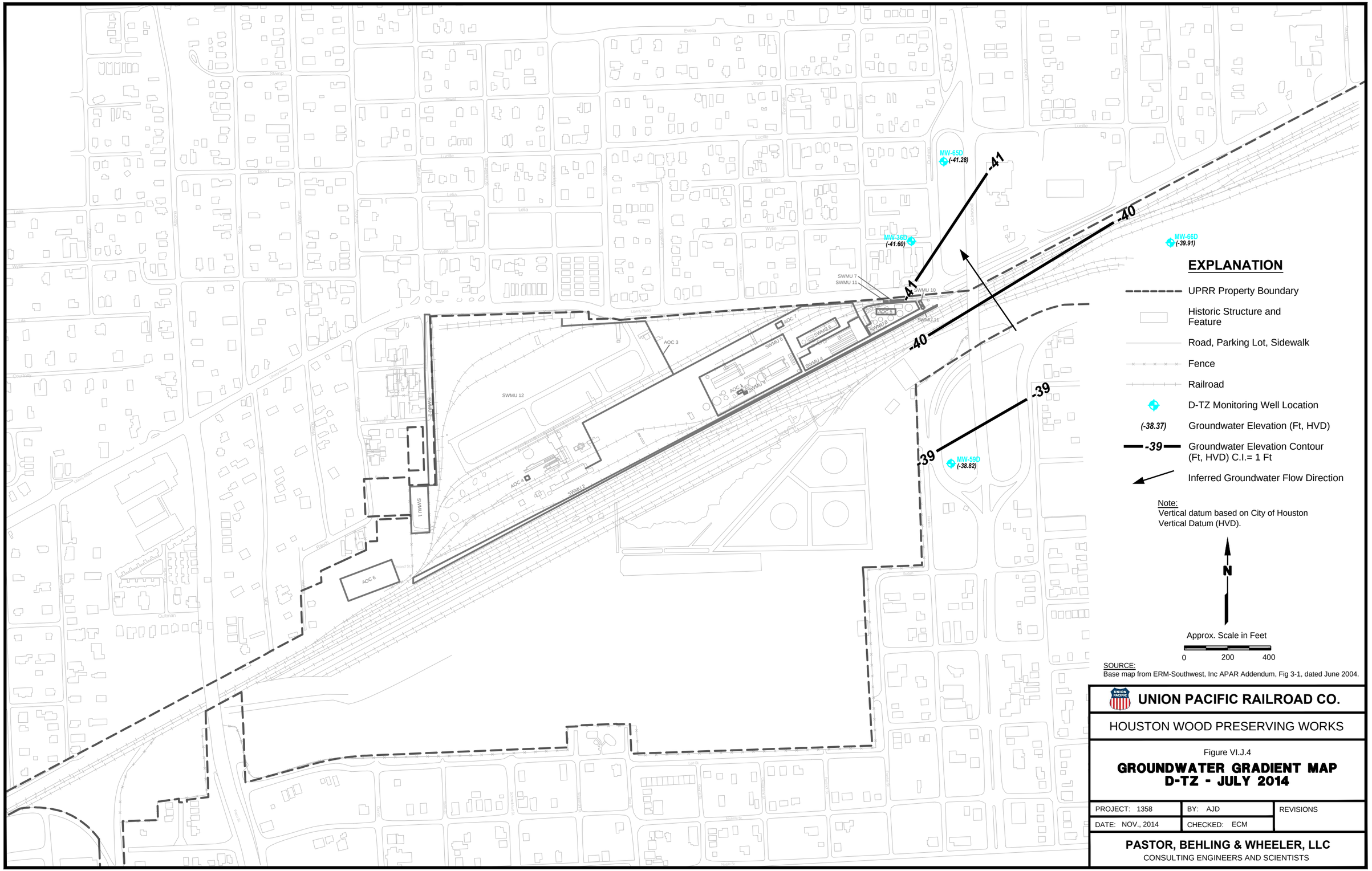
HOUSTON WOOD PRESERVING WORKS

Figure VI.J.3

GROUNDWATER GRADIENT MAP C-TZ - JULY 2014

PROJECT: 1358	BY: AJD	REVISIONS
DATE: NOV., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS


MW-65D
(-41.28)
MW-36D
(-41.60)
MW-66D
(-39.91)
MW-59D
(-38.82)
-41
-40
-39
SWMU 7
SWMU 11
SWMU 10
SWMU 8
SWMU 9
SWMU 6
SWMU 5
SWMU 4
SWMU 3
SWMU 2
SWMU 1
SWMU 12
AOC 1
AOC 2
AOC 3
AOC 4
AOC 5
AOC 6
AOC 7
EXPLANATION
UPRR Property Boundary
Historic Structure and Feature
Road, Parking Lot, Sidewalk
Fence
Railroad
D-TZ Monitoring Well Location
(-38.37) Groundwater Elevation (Ft, HVD)
-39 Groundwater Elevation Contour (Ft, HVD) C.I.= 1 Ft
Inferred Groundwater Flow Direction
Note:
Vertical datum based on City of Houston Vertical Datum (HVD).
N
Approx. Scale in Feet
0
200
400
SOURCE:
Base map from ERM-Southwest, Inc APAR Addendum, Fig 3-1, dated June 2004.
UNION PACIFIC RAILROAD CO.
HOUSTON WOOD PRESERVING WORKS
Figure VI.J.4
GROUNDWATER GRADIENT MAP
D-TZ - JULY 2014
PROJECT: 1358
BY: AJD
REVISIONS
DATE: NOV., 2014
CHECKED: ECM
PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

APPENDICIES

Appendix VI.A

SITE CHRONOLOGY

Houston Wood Preserving Works
Houston, Texas

CHRONOLOGY

Below is a summary of the Site investigation and regulatory chronology at the UPRR Former Houston Wood Preserving Works facility (the Site).

Date	Description
November 2015	Union Pacific Railroad (UPRR) receives the Texas Commission on Environmental Quality (TCEQ) letter dated November 5, 2015 detailing the agency's review of the September 18, 2015 submittal titled Additional Information for Clean Closure Equivalence Demonstration. The TCEQ Industrial and Hazardous Waste (I&HW) Permits Section was unable to accept the request for discontinuing post-closure care of the former surface impoundment, Solid Waste Management Unit (SWMU) 1.
November 2015	Meeting with UPRR, Pastor, Behling & Wheeler (PBW), and the TCEQ on November 4, 2015 discussing the October 23, 2015 technical comment letter from the TCEQ.
October 2015	UPRR receives additional technical comments from the TCEQ in a letter dated October 23, 2015 on the Response Action Plan (RAP) regarding the Plume Management Zones and Technical Impracticability Demonstration provided in the Response Action Plan.
September 2015	PBW submits to the TCEQ the Additional Information for Clean Closure Equivalence Demonstration dated September 18, 2015 that included historical data and letters from 1983, 1984, and 1991 to demonstrate clean closure of the soils under the former surface impoundment (SWMU 1). The letter also included a request to cease the post-closure care for SWMU 1.
August 2015	UPRR receives Technical Notice of Deficiency (NOD) Letter dated August 5, 2015 on the RCRA Part A and B Permit Renewal Application and Response Action Plan from the TCEQ.
July 2015	PBW submits to the TCEQ the Corrective Action Monitoring Report: 2015 First Semi-Annual Event dated July 16, 2015; PBW conducts 2015 second semi-annual groundwater monitoring event for the SWMU No. 1.
April 2015	PBW submits to the TCEQ newspaper tear sheets and affidavits that public notice was published in English and Spanish in the Houston Chronicle on April 2 and La Subasta on March 31, respectively as required once the RCRA Permit Renewal/Compliance Plan with Major Amendment was administratively complete.
March 2015	TCEQ issues a letter dated March 13, 2015 declaring the RCRA Permit Renewal/Compliance Plan with Major Amendment was administratively complete on March 13, 2015.
February 2015	PBW submits a response letter to the TCEQ dated February 13, 2015 for the TCEQ Administrative NOD on the RCRA Part A and B Permit Renewal Application.

Date	Description
January 2015	PBW submits to the TCEQ the Corrective Action Monitoring Report: 2014 Second Semi-Annual Event dated January 15, 2015; PBW conducts 2015 first semi-annual groundwater monitoring event for the SWMU No. 1.
December 2014	UPRR submits the RCRA Part A and B Permit Renewal Application with Response Action Plan (RAP) to the TCEQ dated December 10, 2014. UPRR receives the TCEQ Administrative NOD Letter dated December 17, 2014.
November 2014	RCRA Permit Pre-Application Meeting with UPRR, PBW, and TCEQ dated November 6, 2014.
September 2014	Union Pacific Railroad (UPRR) holds public meeting with residents near the Site to detail institutional controls for off-site groundwater Plume Management Zone (PMZ).
July/August 2014	Pastor, Behling & Wheeler, LLC (PBW) conducts site-wide groundwater sampling event.
May 2014	PBW oversees installation of seven new monitoring wells (MW-51C, MW-76C, MW-77A, MW-78A, MW-79A, MW-80B, and MW-81B) in the Englewood Intermodal Yard to evaluate DNAPL extent and extent of chemicals of concern (COCs) in the B-CZ unit to the southeast, and one replacement well MW-34CR to replace MW-34C. Soil samples also collected from City of Houston right of way (ROW) along north perimeter of the Site.
January 2014	PBW conducts site-wide groundwater sampling event.
July 2013	PBW conducts site-wide groundwater sampling event.
February/March 2013	Pastor, Behling & Wheeler, LLC (PBW) conducts cone penetrometer testing (CPT)/rapid optical screening tool (ROST) and soil investigation at the Englewood Intermodal Yard adjacent to the UPRR Houston Wood Preserving Works (HWPW) site.
January/February 2013	PBW conducts site-wide groundwater sampling event (95 wells). PBW submits Proposed DNAPL Recovery Pilot Test letter to Texas Commission on Environmental Quality (TCEQ) dated February 5, 2013, and initiates monthly dense non-aqueous phase liquid (DNAPL) recovery from on-site and off-site wells (10-12 wells) (planned for 24 months).
November 2012	Meet with TCEQ regarding proposed CPT/ROST investigation of Englewood Intermodal Yard based on DNAPL detected from the December 2011 investigation.
July 2012	PBW conducts site-wide groundwater sampling event.
January 2012	PBW conducts site-wide groundwater sampling event.

Date	Description
July 2012	PBW conducts site-wide groundwater sampling event.
December 2011	PBW installs additional monitoring wells in the cohesive zone B-CZ to evaluate extent of DNAPL in the B-CZ.
July 2011	PBW conducts site-wide groundwater sampling event.
April 2011	TCEQ approves the Affected Property Assessment Report (APAR) (including updates and addendums).
March 2011	PBW submits the Revised Updated APAR Addendum to the TCEQ. UPRR repairs fence around site.
January 2011	PBW conducts site-wide groundwater sampling event.
December 2010/ January 2011	UPRR/PBW submits Off-Site Notification Letters to off-site properties indicating Notice of Information Availability for the site, as required with the submittal of the Updated APAR Addendum (Oct 2012) .
October 22, 2010	PBW submits the Updated APAR Addendum to the TCEQ.
June/July 2010	PBW conducts additional soil (along northeast portion of Site) and groundwater investigation (A-TZ, B-CZ, C-TZ and D-TZ wells); including site-wide groundwater monitoring event.
February 16, 2010	UPRR Response to TCEQ Comment Letter dated November 18, 2009.
January 2010	PBW conducts site-wide groundwater sampling event; selected wells are analyzed for Volatile Organic Compounds (VOCs) by EPA Method 8620.
November 18, 2009	TCEQ Comment Letter on Revised APAR.
July 2009	PBW submits APAR Addendum to TCEQ.
January 2009	PBW conducts additional soil and groundwater investigation.
July 2008	PBW conducts additional CPT-ROST and groundwater investigation
January 2007	PBW conducts additional soil and groundwater investigation
August 2006	ERM-Southwest, Inc. (ERM) conducted additional soil and groundwater investigation
April 2006	ERM conducted additional soil and groundwater investigation
September 6, 2005	UPRR Response to TCEQ Response Letter dated August 1, 2005
August 2005	TCEQ Response to UPRR Response Letter dated June 9, 2005

Date	Description
June 9, 2005	UPRR Response to TCEQ Letter dated April 15, 2005
April 15, 2005	TCEQ Response to UPRR Response Letter dated November 19, 2004
November 19, 2004	UPRR Response to October 8, 2004 TCEQ Letter
October 8, 2004	TCEQ Comment Letter on Revised APAR
June 10, 2004	Revised APAR submitted to the TCEQ by ERM, Inc. on behalf of UPRR
November 7, 2001	Texas Natural Resources Conservation Commission (TNRCC) provides comments to July 5, 2001 response letter.
July 5, 2001	Follow-up response to November 6, 2000 TNRCC comment letter on the On-Site APAR submitted to TNRCC on behalf of UPRR.
January 9, 2001	Initial response to November 6, 2000 TNRCC comments.
November 6, 2000	TNRCC provides comments to On-Site APAR.
July 10, 2000	Affected Property Assessment Report for On-Site Property (On-Site APAR) submitted to TNRCC on behalf of UPRR by ERM.
February 20, 2000	Letter submitted to the TNRCC regarding proposed Phase 2-C investigation for further delineation of off-site areas
September 10, 1999	Phase 2-B RFI/EOC Investigation Report submitted to TNRCC on behalf of UPRR by ERM
April 27, 1998	Interim Stabilization Measures Report – Southern Drainage Ditch, submitted to TNRCC on behalf of UPRR by ERM.
February 13, 1998	Phase 2-A RFI/EOC Investigation Report submitted to TNRCC on behalf of UPRR by ERM.
January 13, 1997	RFI portion of the Phase 1 RFI/EOC Investigation Report approved by TNRCC
November 26, 1996	EOC portion of the Phase 1 RFI/EOC Investigation Report approved by TNRCC
May 23, 1996	Phase 1 RFI/EOC Report submitted on behalf of Southern Pacific Transportation Company (SPTCo) by Terranext
October 16, 1995	RFI Work Plan approved by TNRCC
September 29, 1995	EOC Work Plan approved by TNRCC
January 10, 1995	Operation and Maintenance Plan approved by TNRCC
November 3, 1994	Revised Compliance Schedule approved by TNRCC

Date	Description
October 14, 1994	RCRA Facility Investigation (RFI) Work Plan submitted on behalf of SPTCo
September 16, 1994	Extent of Contamination (EOC) Work Plan submitted on behalf of SPTCo
September 7, 1994	Revised Compliance Schedule submitted on behalf of SPTCo
August 19, 1994	Operation and Maintenance Plan and Compliance Schedule submitted on behalf of SPTCo
June 20, 1994	Permit No. HW-50343-000 and Compliance Plan CP-50343-000 issued by TNRCC.
October 1993	RCRA Facility Assessment completed on behalf of U.S. EPA by PRC Environmental Management, Inc.
May 13, 1991	RCRA Permit Application submitted by SPTCo

Note: Not all groundwater sampling events are listed in the chronology

Appendix VI.B

SOIL BORING LOGS AND WELL COMPLETION RECORDS (on CD)

Houston Wood Preserving Works
Houston, Texas

TerraNext

LOG OF BORING No.: SB02

SHEET NUMBER 1 OF 3

T:	Southern Pacific Lines
T NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	SB02 HWPW
START DATE:	3/3/97
FINISH DATE:	3/3/97
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	CME Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram:

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
							Asphalt - very weathered	Boring Advanced with 8 1/4" O.D., 4 1/4" I.D. hollow stem augers
CB1	1-5		3.8	1	FILL		Gravel, dk. brown, loose with trace sand and silt and cinders (Fill)	
				2				
				3	CL		Gravelly CLAY; dk. gray; firm; moist (Fill)	
				4	CL		Silty CLAY; lt. gray; very stiff; low plasticity; moist; grades dk. gray at 4.7'	
	5.0			5				
CB2	5-10		4.8	6			Grades lt. gray with sparse 1/2" dia. CaC03 nodules	Collect soil sample for chemical analysis at 7-8'
				7				
				8			Grades with numerous peasize CaC03 nodules and trace sand	
				9				
	10.0			10			CaC03 nodules grade out	
CB3	10-15		5.0	11			Iron oxide staining in fractures	
				12				
				13				
				14				
	15.0			15	ML		Clayey SILT; lt. gray; firm; low plasticity; moist with trace sand	
CB4	15-20		0.8	16				
				17				
				18	ML		SILT; lt. gray; firm; low plasticity; moist with trace sand; lt. gray; fine grained	
				19	SP		Silty SAND; lt. gray; very fine grained; wet	
	20.0			20				

eologist: R. Lamb

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: SB02

SHEET NUMBER 2 OF 3

DRILLING CONTRACTOR: Best Drilling Services

Location Diagram

CLIENT: Southern Pacific Lines

PROJECT NAME: Houston Wood Perserving Works

PROJECT NUMBER: 44102069.07

PROJECT LOCATION: 4910 Liberty Road Houston, TX

DRILLING METHOD: Hollow Stem Auger

SAMPLING METHOD: CME Sampler

SURFACE ELEVATION:

TOC ELEVATION:

WATER LEVEL:

WATER ELEVATION:

DATE:

BORING LOCATION: SB02 HWPW

START DATE: 3/3/97 FINISH DATE: 3/3/97

START TIME: FINISH TIME:

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
								Mild Creosote odor; collect
CB5			4.5	21				soil sample from 21.0-21.5'
							Grades very fine to fine grained; wet with mild	
				22			creosote odor	
				23				
				24				
								Collect soil sample 24.0-24.5'
	25.0			25				for chemical analysis
					ML		Silty CLAY; lt. gray; v.stiff; low plasticity; moist	
CB6			4.7	26			with some sand with iron oxide staining	
							Grading hard; lt. brown sand grades out	
				27			Grades lt. gray and lt. brown mottled	
				28				
				29				
	30.0			30				
CB7			3.7	31				
				32				
				33				
				34				
	35.0			35				
CB8			5.0	36				
				37				
					ML		Clayey SILT; lt. reddish brown; firm; low plasticity	Collected sample 37.5-38.0'
				38			moist; creosote odor and oil sheen	for chemical analysis
								Collect soil sample for
				39				chemical analysis from 38.5-
					CL		Silty CLAY; reddish brown; very stiff; low	39.0'
	40.0			40			plasticity; moist	

Geologist: R. Lamo

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval

OVM - Organic Vapor Meter

PP - Pocket Penetrometer

TOC - Top Of Casing

TerraNext

LOG OF BORING No.: SB02

SHEET NUMBER 3 OF 3

NT:	Southern Pacific Lines
ECT NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	SB02 HWPW
START DATE:	3/3/97
FINISH DATE:	3/3/97
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	CME Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
CB9			4.9	41				
				42				
				43				
				44				
	45.0			45				
CB10			4.0	46				
				47				
				48				
				49				
	50.0			50			SILT; reddish brown; firm non-plastic; moist	Collect soil sample for chemical analysis 49.- 49.5'
CB11			3.2	51				
				52				
				53				
				54				
	55.0			55				
				56				Bottom of boring at 55.0'
				57				Backfilled with cement/ bentonite grout on 3/3/97
				58				
				59				
				60				

eologist: R. Lamb

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: SB03

SHEET NUMBER 1 OF 3

:	Southern Pacific Lines
JECT NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	
START DATE:	03/05/97
FINISH DATE:	03/05/97
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	CME Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram:

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	C	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
CB1	1 - 5		3.1	1			Gravel	Boring Advanced with 8 1/4-inch O.D., 4 1/4-inch I.D. HSA
				2	SM		SAND, brown, fine grained creosote impacted moist	
				3	FILL		CINDERS: black:	
				4	CL		Silty CLAY; dark brown, low plasticity, moist, with creosote odor	
	5.0			5				Collect sample for chemical analysis for 5 - 6 feet
CB2			5.0	6				
				7				
				8				
				9			grades gray and brown, mottled light trace CaCO3 nodules	
	10.0			10				
CB3			5.0	11			grades with iron oxide staining	
				12			~ 1/2" sandy silt lens containing creosote	
				13			~ 1/2" sandy silt lens containing creosote	
				14			~ 1/4" sandy silt lens containing creosote	
				15				
CB4			3.9'	16				
				17	ML		SILT, gray and reddish brown, mottled, low plasticity, moist, varved with ~0.1" thick sand seams	
				18			creosote odor	
				19				Collect sample for chemical analysis at 19 - 20 feet
	20.0			20				

ologist: R. Lamb

acked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: SB03

SHEET NUMBER 2 OF 3

T: Southern Pacific Lines
CT NAME: Houston Wood Perserving Works
PROJECT NUMBER: 44102069.07
PROJECT LOCATION: 4910 Liberty Road Houston, TX
BORING LOCATION:
START DATE: 03/05/97 FINISH DATE: 03/05/97
START TIME: FINISH TIME:

DRILLING CONTRACTOR: Best Drilling Services
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: CME Sampler
SURFACE ELEVATION:
TOC ELEVATION:
WATER LEVEL:
WATER ELEVATION:
DATE:

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
CB5			3.9	21				
				22	SP		Silty SAND, grayish brown, very fined grained, wet, with creosote odor	
				23				
				24			~ 1/2" diameter clay nodules clay nodules grade out	Collect soil sample for chemical analysis @ 24 - 25'
	25.0			25				
CB6			3.8	26				
				27				
				28	CL		Silty CLAY, gray and brown mottled; very stiff, low plasticity, moist	
				29			creosote odor	
	30.0			30				
CB7			5.0	31				
				32				
				33				
				34				
	35.0			35				
CB8				36			grading with creosote in hairline fractures comprises ~ 1% of sample	
				37				
				38				
				39				
	40.0			40			0.1" thick silt/sand lenses contain creosote	Collect soil sample for chemical analysis @ 39.5 - 40'

ologist: R. Lamb
Checked By:

LEGEND:
SS - Split Spoon
CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: SB03

SHEET NUMBER 3 OF 3

Location Diagram

DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	CME Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

CLIENT: Southern Pacific Lines

PROJECT NAME: Houston Wood Perserving Works

PROJECT NUMBER: 44102069.07

PROJECT LOCATION: 4910 Liberty Road, Houston, TX

BORING LOCATION:

START DATE: 03/05/97 FINISH DATE: 03/05/97

START TIME: FINISH TIME:

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
CB9			4.2	41			silt/sand lenses grade out	
				42				
				43				
				44				
	45			45				
CB10			5.0	46				
				47				
				48				
				49				
	50.0			50		ML	SILT, reddish brown; non-plastic	
CB11			5.0	51			firm, wet; with trace of sand; creosote odor	
				52		CL	Silty CLAY; reddish brown; low	
				53			plasticity, very stiff, creosote odor	
				54			3" thick sandy silt, lens @ ~ 52' contains oil sheen & creosote odor	
				55			3" thick sandy silt, lens @ ~ 54' contains oil sheen & creosote odor	Collected soil sample for
ST12			1.5	56			grading with creosote in fractures ~ 1% of mass	chemical analysis from silt lenses
				57				
				58				Bottom of boring @ 57.0'
				59				Borehole backfilled with cement/bentonite grout on 3/5/97
				60				

Geologist: R. Lamb

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval

OVM - Organic Vapor Meter

PP - Pocket Penetrometer

TOC - Top Of Casing

TerraNext

LOG OF BORING No.: SB04

SHEET NUMBER 1 OF 3

DRILLING CONTRACTO: Best Drilling Services

Location Diagram

CLIENT: Southern Pacific Lines

DRILLING METHOD: Hollow Stem Auger

PROJECT NAME: Houston Wood Perserving Works

SAMPLING METHOD: CME Sampler

PROJECT NUMBER: 44102069.07

PROJECT LOCATION: 4910 Liberty Road Houston, TX

SURFACE ELEVATION:

BORING LOCATION:

TOC ELEVATION:

WATER LEVEL:

START DATE: 03/05/97 FINISH DATE: 03/05/97

WATER ELEVATION:

START TIME: FINISH TIME:

DATE:

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	C L	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
							Clayey GRAVEL	Boring Advanced with 8 1/4-inch O.D., 4 1/4-inch I.D. HSA
CB1	1 - 5		38.0	1				
				2				
				3	SM		SAND, black, medium grained, moist, contains creosote	Collect soil sample for chemical analysis @ 2' - 3'
					FILL		CINDERS, black, creosote odor	
				4	SM		SAND; lt. brown, fine grained; moist, creosote odor	
	5.0			5	CL		Silty CLAY; black, stiff, low plasticity; moist, creosote creosote odor, grading black and dark brown, mottled	
CB2			5.0	6				
				7				
				8				
				9			grading - gray and dark brown, mottled with slight creosote odor	
	10.0			10			grading light gray and gray, mottled with iron oxide staining, creosote odor, grades out	
CB3			5.0	11			grading with 1/10" diameter CaCO3 nodules	
				12				
				13				
				14				
	15.0			15				
CB4			2.5	16				
				17				
				18				
				19	ML		Clayey SILT; gray and reddish brown mottled, low plasticity; firm with trace sand, moist	
	20			20				

Geologist: R. Lamb

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval

OVM - Organic Vapor Meter

PP - Pocket Penetrometer

TOC - Top Of Casing

TerraNext

LOG OF BORING No.: SB04

SHEET NUMBER 2 OF 3

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	
START DATE:	03/05/97
FINISH DATE:	03/05/97
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	CME Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
CB5			32	21				
				22	SP		Silty SAND; light gray, very fine to fine grained, wet, with mild creosote odor	
				23				
				24				
				25			clay lens ~ 3" thick @ ~ 24.5 creosote in sand lens ~ 2" thick @ ~ 24.8'	
	25							collect sample not submitted
CB6			4.5	26			grading with strong creosote odor oil sheen	25.5 - 26.0' for bio analysis
				27				collect soil sample for
				28				chemical analysis from 27 - 30 feet
				29				collect sample for chemical
				30				analysis @ 29.0 - 30.0'
CB7			5.0	31	CL		Silty CLAY; reddish brown & gray, mottled, low plasticity; moist with creosote in hairline fractures ~ 0.1% at mass	collect sample for chemical analysis @ 31.0 - 32.0'
				32				
				33				
				34			creosote grades out	
	35			35			mild creosote odor	
CB8			5.0	36				
				37				
				38			grading with creosote in hairline fractures ~1% at mass	
				39				collect soil sample for chemical analysis from
	40.0			40			0.1" thick silt/sand lenses contains creosote	39.5 - 40.0'

Geologist: R. Lamb
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: SB04

SHEET NUMBER 3 OF 3

IT:	Southern Pacific Lines
...JECT NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	
START DATE:	03/05/97
FINISH DATE:	03/05/97
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	CME Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	C L	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
CB9			5.0	41				
				42	CL		Silty CLAY reddish brown; stiff; low plasticity; moist; with creosote odor	
				43				
				44			grading very stiff	
	45.0			45	CH		CLAY; reddish brown; medium plasticity; hard; moist; with creosote in fractures ~0.5% of mass	
CB10			5.0	46				
				47				
				48				
				49				
	50.0			50	ML		SILT; reddish brown; low plasticity; firm; moist with creosote ~5% of mass in fractures and trace clay	collected sample @ 51-52' for chemical analysis
CB11			5.0	51				
				52				
				53	CH		CLAY; reddish brown, medium plasticity; hard; moist, with creosote in fractures ~0.1% of mass	
				54				
	55.0			55				
CB12			5.0	56				
				57				
				58				
				59				
	60.0			60			Bottom of boring @ 60' Boring with cement/bentonite grout	Collect soil samples for chemical analysis 58 - 60'

...eologist: R. Lamb

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval

OVM - Organic Vapor Meter

PP - Pocket Penetrometer

TOC - Top Of Casing

TerraNext

LOG OF BORING No.: SB05

SHEET NUMBER 1 OF 3

NT:	Southern Pacific Lines
ROJECT NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	SB05 HWPW
START DATE:	3/4/97
FINISH DATE:	3/4/97
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	CME Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
CB1	1-5		4.0	1	FILL		Gravel; brown and dk. brown; loose; moist; with some sand and silt (Fill)	Boring Advanced with 8 1/4" O.D., 4 1/4" I.D. hollow stem augers
				2				
				3	CL		Silty CLAY; dk. brown; very stiff; low plasticity; moist; grading brownish gray with iron oxide	
				4			staining; trace CaC03 nodules	
	5.0			5	ML		Clayey SILT; brownish gray; firm; low plasticity; moist	
CB2	5 - 10		5.0	6	CL		Silty CLAY; brownish gray; stiff; low plasticity; moist with trace sand CaC03 nodules at approx. 6.5'	
				7				
				8			2" layer of CaC03 nodules at approx. 8'	
				9			Grading lt. brownish gray	
	10.0			10			3" layer of CaCO3 nodules at 10'	
CB3	10 - 15		5.0	11			2" thick clayey silt lens	
				12			Grading soft Grading stiff Grading soft	
				13				
				14			Approx. 1" thick clayey silt lens Grading very stiff	
	15.0			15			Grading firm	
CB4	15 - 20		5.0	16	ML		SILT; brownish gray, soft, non-plastic; wet w/ trace sand and clay	
				17				
				18			Trace clay nodules	
				19				Collect soil sample for chemical analysis from 19.5-20'
	20.0			20	SP		Silty SAND; loose; lt. gray; with fine grained wet with creosote odor	

Geologist: R. Lamb

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: SB05

SHEET NUMBER 2 OF 3

Location Diagram

NT:	Southern Pacific Lines
ECT NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	SB05 HWPW
START DATE:	3/4/97
FINISH DATE:	3/4/97
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	CME Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	C L	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
CB5			5.0	21				
							Grades very fine to fine grained	
				22				
				23				
								Collect soil sample at
				24				24.0-24.5' for chemical
								analysis
	5.0			25				
CB6	5 - 10		5.0	26				
				27				
				28				
				29				
	10.0			30			ML Clayey SILT; gray and reddish brown; stiff;	
							low plasticity; moist with sandy silt lens approx.	
CB7	10 -15		3.5	31			0.1" thick	
							Varved	
				32				
							ML SILT; reddish brown with gray mottling; non-	
				33			plastic; wet with trace sand	
				34				Collect soil sample for
								chemical analysis from
	15.0			35				34.5-35.0'
CB8	15 - 20		4.0	36			SP Silty SAND; reddish brown; loose; very fine	
							to fine grained; wet	
				37				
				38				
				39				Collect soil sample for
								chemical analysis from
	40.0			40				39-40'

Geologist: R. Lamb

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval

OVM - Organic Vapor Meter

PP - Pocket Penetrometer

TOC - Top Of Casing

TerraNext

LOG OF BORING No.: SB05

SHEET NUMBER 3 OF 3

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	SB05 HWPW
START DATE:	3/4/97
FINISH DATE:	3/4/97
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	CME Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
CB9			5.0	41				
				42				
				43	CH		CLAY; reddish brown; hard; medium plasticity; moist	Collect soil sample at 24.0-24.5' for chemical analysis
				44				
	45.0			45				
CB10			2.0	46			Possible sand lens (no recovery)	
				47				
				48				
				49			2" thick silt lens at approx. 49.0	
	50.0			50				
CB11			2.5	51				
				52				
				53	ML		SILT; reddish brown non-plastic, wet; with trace sand	
				54				Collect soil sample for chemical analysis 54-55'
				55				
CB12			3.2	56	CH		CLAY; reddish brown; medium plasticity; firm: moist	
				57				
				58				Bottom of boring at 60' Boring backfilled with cement/grout bentonite
				59	ML		Clayey SILT; reddish brown; low plasticity; firm; wet	
	60.0			60				

Geologist: R. Lamb

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval

OVM - Organic Vapor Meter

PP - Pocket Penetrometer

TOC - Top Of Casing

TerraNext

LOG OF BORING No.: SB06

SHEET NUMBER 1 OF 3

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	SB06 HWPW
START DATE:	3/4/97
FINISH DATE:	3/4/97
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	CME Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram:

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
					FILL		Gravel	Boring Advanced with 8 1/4" O.D., 4 1/4" I.D. hollow stem augers
CB1	1-5		3.5	1	SM		SAND - lt. brown; loose, moist; mild creosote odor	
				2				
				3				
				4	FILL		Cinders	Collect samples from 4' to 5' for chemical analysis
	5.0			5	CL		Silty CLAY; black; stiff; low plasticity; moist; creosote odor	
CB2	5 -10		5.0	6			Grading dark gray	
				7			Grading lt. gray with iron oxide staining; creosote odor	
				8			Grades out	
				9				
	10.0			10				
CB3			5.0	11			Silt lens approx. 2" creosote impacted	
				12				
				13			Silt lens approx. 3" creosote impacted	
				14			Silt lens approx. 2" creosote impacted	
	15.0			15				
CB4			4.5	16			Sand lens approx. 1" creosote impacted	
				17				
				18			Silt lens approx. 2" creosote impacted Silt lens approx. 3" creosote impacted	
				19				Collected soil sample from 19.5-20' for chemical analysis
	20.0			20	ML		SILT; gray; firm; non-plastic; moist with trace sand creosote impacted	

Geologist: R. Lamb

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: SB06

SHEET NUMBER 2 OF 3

Location Diagram

ENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	SB06 HWPW
START DATE:	FINISH DATE:
START TIME:	FINISH TIME:
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	CME Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
CB5			4.2	21	SP		Silty SAND; lt. gray; loose; very fine to fine grained; wet with mild creosote odor	
				22				
				23				
				24	CL			Collect samples from 24' to 25' for chemical analysis
				25				
CB6	5 - 10		3.1	26				
				27	CL		Silty CLAY; light gray; very stiff; low plasticity; moist with iron oxide staining	
				28				
				29				
				30				
CB7			2.0	31				
				32				
				33	SP		Silty SAND; lt. gray; very fine to fine grained; wet; with creosote odor	Collect soil sample for geotech analysis
				34				
				35				
CB8			5.0	36	CH		CLAY; reddish brown; hard; medium plasticity; moist; with trace hairline fractures; creosote in fractures	
				37				
				38			1" thick lens CaC03 nodules	
				39				
	40.0			40			Creosote in fractures grades out	

Geologist: R. Lamb

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval

OVM - Organic Vapor Meter

PP - Pocket Penetrometer

TOC - Top Of Casing

TerraNext

LOG OF BORING No.: SB06

SHEET NUMBER 3 OF 3

DRILLING CONTRACTOR: Best Drilling Services

DRILLING METHOD: Hollow Stem Auger

SAMPLING METHOD: CME Sampler

Location Diagram

ENT: Southern Pacific Lines

JECT NAME: Houston Wood Perserving Works

PROJECT NUMBER: 44102069.07

PROJECT LOCATION: 4910 Liberty Road Houston, TX

BORING LOCATION: SB06 HWPW

SURFACE ELEVATION:

TOC ELEVATION:

WATER LEVEL:

WATER ELEVATION:

START DATE: FINISH DATE:

START TIME: FINISH TIME:

DATE:

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
CB9			5.0	41			Grading with creosote in hairline fractures	
				42				
				43				
				44				
	45.0'			45			Approx. 2" thick layer of CaC03 nodules	
CB10			4.7	46			Creosote in fractures grades out	
				47				
				48				
				49	ML		Clayey SILT; reddish brown; low plasticity; moist	Collect soil sample from 49 to 50' for chemical analysis
	50.0			50				
				51				
				52				
				53				
				54				
				55				
ST11			2.0	56				Collect soil sample for geotech analysis
	57.0'			57				
				58				
				59				Bottom of boring at 57' Backfilled with bentonite
	60.0			60				

Geologist: R. Lamb

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval

OVM - Organic Vapor Meter

PP - Pocket Penetrometer

TOC - Top Of Casing

TerraNext

LOG OF BORING No.: SB07

SHEET NUMBER 1 OF 2

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	SB07 HWPW
START DATE:	3/06/97
FINISH DATE:	3/06/97
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	CME Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
				1			Gravel (Fill)	Boring advanced with 8 1/4" O.D. 4 1/4" I.D. hollow stem augers
				2			Railroad Ties (Fill)	
CB1			2.8'	3			Gravel (Fill)	Collect soil sample for chemical analysis 2.5-3.0'
				4	SM		SAND; Black; fine grained; moist with creosote odor; grading brown (Fill)	
	5.0			5	CL		Silty CLAY; dk. brown/black mottled; stiff; low plasticity; moist; creosote odor	
CB2			3.4'	6			Grading black very stiff	
				7				
				8				
				9			Grading - gray with iron oxide staining	
	10.0			10				
CB3			4.1'	11			Grading lt. gray; stiff	
				12				
				13				
				14				
	15.0			15				
CB4			3.5	16				
				17				
				18				
				19	ML		Clayey SILT; lt. gray; firm; low plasticity; moist; contains oil sheen; creosote odor	Collect soil sample 19-20' for chemical analysis
	20.0			20				

Geologist: R. Lamb

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval

OVM - Organic Vapor Meter

PP - Pocket Penetrometer

TOC - Top Of Casing

TerraNext

LOG OF BORING No.: SB07

SHEET NUMBER 2 OF 2

IENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	SB07 HWPW
START DATE:	3/06/97
FINISH DATE:	3/06/97
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	CME Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
								Collect soil sample at 21-22'
CB5			4.2	21				for chemical analysis
				22	SP		Silty SAND; brownish gray; fine grained; wet	Collect soil sample at 22-23'
							Contains creosote	for chemical analysis
				23				
				24				Collect soil sample at 24-25'
	25.0			25			2" laver cemented sand - contains creosote	for chemical analysis
								Bottom of boring @ 25.0'
				26				boring backfilled with
				27				cement/bentonite grout
				28				
				29				

Geologist: R. Lamb

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval

OVM - Organic Vapor Meter

PP - Pocket Penetrometer

TOC - Top Of Casing

TerraNext

LOG OF BORING No.: SB08

SHEET NUMBER 1 OF 2

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	SB08 HWPW
START DATE:	3/6/97
FINISH DATE:	3/6/97
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	CME Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
				1	FILL		Gravel; Railroad ties	Boring advanced with 8 1/4" O.D. 4 1/4" I.D. hollow stem augers
				2				
CB1	2-5		2.5	3	SM		SAND; black; fine grained; moist, creosote odor	
				4	CL		Silty SANDY CLAY; black; firm; low plasticity;	
	5.0			5			moist; strong creosote odor	Collect soil sample at 4-5' for chemical analysis
CB2	5 - 10		5.0	6	CL		Silty CLAY; black; very stiff;	
				7			low plasticity; moist; strong creosote odor	
				8				
				9			Grading gray with iron oxide staining	
	10.0			10				
CB3	10 - 15		4.5	11			Grading with creosote in hairline fractures	
				12			Grading with pea to gravel size CaC03 nodules	
				13				
				14			grading with varved bedding	Collect soil sample 14-15' for chemical analysis
	15.0			15				
CB4	15 - 20		4.2	16				
				17	ML		Clayey SILT; brownish gray; firm; low plasticity; moist; creosote odor	
				18				Collect soil sample 18-19' for chemical analysis
				19				
	20.0			20				

Geologist: R. Lamb

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval

OVM - Organic Vapor Meter

PP - Pocket Penetrometer

TOC - Top Of Casing

TerraNext

LOG OF BORING No.: SB08

SHEET NUMBER 2 OF 2

NT:	Southern Pacific Lines	DRILLING CONTRACTOR:	Best Drilling Services
PROJECT NAME:	Houston Wood Perserving Works	DRILLING METHOD:	Hollow Stem Auger
PROJECT NUMBER:	44102069.07	SAMPLING METHOD:	CME Sampler
PROJECT LOCATION:	4910 Liberty Road Houston, TX		
		SURFACE ELEVATION:	
BORING LOCATION:	SB08 HWPW	TOC ELEVATION:	
		WATER LEVEL:	
START DATE:	3/6/97 FINISH DATE: 3/6/97	WATER ELEVATION:	
START TIME:	FINISH TIME:	DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	C	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
CB5			4.1'	21				
				22				
				23	SP		Silty SAND; lt. gray; very fine to fine grained; wet; with creosote odor and oil sheen	
				24				
				25				
				26				Bottom of boring at 25.0'
				27				Boring backfilled with cement/bentonite grout
				28				
				29				
				30				
				31				
				32				
				33				
				34				
				35				
				36				
				37				
				38				
				39				
				40				

eologist: R. Lamb
ecked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

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SB21 DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB21 Date Drilled 10/09/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 24 ' Boring Diam. 2 "

N. Coord. 729023.67 ' E. Coord. 3168355.13 ' Surface Elevation 45.51 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Alfredo Palacios

Drilling Method Direct Push Sampling Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
45.51	0					0-3	0-1.4	SANDY SILTY CLAY: Very dark gray 2.5Y3/1; hard; low plasticity; moist; small roots; small gravel (<0.3" diameter); small shell fragments; friable; no odor.
45							1.4-3	At 0-1' collect surface soil sample SB21-00 and SPLP.
						3-6	3-8	SILTY CLAY: Very dark gray 2.5Y3/1; stiff PP=1.5-2.0; plastic; moist; trace small roots.
40	5							SILTY CLAY: Dark gray 2.5Y4/1; stiff PP=1.25-2.0; plastic; moist; some small caliche nodules (0.1-0.5" diameter); no odor.
						6-9		
							8-14	SILTY CLAY: Light gray 5Y7/1 mottled light olive brown 2.5Y5/6 and dark gray 2.5Y4/1; stiff PP=1.0-2.0; very plastic; moist; no odor.
						9-12		
35	10							
						12-15		
							14-17.5	SANDY SILTY CLAY: Light gray 5Y7/2; very stiff; plastic; moist; trace to some Mn-concretions and black speckles. Some Mn-concretions have reddish brown 5YR4/4 halos.
30	15					15-18		
						18-21	17.5-19.2	CLAYEY SILTY SAND: Light greenish gray 5GY7/1; medium dense; moist; very fine grained; no odor.
							19.2-24	CLAYEY SAND: Brown 10YR5/3; wet; loose to very loose; fine grained; well sorted; subrounded to rounded; no odor.
25	20					21-24		At 21' collect ground water grab sample SB21-A and duplicate
	25							T.D. = 24 '

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SB22 DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB22 Date Drilled 09/29/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 45 ' Boring Diam. 8.25 "

N. Coord. 728979.34 ' E. Coord. 3167971.31 ' Surface Elevation 44.91 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
44.91	0					0-3	0-1	ASPHALT: Asphalt pavement; some small gravel, subangular, 0.25 to 0.5" diameter; sand, gray 7.5YR5/1, loose.
							1-5	SILTY CLAY: Very dark gray 10YR3/1; stiff PP=1.25-2.0; plastic; moist. At 1-2' Collect surface soil sample SB22-00
						3-5		At 3.0' grades with some caliche nodules (0.25-0.5" diameter), rounded to subrounded
40	5					5-10	5-15	At 4.7' grades gray 10YR5/1 SANDY CLAY: Gray 2.5YR6/1 mottled with greenish gray 10GY6/1; stiff PP=1.5-2.0; plastic; moist; some iron-like coloration as dark yellowish brown 10YR4/6. At 7.0' trace to some small caliche nodules (0.125-0.5" diameter), subrounded.
35	10				1	10-15		At 10.0' grades gray 10YR6/1 mottled with yellowish brown 10YR5/8;
								At 13.0' grades to wet
30	15					15-20	15-27	At 15' Collect ground water grab sample SB22-A CLAYEY SAND: Light olive gray 5Y6/2; loose; fine grained; well rounded; well sorted; wet; very slight odor.
25	20				2	20-25		At 20.0' grades to olive gray 5Y5/2
20	25				4			

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SB22
DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB22 Date Drilled 09/29/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 45 ' Boring Diam. 8.25 "

N. Coord. 728979.34 ' E. Coord. 3167971.31 ' Surface Elevation 44.91 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	25					25-27		At 25.0' grades to olive 5Y4/3 mottled with greenish gray 10GY6/1.
					36	27-29	27-30	SILTY SANDY CLAY: Brown 10YR5/3 mottled with light gray 2.5Y7/1; very stiff to hard PP=2.25-4.5; plastic; moist; slight odor; trace small black nodules.
					57	29-30		At 29.0' grades to light gray 2.5Y7/1 mottled with brown 10YR5/3; no black nodules.
15	30					30-35	30-35	SILTY CLAY: Strong brown 7.5YR4/6 mottled with gray 7.5YR6/1; very stiff to hard PP=3.0-4.0; moist; with sand lenses; light yellowish brown 2.5Y6/3; very fine to fine grained; well sorted; well rounded; no visible staining; odorous.
					101			At 32-33' Collect soil sample SB22-32
10	35					35-40	35-45	CLAY: Strong brown 7.5YR4/6 mottled with light olive gray 5Y6/2; very stiff to hard PP=3.5-4.5; plastic; moist; with some silt; very slight to no odor.
5	40					40-45		
					6			At 44-45' collect soil sample SB22-44 with SPLP
0	45							T.D. = 45 '
-5	50							

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SB24 DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB24 Date Drilled 09/28/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 50 ' Boring Diam. 8.25 "

N. Coord. 728626.38 ' E. Coord. 3167443.77 ' Surface Elevation 49.24 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
49.24	0					0-3	0-1	SILTY SAND: White to gray; loose; subangular to angular; dry; some gravel (Fill).
							1-3	GRAVEL: loose; subangular; some sand; some silt; dominant black staining; sticky; trace wood; faint fluorescence; odorous.
						3-5	3-5.6	SILTY CLAY: Very dark gray 10YR3/1; firm; plastic; moist; trace black staining; odorous
45	5				71	5-10		At 4.5' grades with very fine grained sand, trace wood fragments At 5.0' grades with trace gravel, diameter 0.5-1.0"
							5.6-7	SANDY SILTY CLAY: Very dark gray 10YR3/1; soft to firm; low plasticity; moist; very fine grained sand; no fluoresence; odorous.
							7-10	SILTY CLAY: Very dark gray 7.5YR3/1; firm PP=1.0; plastic; moist; no fluorescence; odorous.
40	10				151	10-15	10-15	SANDY CLAY: Light brownish gray 2.5Y6/2 mottled with light olive brown 2.5Y5/6; firm PP=1.0-2.25; plastic; moist; very fine grained sand; no fluorescence; odorous.
35	15				62	15-20	15-16	SANDY SILTY CLAY: Greenish gray; soft; plastic; moist; odorous.
							16-22	CLAYEY SAND: Greenish gray; very loose; wet; fine grained; well sorted.
30	20					20-25		At 20.0' grades to olive gray 5Y5/2; odorous
							22-23	SILTY CLAY: Olive 5Y4/3; stiff PP=1.25; plastic; moist; some very fine grained sand.
25	25				191		23-26.2	CLAYEY SAND: Olive 5Y4/3; very loose; wet; fine grained; dark brown staining; sheen on water; odorous.

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SB24
DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB24 Date Drilled 09/28/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 50 ' Boring Diam. 8.25 "

N. Coord. 728626.38 ' E. Coord. 3167443.77 ' Surface Elevation 49.24 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	25					25-30		At 25.0' grades to medium grained sand
							26.2-30	SILTY CLAY: Light olive gray 5Y6/2 mottled with olive brown 2.5Y4/4; very stiff PP=2.5-4.0; plastic; moist.
20	30					30-35	30-31	CLAYEY SAND: Olive 5Y5/3; loose; wet; fine to medium grained sand; well sorted.
							31-35	SILTY CLAY: Gray 2.5Y6/1 mottled with yellowish red 5YR4/6; stiff PP=1.0-2.0; plastic; moist; with fine grained sand; some dark brown staining.
15					222			At 34.0-36' collect soil sample SB24-34
	35					35-40	35-50	At 34.5' grades to dark reddish brown 5YR3/4
								CLAY: dark reddish brown 5YR3/4 mottled with olive gray 5Y5/2; very stiff PP=3.0-4.0; plastic; moist; very slight odor.
10	40					40-45		At 40.0' grades to yellowish red 5YR4/6 mottled light olive gray 5Y6/2
5	45					45-50		
					23			
0	50							At 49.0-50' collect soil sample SB24-49 T.D. = 50 '

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SB25 DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB25 Date Drilled 09/29/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 50 ' Boring Diam. 8.25 "

N. Coord. 728932.90 ' E. Coord. 3167697.23 ' Surface Elevation 44.91 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
44.91	0					0-1	0-1	ASPHALT: Asphalt pavement; sand, loose.
						1-3	1-2	CLAYEY SILT: Very dark gray 2.5Y3/1; hard to very hard PP>4.0; plastic; moist.
							2-5	SILTY CLAY: Gray 2.5Y6/1 mottled with light olive brown 2.5Y5/6; very stiff PP=2.0-3.0; plastic; moist; trace caliche nodules (0.5" diameter).
						3-5		At 3' grades to gray 2.5Y5/1 mottled with light olive brown 2.5Y5/6; some caliche nodules (<0.5" diameter).
40	5					5-10	5-10	SILTY CLAY: Dark gray 2.5Y4/1 mottled with greenish gray 5BG6/1 and yellowish brown 10YR5/8; firm to stiff PP=0.5-1.25; plastic; moist; some sand, fine grained.
								At 7.7' some caliche nodules (<0.3" diameter)
					1			
35	10					10-15	10-15	CLAYEY SAND: Greenish gray 10GY6/1; dense; very fine grained; well sorted; subrounded to rounded; very moist.
								At 14' grades to wet
30	15					15-20	15-22	CLAYEY SAND: Olive gray 5Y5/2; loose; well sorted; rounded; fine grained; wet; no odor.
								At 15' Collect ground water grab sample SB25-A
25	20				4	20-22		At 20' grades to olive gray 5Y4/2, very slight odor
						22-24	22-24	SILTY SANDY CLAY: Greenish gray 10Y6/1; very stiff PP=2.5-3.5; plastic; moist
					61			At 23' some caliche nodules (0.2-0.7" diameter)
20	25				45	24-25	24-25	SILTY CLAY: Reddish brown mottled with red 2.5YR4/8, greenish gray 5G6/1, and olive 5Y5/4; very stiff PP=3.0-3.75; moist; some caliche nodules(<0.3" diameter).

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SB25 DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB25 Date Drilled 09/29/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 50 ' Boring Diam. 8.25 "

N. Coord. 728932.90 ' E. Coord. 3167697.23 ' Surface Elevation 44.91 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
15	25				134	25-30	25-35	SANDY SILTY CLAY: Red 2.5YR4/8 mottled with greenish gray 10Y6/1; very stiff to hard PP=2.25-4.5; plastic; moist. At 26' some caliche nodules (0.2-0.7" diameter)
10	30				165	30-35		
5	35				283	35-40	35-50	CLAY: Dark red 2.5YR3/6 mottled with light brownish gray 10YR6/2; firm to very stiff PP=0.5-3.75; very plastic; moist; trace black staining from magnesium-like nodules; no fluorescence. At 35-36' slight odor. Collect soil sample SB25-35
0	40					40-45		At 40' grades with no Mg-like nodules, no odor
-5	45					45-50		At 45' grades to reddish brown 5YR4/4, very hard
	50				24			At 48-50' Collect soil sample SB25-48
								T.D. = 50 '

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SB28 DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB28 Date Drilled 09/30/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 50 ' Boring Diam. 8.25 "

N. Coord. 728573.27 ' E. Coord. 3165897.88 ' Surface Elevation 45.22 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
45.22	0					0-5	0-0.5	CLAYEY SILTY SAND: Black 10YR2/1; loose; poorly sorted; many small roots; some small angular shell fragments; organic; moist; no odor.
							0.5-3.2	At 0-1' collect surface soil sample SB28-00
								SILTY SANDY CLAY: Dark gray 10YR4/1; homogeneous; plastic; moist; some small roots; no odor.
							3.2-10	SILTY CLAY: Gray 2.5Y6/1 mottled with olive yellow 2.5Y6/8; firm to stiff PP=0.5-2.0; plastic; moist; no roots; no odor.
40	5					5-10		At 7.0-8.0' very small to very large caliche nodules (0.1-1.5" diameter)
								At 9-10' medium to large caliche nodules (0.5-1.5" diameter)
35	10					10-15	10-20.3	CLAYEY SAND: Light gray 2.5Y7/1 mottled with olive yellow 2.5Y6/8; dense; very fine grained; well sorted; moist; no odor.
30	15					15-20		At 15' grades to wet.
								At 17' Collect ground water grab sample SB28-A
25	20					20-25	20.3-25	SANDY SILTY CLAY: Light gray 2.5Y7/1 mottled with olive yellow 2.5Y6/8; very stiff to hard PP=2.0-4.5; plastic; moist; very fine grained sand; no odor.
	25							

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SB28 DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB28 Date Drilled 09/30/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 50 ' Boring Diam. 8.25 "

N. Coord. 728573.27 ' E. Coord. 3165897.88 ' Surface Elevation 45.22 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
20	25					25-30	25-31	SILTY CLAY: Yellowish red 5YR4/6 mottled with light gray 10YR7/2; very stiff PP=1.25-3.5; very plastic; moist.
15	30					30-35	31-43.7	CLAY: Red 2.5 YR4/6; stiff to hard PP=1.25-4.5; very plastic; moist; some very fine grained sand lenses, buff.
10	35					35-40		At 36.3' some small white and black nodules, 0.125-0.25" diameter
5	40					40-45		At 40-42' Collect soil sample SB28-40
0	45					45-50	43.7-50	CLAYEY SAND: Yellowish red 5YR4/6; dense; very fine grained; well sorted; moist; no odor. At 45' grades to wet
	50							At 47.0' collect ground water grab sample SB28-B At 49-50' collect soil sample SB28-49 T.D. = 50 '

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SB29 DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB29 Date Drilled 09/30/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 35 ' Boring Diam. 8.25 "

N. Coord. 728289.77 ' E. Coord. 3165954.87 ' Surface Elevation 45.17 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
45.17	0					0-3	0-1.5	CLAYEY SILTY SAND: Black 5Y2.5/1; loose; plastic; moist; many roots; many gravel, 1-2" diameter, subangular. (Organic layer).
							1.5-6.3	At 0-1' collect surface soil sample SB29-00 SILTY CLAY: Very dark gray 5Y3/1; firm to stiff PP=0.5-2.0; very plastic; moist; some very fine grained sand; trace very small roots.
						3-5		
40	5					5-10		
							6.3-11	SILTY CLAY: Light gray 5Y7/1 mottled with olive yellow 2.5Y6/8; stiff PP=1.25-1.75; very plastic; moist. At 6.3-6.5' some small caliche nodules
35	10					10-15		At 9.5-9.7 some small caliche nodules; trace small black Mg-like or Fe-like nodules.
							11-15	SANDY CLAY: Greenish gray 10G6/1 mottled with gray 2.5Y5/1 and light olive brown 2.5Y5/6; firm PP=0.25-1.0; plastic; moist.
30	15					15-20	15-21	CLAYEY SAND: Gray 5Y6/1; loose; very fine to fine grained; well sorted; subrounded to rounded; wet.
25	20					20-25		At 20' collect ground water grab sample SB29-A
							21-22.5	SILTY SANDY CLAY: Light gray 5Y7/2 mottled with olive yellow 2.5Y6/8; very stiff PP=2.0-3.0; plastic; moist.
							22.5-27	SILTY CLAY: Light gray 5Y7/2 mottled with yellowish red 5YR4/6; very stiff PP=3.0-4.0; plastic; moist.
	25							

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SB29 DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB29 Date Drilled 09/30/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 35 ' Boring Diam. 8.25 "

N. Coord. 728289.77 ' E. Coord. 3165954.87 ' Surface Elevation 45.17 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
20	25					25-30		
							27-28.8	SANDY SILTY CLAY: Light gray 5Y7/2 mottled yellowish red 5YR4/6; stiff to very stiff PP=1.0-2.5; plastic; moist.
							28.8-30	CLAYEY SAND: Light gray 5Y7/2; dense; very fine to fine grained; well sorted; subrounded to rounded; moist.
15	30					30-35	30-35	CLAYEY SAND: Yellowish red 5YR4/6 mottled light gray 5Y7/2; loose to medium dense; very fine to fine grained; well sorted; subrounded to rounded; wet.
								At 33' Collect ground water grab sample SB29-B and MS/MSD.
10	35							T.D. = 35 '
5	40							
0	45							
	50							

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SB30 DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB30 Date Drilled 10/12/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 34' Boring Diam. 2"

N. Coord. 728167.71' E. Coord. 3165947.86' Surface Elevation 45.22' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Alfredo Palacios

Drilling Method Direct Push Sampling Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
45.22	0					0-3	0-3	SILTY CLAY: Black 10YR2/1; soft to very soft; high plasticity; moist; many organics; no staining; no odor.
						3-6	3-6	SILTY CLAY: Dark gray 2.5Y4/1 mottled with light olive brown 2.5Y5/6; firm; high plasticity; moist; trace small roots; no staining; no odor.
40	5					6-9	6-10.2	SILTY CLAY: Gray 2.5Y6/1 mottled with olive yellow 2.5Y6/8; firm; plastic; moist; trace black nodules (Fe?) (0.3" diameter); no staining; no odor.
						9-12		
35	10						10.2-12	SILTY SANDY CLAY: Greenish gray 5GY6/1; firm; plastic; moist; no staining; no odor.
						12-15	12-14	SILTY SANDY CLAY: Gray 2.5Y6/1 mottled light olive brown 2.5Y5/6; hard; plastic; moist; trace black concretions (Fe?) with reddish brown halos; no odor.
							14-15	CLAYEY SAND: Greenish gray 5GY6/1; medium dense; moist to wet; very fine grained; well sorted; no staining; no odor.
30	15					15-18	15-20.5	CLAYEY SAND: Light gray 2.5Y7/1; loose; wet; very fine to fine grained; well sorted; subrounded to rounded; no staining; no odor
						18-21		
25	20					21-24	20.5-27	SILTY SANDY CLAY: Greenish gray 10Y6/1; very stiff to hard; plastic; moist; no stalning; no odor.
								At 22.7'grades with mottling of yellowish brown 10YR5/8
	25					24-27		

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SB30
DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB30 Date Drilled 10/12/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 34 ' Boring Diam. 2 "

N. Coord. 728167.71 ' E. Coord. 3165947.86 ' Surface Elevation 45.22 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Alfredo Palacios

Drilling Method Direct Push Sampling Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
20	25							
						27-31	27-34	At 26.0'yellowish brown mottling grades to strong brown 7.5YR4/6 NO RECOVERY: collect ground water grab sample from B-zone using hydropunch; SB30-B
15	30					31-34		
								T.D. = 34 '
10	35							
5	40							
0	45							
	50							

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SB37 DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB37 Date Drilled 10/09/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 24 ' Boring Diam. 2 "

N. Coord. 727591.98 ' E. Coord. 3165340.67 ' Surface Elevation 46.42 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Alfredo Palacios

Drilling Method Direct Push Sampling Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING PPM	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
46.42	0					0-3	0-0.2	CLAYEY SANDY SILT: Very dark grayish brown 10YR3/2; loose; moist; with some pebbles and gravel; roots; no odor.
							0.2-1.9	At 0-1' collect surface soil sample SB37-00 with duplicate and SPLP
45							1.9-6	FILL: White 5Y8/1; crushed shell fragments (0.1 to 1" diameter) with clayey sand; loose to dense; moist; no odor.
						3-6		SILTY CLAY: Dark gray 5Y4/1 mottled with olive 5Y4/4; stiff PP=1.75; plastic; moist; trace lenses of fine grained sand; trace small roots; no odor.
	5							
40						6-9	6-6.2	CONCRETE: with small pebbles
							6.2-8.5	CLAYEY GRAVEL: Light gray 2.5Y7/2; loose; wet; subangular; poorly sorted (0.1-1.0" diameter); no odor.
						9-12	8.5-9	SILTY CLAY: Light brownish gray 2.5Y6/2 mottled olive yellow 2.5Y6/8; stiff PP=1.0; plastic; moist; some small gravel (0.1" diameter); no roots; no odor.
	10				2.5		9-12.7	SILTY CLAY: Light gray 2.5Y7/1 mottled with yellow 2.5Y7/8; stiff to very stiff PP=1.75-3.25; plastic; moist; no odor.
35					4	12-15		At 10.4-11.5' with some medium to large caliche nodule (up to 0.8" diameter).
							12.7-14.7	At 12-14' Collect soil sample SB37-12
	15					15-18		SILTY CLAY: Light gray 5Y7/2 mottled reddish brown 5YR4/4; very stiff; plastic; moist; no odor.
30							14.7-17.3	At 13.8-14.7' white silty clay lenses; white mottled with pale yellow 5Y8/2; soft to firm; moist
								CLAYEY SAND: Light brown 7.5YR6/4; loose; moist to wet; fine grained; subrounded; well sorted; no odor.
						18-21	17.3-24	At 15.0' Collect ground water grab sample SB37-A and duplicate
	20				3			SILTY CLAY: Light gray 5Y7/2 mottled with yellowish brown 10YR5/6; stiff PP=1.5; very plastic; moist; no odor.
25						21-24		At 18.0' grades light gray 2.5Y7/2 mottled with strong brown 7.5YR5/6; firm to hard.
					3			At 22.5-24' Collect soil sample SB37-22.5 and duplicate
	25							T.D. = 24 '

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SB38 DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB38 Date Drilled 10/08/98

Project Phase 2B RFI Owner Southern Pacific RR

Location Houston Wood Preserving Works Boring T.D. 33 ' Boring Diam. 2 "

N. Coord. 727513.09 ' E. Coord. 3165745.29 ' Surface Elevation 47.52 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Alfredo Palacios

Drilling Method Direct Push Sampling Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
47.52	0					0-3	0-0.5	CLAYEY SILTY SAND: Light yellowish brown 10YR6/4; dense; moist; trace small pebbles; no vegetation.
							0.5-3.9	At 0-1' Collect surface soil sample SB38-00 SANDY SILTY CLAY: Dark gray 10YR4/1 mottled with yellowish brown 10YR5/8; firm PP=0.5; plastic; moist.
45						3-6		
					25		3.9-7.2	SILTY CLAY: Dark gray 7.5YR4/1; very stiff PP=2.0; plastic; moist; slight odor.
	5							
					24	6-9		
40							7.2-16	SILTY CLAY: Greenish gray 10G6/1 mottled with light olive brown 2.5Y5/6; very stiff PP2.5-3.0; plastic; moist; slight odor.
						9-12		At 8.1' with small caliche to 8.3'
	10				32			At 9.8' visible dark brown liquid stain with odor At 10' grades to greenish gray 10Y6/1 mottled with light olive brown 2.5Y5/6
						12-15		At 10' trace dark brown staining in microfractures; slight fluorescence At 10-12' Collect soil sample SB38-10
35								At 11.9' small caliche nodules (<0.3" diameter) At 12.5-12.9' some small to medium caliche nodules (0.2-0.7" diameter)
					31			At 13.5-13.7' many small caliche nodules (<0.3" diameter)
	15					15-18		At 13.5' some dark brown liquid; slight fluorescence At 14' grades to very hard PP=4.0-4.5
							16-17.6	SILTY CLAY: Strong brown 7.5YR4/6 mottled with light greenish gray 5GY7/1; very hard; very plastic; moist; odor.
30					13	18-21	17.6-18.9	SANDY SILTY CLAY: Greenish gray 5GY6/1; firm to hard; plastic; moist; very fine grained sand; no odor.
							18.9-20	At 18' grades to wet; no fluorescence
	20						20-33	CLAYEY SAND: Greenish gray 10GY6/1; medium dense; very fine grained; well sorted; subrounded to rounded; moist to wet; very slight odor.
						21-24		SANDY SILTY CLAY: Strong brown 7.5YR4/4 mottled with light gray 10YR7/1; very stiff to hard PP=1.5-4.0; plastic; moist; odor.
25								At 18' grades to light gray 2.5Y7/1, very slight odor
						24-27		At 22' grades no odor
	25							

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SB38
DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB38 Date Drilled 10/08/98

Project Phase 2B RFI Owner Southern Pacific RR

Location Houston Wood Preserving Works Boring T.D. 33 ' Boring Diam. 2 "

N. Coord. 727513.09 ' E. Coord. 3165745.29 ' Surface Elevation 47.52 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Alfredo Palacios

Drilling Method Direct Push Sampling Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
20	25					27-30		At 26' grades to mottled strong brown 7.5YR4/6; very faint odor
15	30				6	30-33		At 30' grades light gray 2.5Y7/1 mottled strong brown 7.5YR4/6; very faint odor; trace dark brown shiny staining in microfractures, fluorescence in microfractures At 31' no fluorescence At 31-33' Collect soil sample SB38-31 and duplicate T.D. = 33 '
10	35							
5	40							
0	45							
	50							

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SB39
DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB39 Date Drilled 10/08/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 30 ' Boring Diam. 2 "

N. Coord. 727453.63 ' E. Coord. 3165635.93 ' Surface Elevation 47.32 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Alfredo Palacios

Drilling Method Direct Push Sampling Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
47.32	0					0-3	0-0.5	SILTY CLAY: Dark yellowish brown 10YR4/4 mottled with dark gray 2.5Y4/1; hard; plastic; moist; some large grained sand; one piece wood (0.5" by 1"); no odor.
							0.5-2.5	At 0-1' Ccollect surface soil sample SB39-00 and SPLP
45						3-6	2.5-5	CLAYEY SAND: Brown 7.5YR5/4; loose; moist to wet; large grained; angular; some large gravel (1"); no odor.
					26			SANDY CLAY: Black; soft; plastic; moist; homogeneous; organic odor (Organic).
	5						5-9.5	At 3.0' with shiny brown staining; with some small roots; odor
					26	6-9		SILTY CLAY: Very dark gray 5Y3/1; firm to stiff; plastic; moist; shiny brown staining in microfractures; some small roots.
40								At 6' grades gray 5Y5/1. One piece wood (1"x9").
					41	9-12		At 9' grades dark gray 2.5Y4/1; some small to medium roots.
	10						9.5-15	SILTY CLAY: Blueish gray 5B6/1 mottled with olive yellow 2.5Y6/8; firm to stiff; plastic; moist; no roots;
								At 9.510.6' trace caliche nodules (0.1-1.3")
35					42	12-15		At 12' with trace dark brown staining in microfractures; with some small to large caliche nodules (0.2-1.0" diameter).
								At 12-14' Collect soil sample SB39-12 and duplicate
	15				41	15-18	15-18	SILTY CLAY: Greenish gray 10GY 6/1 mottled with yellowish brown 10YR5/8; stiff to very stiff PP=1.75-3.0; plastic; moist; trace brown staining in microfractures; odor.
30								At 15.4' some caliche nodules (0.5" diameter)
					27	18-21	18-24	At 17.5' grades to greenish gray 10GY7/1
								SILTY CLAY: Light greenish gray 10Y7/1; firm to stiff PP=2.0; plastic; moist; trace dark brown shiny staining; odor.
	20							At 19' grades no staining
						21-24		
25					12			
								At 23' trace dark brown to black staining in microfractures; fluorescence.
	25				17	24-27	24-26.1	CLAYEY SAND: Yellowish brown 10YR5/4; loose; moist; fine grained; homogeneous; no staining; odor.

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SB39
DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB39 Date Drilled 10/08/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 30 ' Boring Diam. 2 "

N. Coord. 727453.63 ' E. Coord. 3165635.93 ' Surface Elevation 47.32 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Alfredo Palacios

Drilling Method Direct Push Sampling Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
20	25				8	27-30	26.1-30	SILTY CLAY: Greenish gray 10G6/1; hard; plastic; moist; no staining; very slight to no odor. At 27' grades no odor At 27-30' Collect soil sample SB39-27 At 28.5' grades with brown 7.5YR4/4 mottling T.D. = 30 '
15	30							
10	35							
5	40							
0	45							
	50							

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SB40
DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB40 Date Drilled 10/01/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 54 ' Boring Diam. 8.25 "

N. Coord. 727773.02 ' E. Coord. 3165514.37 ' Surface Elevation 46.35 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
46.35	0					0-2	0-1.5	COARSE SAND: Light brownish gray 2.5Y6/2; loose; moist; with small shell fragments; some medium and large shell fragments (.5-1"); some clay (Fill).
45						2-4	1.5-12.7	SILTY CLAY: Very dark gray 2.5Y3/1; firm to stiff PP=1.0-2.0; plastic; moist; some to many red brick fragments (Fill).
								At 2' grades to very dark gray 10YR5/1.
						4-9		At 2-3' Collect surface soil sample SB40-02
	5							At 3.5' grades to gray 10YR5/1 mottled with yellowish brown 10YR5/8
40								At 4.0' grades to gray 10YR6/1 mottled with yellowish brown 10YR5/8
								At 6.6' some small caliche nodules (<0.3" diameter); trace medium to large caliche nodules (0.5-1.0" diameter)
						9-14		At 9.0' grades with trace black staining from Mg-like nodules
	10							
35					2		12.7-15	CLAYEY SAND: Light gray 5Y7/2 mottled with olive yellow 2.5Y6/8; very fine to fine grained, loose to medium dense; well sorted, subrounded to rounded; moist.
						14-19		At 14' grades to wet; collect ground water grab sample SB40-A
	15						15-18	SILTY CLAY: Yellowish red 5YR4/6 mottled with light gray 5Y7/2; very stiff PP=2.0-3.25; very plastic; moist.
30							18-24	CLAY: Pale yellow 2.5Y7/3; firm to stiff PP=0.5-2.5; plastic; moist; some silt.
						19-24		
	20							
25								
	25					24-29	24-33	SILTY CLAY: Light gray 5Y7/2 mottled with brownish yellow 10YR6/6; stiff to very stiff PP=1.5-2.5; very plastic; moist.

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SB40
DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB40 Date Drilled 10/01/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 54 ' Boring Diam. 8.25 "

N. Coord. 727773.02 ' E. Coord. 3165514.37 ' Surface Elevation 46.35 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
20	25							
						29-34		At 28.0' grades to yellowish red 5YR4/6 mottled with light gray 2.5Y7/2 and olive yellow 2.5Y6/8 At 29.0' grades to brownish yellow 10YR6/6 mottled with light gray 5Y7/2
15	30							
					6		33-34	SILTY SANDY CLAY: Yellowish red 5YR4/6; very stiff PP=2.75; plastic; moist. At 33-34' Collect soil sample SB40-33 and duplicate
						34-39	34-38.3	SILTY CLAY: Yellowish red 5YR5/6 mottled with light gray 5Y7/2; stiff to very stiff PP=1.25-3.0; plastic; moist; blocky.
10	35							
							38.3-54	CLAY: Red 2.5YR4/6; very stiff to hard PP=3.5-4.25; very plastic; moist.
						39-44		
5	40							
					5			
						44-49		
0	45							
						49-54		
	50							

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SB40 DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB40 Date Drilled 10/01/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 54 ' Boring Diam. 8.25 "

N. Coord. 727773.02 ' E. Coord. 3165514.37 ' Surface Elevation 46.35 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-5	50				4			At 53-54' Collect soil sample SB40-53 T.D. = 54 '
-10	55							
-15	60							
-20	65							
-25	70							
	75							

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SB43 DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB43 Date Drilled 10/12/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 24 ' Boring Diam. 2 "

N. Coord. 727396.83 ' E. Coord. 3165534.13 ' Surface Elevation 47.58 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Alfredo Palacios

Drilling Method Direct Push Sampling Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
47.58	0					0-3	0-1.2	SANDY SILTY CLAY: Light yellowish brown 2.5Y6/3; firm to hard; plastic; moist; some small gravel; trace small roots; no staining; no odor.
								At 0-1' Collect surface soil sample SB43-00, duplicate, SPLP
							1.2-1.8	CLAYEY GRAVEL: Clay is yellowish brown 10YR5/4; soft; moist. Gravel is white; subangular; large (0.5"-1.5" diameter). No staining, no odor.
							1.8-3	SILTY CLAYEY SAND: Black to brown to red; fine to medium grained; moist. Black and brown sand is loose. Red sand is cemented(old brick?); sewer-gas-like odor.
45						3-6	3-6	SANDY SILTY CLAY: Dark gray 2.5Y4/1; soft to firm; plastic; moist; trace small roots; odor.
					16			At 3.6' black to dark brown shiny staining throughout the core. stained areas fluoresce.
	5					6-9	6-9.7	At 4.1' staining only visible in the microfracture, typically following the root; stained areas fluoresce
					19			SILTY CLAY: Dark gray 2.5Y4/1; firm; plastic; moist; dark brown shiny staining in microfracture along root traces; odor.
40						9-12		At 7-9' Collect soil sample SB43-07
	10				13		9.7-13	SILTY CLAY: Greenish gray 5GY6/1; hard; plastic; moist; some caliche nodules (0.3-1.5" diameter); very dark gray 5Y3/1 shiny staining starting in microfracture and spreading away from microfracture; odor.
						12-15		SANDY GRAVELLY CLAY: Dark olive gray 5Y3/2; soft; wet; fine to medium grained sand; faint rainbow-like sheen; odor.
35					8		13-13.4	At 13-15' Collect soil sample SB43-13
							13.4-14	SILTY CLAY: Greenish gray 5GY6/1 mottled with strong brown 7.5YR5/8; hard; plastic; moist; trace small roots that are stained very dark greyish brown; odor.
	15					15-18	14-15	CLAYEY SAND: Light greenish gray 5GY7/1; medium dense to dense; moist; fine grained; rounded; well sorted; trace dark staining; no roots; odor.
					6		15-18	SILTY CLAY: Greenish gray 5GY7/1 mottled with reddish brown 5YR4/6; very hard; plastic; moist; trace black staining in reddish brown area (Mg?); some sandy clay lenses (1" thick); very slight odor.
30						18-21	18-20.5	SANDY CLAY: Greenish gray 5GY7/1; loose to dense; low plasticity; moist; no staining; very slight to no odor.
	20						20.5-24	At 19' grades to brown 7.5YR5/4
					3	21-24		SILTY CLAY: Greenish gray 5GY7/1; soft to firm; high plasticity; moist; no staining; no odor.
25								At 21-24' Collect soil sample SB43-21 and SPLP
	25							T.D. = 24 '

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SB44 DRILLING LOG

W.O. NO. 422-09 Boring/Well ID SB44 Date Drilled 10/12/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 24 ' Boring Diam. 2 "

N. Coord. 727297.04 ' E. Coord. 3165374.86 ' Surface Elevation 46.88 ' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Alfredo Palacios

Drilling Method Direct Push Sampling Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
46.88	0					0-3	0-0.7	CLAYEY SILTY SAND: Light olive brown 2.5Y5/4; medium dense; fine grained; rounded; well sorted; moist; some small roots; trace small pebbles; no odor.
							0.7-1.5	At 0-1' Collect surface soil sample SB44-00 and SPLP
45							1.5-6.8	CLAYEY GRAVEL: Clay is dark grayish brown 2.5Y3/2; moist. Gravel is white to light pink; angular; 0.3-1.5" diameter.
						3-6		SILTY CLAY: Very dark gray 2.5Y3/1; soft; very plastic; moist; no staining; no odor.
	5							
						6-9		
40					4		6.8-9	SILTY CLAY: Dark gray 2.5Y4/1 mottled with light olive brown 2.5Y5/6; firm to stiff; plastic; moist; no staining; no odor.
								At 8.0'dark gray grades gray 2.5Y6/1
						9-12	9-13	At 8.4' 1 large caliche nodule (1.5" diameter)
	10				3			SILTY SANDY CLAY: Gray 2.5Y6/1 mottled with olive yellow 2.5Y6/8; very stiff; plastic; moist; no odor
35								At 10.0' 1" thick lens of small caliche nodules (<0.5" diameter)
						12-15		
					4		13-15	CLAYEY SAND: Light gray 2.5Y7/1; medium dense; subrounded to rounded; well sorted; moist; no staining; no odor.
	15				5	15-18	15-16.3	SANDY CLAY: Light gray 2.5Y7/1 mottled with olive yellow 2.5Y6/8; very stiff; plastic; moist; no staining, no odor.
							16.3-17	At 15-17' Collect soil sample SB44-15 and SPLP
30							17-18	CLAYEY SAND: Light gray 2.5Y7/1; dense; subrounded to rounded; well sorted; moist; no staining; no odor.
						18-21	18-21	CLAY: Yellowish red 5YR4/6; hard; very plastic; moist; no staining; no odor.
	20							CLAYEY SAND: Light yellowish brown 2.5Y6/3; loose; well sorted; subrounded to rounded; wet; no staining; no odor
						21-24	21-21.7	SANDY CLAY: Brown 10YR5/4; soft; non-plastic; moist; very fine grained; no staining; no odor.
25					1		21.7-24	SILTY SANDY CLAY: Light gray 10YR7/1 mottled with olive yellow 2.5Y6/8; very stiff to hard; plastic; moist; no staining; no odor.
								At 22-24' Collect soil sample SB44-22
	25							T.D. = 24 '

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SB-50 DRILLING LOG

W.O. NO. 422-009 Boring/Well ID SB-50 Date Drilled 03/07/00

Project Phase 2C RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 31' Boring Diam. 8"

N. Coord. 729142.28' E. Coord. 3168191.52' Surface Elevation 45.12' MSL Datum

Screen: Type _____ Diam. _____ Length _____ Slot Size _____

Casing: Type _____ Diam. _____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. 20 (ATD) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

NAPL = Non-Aqueous Phase Liquid
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
100	0					0-5	0-2	FILL: asphalt
					0		2-15	SILTY CLAY: dark gray 7.5YR4/1; stiff PP=1.5 tsf; plastic; moist; no NAPL staining; no odor.
95	5					5-10		At 3' grades to mottled with gray 10YR6/1; firm PP=0.5 tsf; some small caliche nodules (1/8" diam)
					0			At 6.0-6.5' many small caliche nodules (1/8"); trace medium (1/4-1/2") caliche nodules
								At 6-10' grades to light gray 10YR7/1 mottled with browinish yellow 10YR6/8
90	10					10-15		At 7-9' Collect soil sample SB50-07'
								At 10-15' grades firm PP=1.0 tsf
					0			At 14-15' trace Fe-concretions
85	15					15-20	15-17.5	CLAY: light gray 2.5Y7/2, mottled with yellowish-red 5YR4/6; very stiff PP=2.5 tsf; plastic; moist; many small caliche nodules (1/8"); some medium caliche nodules (1/4-1/2"); angular-blocky ped structure; rare, light yellow-brown staining in microfractures between ped structures; no odor.
					0		17.5-20	SANDY CLAY: light greenish gray (2G7/10BG); very stiff PP=2.0 tsf; plastic; moist; very fine grained; trace light yellow-brown circular staining; no odor.
80	20					20-25	20-30	CLAYEY SAND: yellowish brown 10YR5/6; saturated; loose (fluidized); very fine grained; angular to subangular, well sorted; no sheen on standing water; no odor.
					0			
75	25					25-30		At 25' grades wet; medium dense
					0			
70	30							

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SB-50
DRILLING LOG

W.O. NO. 422-009 Boring/Well ID SB-50 Date Drilled 03/07/00

Project Phase 2C RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 31 ' Boring Diam. 8 "

N. Coord. 729142.28 ' E. Coord. 3168191.52 ' Surface Elevation 45.12 ' MSL Datum

Screen: Type _____ Diam. ____ Length _____ Slot Size _____

Casing: Type _____ Diam. ____ Length _____ Sump Length _____

Top of Casing Elevation _____ Stickup _____

Depth to Water: 1. Ft. 20 (ATD) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

NAPL = Non-Aqueous Phase Liquid
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
70	30				0	30-31	30-31	SILTY CLAY: strong brown 7.5YR4/6; very stiff PP=2.5 tsf; plastic; moist; no NAPL staining; no odor. At 30-31' Collect soil sample SB50-30 T.D. = 31 '
65	35							
60	40							
55	45							
50	50							
45	55							
40	60						67	

ERM Environmental Resources Management

SB-56 DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-56 Date Drilled 8/25/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 20' Boring Diam. 2"

N. Coord. 728295.4' E. Coord. 3167025.99' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

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NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-20	0-3.9	FILL: fill, gravelly sandy silt, very dark brown gray (7.5 YR), saturated with dark brown fluid, strong odor, gravel pieces 5-10mm
					52			
							3.9-5	SILTY CLAY: silty clay, very dark gray (7.5 YR 3/1), moist, pp=1.0tsf, very plastic, strong odor, sample SB-56 (4') collected @ 13:50
-5	5				110		5-10	SANDY CLAY: sandy clay, gray (7.5 YR 5/1), mottled with strong brown (7.5 YR 5/8), moist, pp=2.5tsf, very plastic, brown concretions <2mm, white calcareous nodules @ 10ft
					120			
-10	10				61		10-15	SANDY CLAY: sandy clay, gray (7.5 YR 5/1), sand content increases with depth, mottled with strong brown (7.5 YR 5/8), moist, pp=2.5tsf, very plastic
					216			
-15	15							

ERM Environmental Resources Management

SB-56
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-56 Date Drilled 8/25/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 20' Boring Diam. 2"

N. Coord. 728295.4' E. Coord. 3167025.99' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-15	15				111.5		15-20	SAND: sand, greenish gray (1 Gley 5/10 GY), saturated, fine-grained sand, poorly sorted, subrounded, saturated with dark brown fluid and water. collected SB-56C19at 14:15 (strong odor)
					60			
-20	20				41			T.D. = 20'
-25	25							
-30	30							

ERM Environmental Resources Management

SB-59
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-59 Date Drilled 8/21/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 1' Boring Diam. 2.5"

N. Coord. 728941.85' E. Coord. 3168210.72' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				0.0	0-1	0-0.2 0.2-1	CLAY: gray (1 for Gley 5/N), clay, moist, loose, slightly plastic, plant roots, 100% recovery SAND: pink (5 YR 7/4), sand, very fine-grained, sorted, rounded, moist, slightly cohesive, clay lenses, 100% recovery T.D. = 1'
-5	5							
-10	10							
-15	15							

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SB-60
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-60 Date Drilled 8/21/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 5' Boring Diam. 2.5"

N. Coord. 728918.5' E. Coord. 3168055.04' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-5	0-0.2	SANDY CLAY: dark gray (1 for Gley 4/N), sandy clay, moist, plastic, some black mottles, sand grains very fine-grained, sorted, rounded, 100% recovery
					2.4		0.2-1	SANDY CLAY: dark gray (1 for Gley 4/N), sandy clay, moist, slightly plastic, sand grains medium to fine-grained, sorted, subangular to rounded, 100% recovery
					0.0		1-2	SANDY CLAY: dark gray (1 for Gley 4/N), sandy clay, moist, plastic, sand grains very fine-grained, sorted, rounded, clay lenses, 100% recovery
					0.0		2-3	SANDY CLAY: gray (1 for Gley 5/N), sandy clay, moist, plastic, dense and firm, sand grains very fine-grained, sorted, rounded, occasional gravels, 100% recovery
-5	5				0.0		3-4	SANDY CLAY: gray (1 for Gley 5/N), sandy clay, moist, plastic, dense and firm, sand grains very fine-grained, sorted, rounded, occasional gravels, some calcite lenses, 100% recovery
							4-5	SANDY CLAY: greenish gray (1 for Gley 6/1), sandy clay, with light olive brown (2.5 Y 5/6) mottles, sand grains are very fine grains, rounded, sorted, moist, plastic and firm, sand grains in microfractures, 100% recovery
-10	10							T.D. = 5'
-15	15							

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SB-61
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-61 Date Drilled 8/22/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 0.5' Boring Diam. 2.5"

N. Coord. 728957.25' E. Coord. 3167661.25' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				NM	0-0.5	0-0.5	CLAYEY SAND: gray (1 for Gley 5/N), fine grained, sorted, rounded to subrounded, slightly cohesive, some gravel, moist, 100% recovery T.D. = 0.5'
-5	5							
-10	10							
-15	15							

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SB-62
DRILLING LOG

.oj. No. 0014419 Boring/Well ID SB-62 Date Drilled 8/21/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 0.5' Boring Diam. 2.5"

N. Coord. 728877.92' E. Coord. 3167485.01' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				0.5	0-0.5	0-0.5	SANDY CLAY: gray (1 for Gley 5/1), sandy clay, moist, plastic, some gravel, reddish brown (2.5 YR 4/4) mottles, 100% recovery T.D. = 0.5'
-5	5							
-10	10							
-15	15							

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SB-64
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-64 Date Drilled 8/28/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 34' Boring Diam. 2"

N. Coord. 728807.41' E. Coord. 3167316.72' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

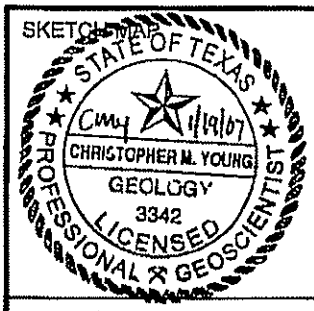
Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP



NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-34	0-2.2	FILL: gravelly, sandy silt, very dark gray (7.5 YR 5/1), moist, tan road base material, 5mm diameter gravel, medium to coarse sand, subangular
					1.6		2.2-5	CLAY: dark gray (7.5 YR 4/1), moist, pp=1.5 tsf, very plastic, white calcareous nodules <2mm diameter
-5	5				1.0		5-10	CLAY: greenish gray (1 Gley 5/10GY) mottled with strong brown (7.5 YR 5/6), moist, pp=2.5 tsf, very plastic, brown stains, white calcareous nodules ranging from <2mm and <5mm
					1.0			
-10	10				0.5		10-13.5	SAND: greenish gray (1 Gley 5/10 GY), saturated, pp=1.5 tsf, crumbly, very fine to medium-grained, subrounded, strong odor, traces of brown stains
					2.7			
							13.5-15	NO RECOVERY
-15	15							

ERM Environmental Resources Management

SB-64 DRILLING LOG

oj. No. 0014419 Boring/Well ID SB-64 Date Drilled 8/28/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 34' Boring Diam. 2"

N. Coord. 728807.41' E. Coord. 3167316.72' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-15	15				7.6		15-16.9	SAND: greenish gray (1 Gley 5/10 GY), saturated, pp=1.5 tsf, crumbly, very fine to medium-grained, subrounded, strong odor, traces of brown stains
					12		16.9-19.7	CLAY: greenish gray (1 Gley 5/10GY), mottled brown (7.5 YR 4/4), moist, pp=3.5 tsf, white concretions <4mm diameter
-20	20				39		19.7-20 20-25	SAND: brown (7.5 YR 4/4), saturated with dark brown fluid, loose, very fine to medium-grained, poorly sorted, subrounded, strong odor NO RECOVERY
-25	25				NM		25-26.7	SAND: brown (7.5 YR 4/4), saturated with less dark brown fluid, loose, very fine to medium-grained, poorly sorted, subrounded, strong odor
					25		26.7-28.5	CLAY: strong brown (7.5 YR 5/6) mottled with light gray (7.5 YR 7/1), moist, pp=3.5 tsf, very plastic, strong odor
-30	30						28.5-30	NO RECOVERY

ERM Environmental Resources Management

SB-64
DRILLING LOG

oj. No. 0014419 Boring/Well ID SB-64 Date Drilled 8/28/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 34 ' Boring Diam. 2 "

N. Coord. 728807.41 ' E. Coord. 3167316.72 ' Surface Elevation 0 ' Ft. MSL Datum

Screen: Type ____ Diam. 0 " Length 0 ' Slot Size 0 "

Casing: Type ____ Diam. 0 " Length 0 ' Sump Length 0 '

Top of Casing Elevation 0 ' Stickup 0 '

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-30	30				16.8		30-34	CLAY: red (2.5 YR 4/6), moist, pp=>4.5 tsf, white concretion <2mm diameter, slightly plastic, collected sample SB-64(31'-33')
					63.5			
					64			T.D. = 34 '
-35	35							
-40	40							
-45	45							

ERM Environmental Resources Management

SB-67
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-67 Date Drilled 8/30/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 34 ' Boring Diam. 2 "

N. Coord. 728619.35 ' E. Coord. 3167479.83 ' Surface Elevation 0 ' Ft. MSL Datum

Screen: Type _____ Diam. 0 " Length 0 ' Slot Size 0 "

Casing: Type _____ Diam. 0 " Length 0 ' Sump Length 0 '

Top of Casing Elevation 0 ' Stickup 0 '

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP

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NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-34	0-5	FILL: gravelly silty sand, very dark gray (7.5 YR 3/1) moist, gravel pieces 2mm to 50mm, slight odor, saturated with brown fluid in some locations, strong odor
					76			
-5	5				36.5		5-7.7	CLAY: very dark gray (7.5 YR 3/1), moist, pp=1.5 tsf, very plastic, rootlets, strong odor, traces of brown fluid
							7.7-10	CLAY: gray (7.5 YR 5/1), mottled with strong brown (7.5 YR 5/6), moist, pp=2.5 tsf, very plastic, strong odor
-10	10				40.8		10-12.8	SANDY CLAY: greenish gray (1 Gley) mottled with strong brown (7.5 YR 5/6), moist, pp=3.5 tsf, brown stains <2mm diameter, sand content increases with depth
					48.5		12.8-15	NO RECOVERY
-15	15							

ERM Environmental Resources Management

SB-67
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-67 Date Drilled 8/30/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 34' Boring Diam. 2"

N. Coord. 728619.35' E. Coord. 3167479.83' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-15	15				20.1		15-18.2	SAND: greenish gray (1 Gley 5/10GY) mottled with very dark greenish gray (1 Gley 3/10Y) and strong brown (7.5 YR 5/6), saturated, loose, very fine to medium-grained, subrounded, traces of brown fluid at 16.4', poorly sorted, strong odor
					42.9			
					19.5		18.2-20	NO RECOVERY
-20	20				NM		20-25	SAND: greenish gray (1 Gley 5/10GY), very dark brown staining in sand from 21.4' to 25', saturated, loose, very fine to medium-grained, subrounded, poorly sorted
					191			
-25	25				304		25-25.3	SAND: greenish gray (1 Gley 5/10GY), saturated, loose, very fine to medium-grained, subrounded, poorly sorted
							25.3-28.8	CLAY: strong brown (7.5 YR 5/6) mottled with gray (7.5 YR 6/1) moist, pp=4.5tsf, plastic, traces of white calcareous nodules, 2mm diameter
					230			
					119		28.8-30	NO RECOVERY
-30	30							

ERM Environmental Resources Management

SB-67
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-67 Date Drilled 8/30/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 34' Boring Diam. 2"

N. Coord. 728619.35' E. Coord. 3167479.83' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-30	30				NM		30-34	CLAY: strong brown (7.5 YR 5/6) mottled with gray (7.5 YR 6/1) moist, pp=>4.5 tsf, plastic, collected sample at 31'-33', At 32.2'-32.2' - a 1-inch calcareous zone
					40			
					75			T.D. = 34'
-35	35							
-40	40							
-45	45							

ERM Environmental Resources Management

SB-72
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-72 Date Drilled 8/25/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 35' Boring Diam. 2"

N. Coord. 728508.52' E. Coord. 3167169.38' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP

STATE OF TEXAS
CHRISTOPHER M. YOUNG
GEOLOGY
3342
LICENSED
PROFESSIONAL GEOSCIENTIST
1/8/07

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-35	0-3	FILL: gravelly, silty, sand, very dark gray (7.5 YR 3/1), moist to wet, (sheen at 3'), wood fragments
							3-5	DEPRECATED: SANDY SILTY CLAY: very dark gray (7.5 YR 3/1), moist, pp=1.5 tsf, crumbly
-5	5				32		5-10	SILTY CLAY: gray (7.5 yr 5/1), moist, mottled with strong brown (7.5 YR 5/6), pp=2.5 tsf, very plastic, brown concretions <2mm, at 9.1' white calcareous nodules <2mm
					41			
-10	10				516		10-15	SANDY CLAY: greenish gray (1 Gley 5/10GY), mottled with strong brown (7.5 YR 5/6), moist, pp=2.25 tsf, very fine to medium-grained sand, subrounded, very plastic, from 11.5' to 12.1' white calcareous nodule zone, 2mm to 5mm diameter, sand content increases with depth, brown concretions <2mm
					2.4			
-15	15							

ERM Environmental Resources Management

SB-72
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-72 Date Drilled 8/25/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 35' Boring Diam. 2"

N. Coord. 728508.52' E. Coord. 3167169.38' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-15	15				2.5		15-18.1	SAND: greenish gray (1 Gley 5/10GY), mottled with gray (7.5 YR 6/1), saturated, pp=1.0 tsf subrounded, very fine to medium-grained, poorly sorted, strong odor
					19		18.1-20	NO RECOVERY
-20	20				15		20-25	SAND: greenish gray (1 Gley 5/10GY), mottled with gray (7.5 YR 6/1), saturated, pp=1.0 tsf subrounded, very fine to medium-grained, poorly sorted, strong odor, collected sample SB-72(21')
					14.5			
-25	25				8.7		25-25.4	SAND: greenish gray (1 Gley 5/10GY), mottled with gray (7.5 YR 6/1), saturated, pp=1.0 tsf subrounded, very fine to medium-grained, poorly sorted, strong odor
							25.4-28.6	CLAY: strong brown (7.5 YR 5/6) mottled with light gray (7.5 YR 7/1), moist, pp=>4.5 tsf, plastic,
					7.1			
-30	30						28.6-30	NO RECOVERY

ERM Environmental Resources Management

SB-72
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-72 Date Drilled 8/25/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 35' Boring Diam. 2"

N. Coord. 728508.52' E. Coord. 3167169.38' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-30	30				2.0		30-31.8	CLAY: strong brown (7.5 YR 5/6) mottled with light gray (7.5 YR 7/1), moist, pp=>4.5 tsf, plastic, white calcareous nodules
					2.5		31.8-35	CLAY: red (2.5 YR 4/6), moist, pp=>4.5 tsf, slightly plastic, white calcareous nodules, collected sample SB-72 (34')
-35	35				11.3			T.D. = 35'
-40	40							
-45	45							

ERM Environmental Resources Management

SB-73
DRILLING LOG

. .oj. No. 0014419 Boring/Well ID SB-73 Date Drilled 8/30/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 35' Boring Diam. 2"

N. Coord. 728578.23' E. Coord. 3167360.26' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP

STATE OF TEXAS
CHRISTOPHER M. YOUNG
GEOLOGY
3342
LICENSED
PROFESSIONAL GEOSCIENTIST

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-35	0-5	FILL: concrete, road base to approximately 1.5', gravelly, silty sand, black (7.5 YR 2.5/1), saturated to wet, loose, large wood pieces (2inch), dark brownish fluid, strong odor
-5	5				43		5-8.3	SILTY CLAY: very dark gray (7.5 YR 3/1), moist, pp=1.5 tsf, very plastic, traces of rootlets, strong odor
					62.7		8.3-10	SILTY CLAY: gray (7.5 YR 5/1), moist, pp=3.0 tsf, plastic, trace fractures, few strong brown mottling (7.5 YR 5/6), brown stains (<3mm diameter), strong odor
-10	10				28		10-15	SANDY CLAY: greenish gray (1 Gley 5/10 Y) mottled with strong brown (7.5 YR 5/6), moist, pp=2.5 tsf, very plastic, brown stains (<2mm diameter), traces of brown fluid, very fine sand grains, subrounded, collected SB-73(14')
					23.4			
-15	15							

ERM Environmental Resources Management

SB-73 DRILLING LOG

. .Jj. No. 0014419 Boring/Well ID SB-73 Date Drilled 8/30/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 35' Boring Diam. 2"

N. Coord. 728578.23' E. Coord. 3167360.26' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-15	15				54.8		15-19	SAND: greenish gray (1 Gley 6/10Y), saturated, loose, very fine to medium-grained, poorly sorted, slight odor, collected sample 16'-19'
					24.9			
					16		19-20	NO RECOVERY
-20	20				NM		20-24	SAND: greenish gray (1 Gley 6/10Y), saturated, loose, very fine to medium-grained, poorly sorted, slight odor, collected sample 21'
					40			
					150		24-25	NO RECOVERY
-25	25				NM		25-30	CLAY: gray (7.5 YR 6/1), moist, pp=2.5 tsf, very plastic, strong brown mottling (7.5 YR 5/6)
					10.2			
-30	30							

ERM Environmental Resources Management

SB-73
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-73 Date Drilled 8/30/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 35' Boring Diam. 2"

N. Coord. 728578.23' E. Coord. 3167360.26' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-30	30				40		30-35	CLAY: strong brown (7.5 YR 5/6) moist, pp=4.5 tsf, slightly plastic, traces of white calcareous nodules <1mm diameter, collected sample 31'-33', collected sample 34'
					46.8			
-35	35				45.2			T.D. = 35'
-40	40							
-45	45							

ERM Environmental Resources Management

SB-74
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-74 Date Drilled 8/28/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 22' Boring Diam. 2"

N. Coord. 728517.08' E. Coord. 3167494.85' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Jessica Rose

SKETCH

STATE OF TEXAS
CHRISTOPHER M. YOUNG
GEOLOGY
3342
LICENSED
PROFESSIONAL GEOSCIENTIST

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-22	0-0.3	SANDY CLAY: dark yellowish brown (10 YR 4/4) sandy clay, moist, poorly sorted sands and gravel, mica, odor
							0.3-1.5	SANDY CLAY: black (10 YR 2/1) sandy clay, moist, well rounded sand, traces of gravel, plastic, pp=0.5 tsf at 1'
					108.5		1.5-5	NO RECOVERY
-5	5				NM		5-10	DEPRECATED: SANDY SILTY CLAY: black (2.5 Y 2.5/1) sandy, silty clay, well sorted, very fine-grained sand, moist, plastic, pp=1.5 tsf at 6', pp=1.75 tsf at 7', pp=1.5 tsf at 8', pp=2.75 tsf at 9', pp=1.75 tsf at 10', carbonate lenses last three inches, mottled with light gray last foot
					26.1			
-10	10				30.2		10-13	SANDY CLAY: gray (3.5 Y 5/1) sandy clay, well sorted, well rounded, very fine-grained sand, moist, plastic, pp=3.0 tsf at 11', pp=2.5 tsf at 12', pp=2.55 tsf at 13', pp=1.5 tsf at 14', mottled, carbonate lense at 11.4'-11.5', increasing sand content
					48.8		13-15	SANDY CLAY: gray (2.5 Y 5/1) sandy clay, slightly plastic, loose, well rounded, fine-grained sand, moist, carbonate lenses throughout
-15	15							

ERM Environmental Resources Management

SB-74
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-74 Date Drilled 8/28/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 22 ' Boring Diam. 2 "

N. Coord. 728517.08 ' E. Coord. 3167494.85 ' Surface Elevation 0 ' Ft. MSL Datum

Screen: Type _____ Diam. 0 " Length 0 ' Slot Size 0 "

Casing: Type _____ Diam. 0 " Length 0 ' Sump Length 0 '

Top of Casing Elevation 0 ' Stickup 0 '

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

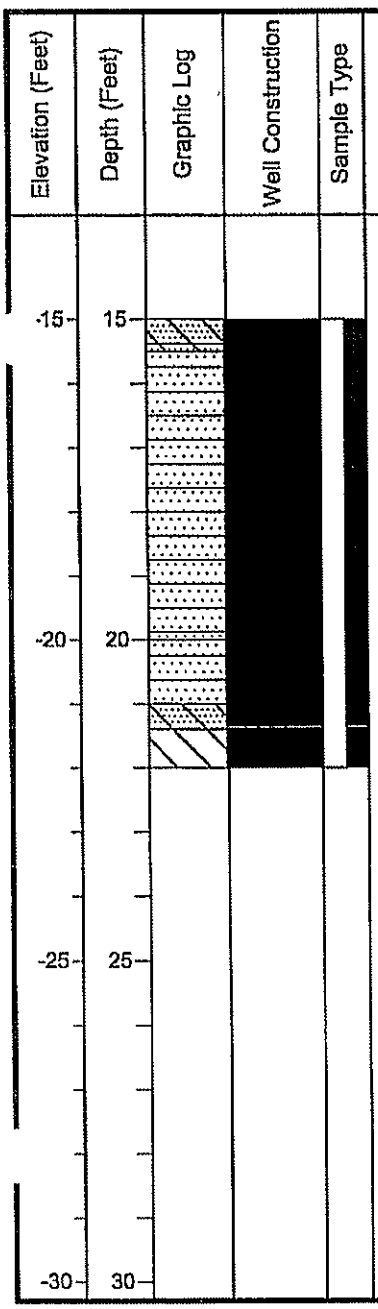
Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.



OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
67.3		15-15.5	SILTY SANDY CLAY: grayish brown (2.5 Y 5/2) silty sand clay, moist, plastic, pp=1.0 tsf at 15.5', slightly mottled
		15.5-20	SILTY SAND: light olive brown (2.5 Y 5/4) silty sand, fine-grained, well rounded, well sorted sand, wet
159			
273		20-21	SILTY SAND: olive (5 Y 5/4) silty sand, very fine-grained sand, traces of clay, moist
		21-21.4	SANDY CLAY: strong brown (7.5 YR 4/6) sandy clay first 4 inches, well sorted sands, carbonate traces, loose , decreasing sand content with depth, moist
307		21.4-22	CLAY: clay mottled, moist, plastic, pp=4.5 tsf at 21.5'
			T.D. = 22 '

ERM Environmental Resources Management

SB-75
DRILLING LOG

. .oj. No. 0014419 Boring/Well ID SB-75 Date Drilled 8/28/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 34' Boring Diam. 2"

N. Coord. 728685.63' E. Coord. 3167404.87' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP

STATE OF TEXAS
CHRISTOPHER M. YOUNG
GEOLOGY
3342
LICENSED
PROFESSIONAL GEOSCIENTIST

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-34	0-3	FILL: fill, gravelly silty sand, tan road fill packed material
							3-5	SANDY SILT: very dark gray (7.5 YR 3/1), sandy silty, moist, crumbly, pp=0.5 tsf, very fine to medium-grained, poorly sorted
-5	5				4.8		5-10	SILTY CLAY: silty clay, gray (7.5 YR 5/1) mottled with strong brown (7.5 YR 5/6) moist, pp=3.0 tsf, very plastic, brown concretions, <2mm diameter
					0.5			
-10	10				1.0		10-14.3	SANDY CLAY: sandy clay, greenish gray (1 Gley 5/10GY), mottled with strong brown (7.5 YR 5/6), moist, pp=2.5 tsf, plastic, very fine to medium-grained sand, sand content increases with depth
					1.0			
-15	15						14.3-15	SAND: sand, greenish gray (1 Gley 5/10GY), wet, saturated, pp=1.0 tsf, very fine to medium-grained sand, strong odor

ERM Environmental Resources Management

SB-75
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-75 Date Drilled 8/28/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 34' Boring Diam. 2"

N. Coord. 728685.63' E. Coord. 3167404.87' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-15	15				2.1		15-20	SAND: sand, greenish gray (1 Gley 5/10GY), wet, saturated, pp=1.0 tsf, very fine to medium-grained sand, strong odor
					2.1			
-20	20				5.4		20-23.4	SAND: sand, brown (7.5 YR 4/3) mottled with greenish gray (1 Gley 5/10GY) and strong brown (7.5YR5/6), saturated with brown fluid with sheen, loose, very fine to medium-grained, poorly sorted, subrounded
					95.3			
							23.4-25	CLAY: clay, greenish gray (1 Gley), mottled with strong brown (7.5 YR 5/6), moist, pp=>4.5 tsf, slightly plastic, brown concretions <5mm
-25	25				102.6		25-28.3	CLAY: clay, gray (7.5 YR 5/1), mottled with strong brown (7.5 YR 5/6), moist, pp=>4.5 tsf, slightly plastic, white calcareous nodules <2mm diameter, strong odor
					53.8			
							28.3-30	NO RECOVERY
-30	30							

ERM Environmental Resources Management

SB-75 DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-75 Date Drilled 8/28/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 34' Boring Diam. 2"

N. Coord. 728685.63' E. Coord. 3167404.87' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-30	30				50.4		30-34	CLAY: clay, red (2.5 YR 4/6) mottled with gray (7.5 YR 5/1) , moist, pp=>4.5 tsf, white concretion <2mm, slightly plastic, collected sample SB-75 (30') and SB-75 (31'-33')
					40.6			
					31.2			T.D. = 34'
-35	35							
-40	40							
-45	45							

ERM Environmental Resources Management

SB-76 DRILLING LOG

Job No. 0014419 Boring/Well ID: SB-76 Date Drilled 8/30/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 35' Boring Diam. 2"

N. Coord. 728748.25' E. Coord. 3167651.47' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP

STATE OF TEXAS
CHRISTOPHER M. YOUNG
GEOLOGY
3342
LICENSED
PROFESSIONAL GEOSCIENTIST
1/19/07

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-35	0-3.1	FILL: gravelly, silty, sand, very dark gray (7.5 YR 3/1), moist, crumbly-loose, gravel 5mm-20mm diameter
					37.9		3.1-5	SILTY CLAY: very dark gray (7.5 YR 3/1), moist to saturated, pp=1.0 tsf, very plastic, strong odor
-5	5				46		5-10	SILTY CLAY: gray (7.5 YR 5/1) mottled with strong brown (7.5 YR 5/6), moist, pp=<2.5 tsf, very plastic, brown stains, at 9.1' many white calcareous nodules
					56.7			
-10	10				66.2		10-15	SANDY CLAY: sandy clay, greenish gray (1 Gley 5/10GY), mottled with strong brown (7.5 YR 5/6) and gray (7.5 yr 6/1), moist, pp=2.5 tsf, very fine grained to medium-grained sand, strong odor, subrounded, traces of brown stains <3mm diameter, white calcareous nodules <2mm
					83.9			
-15	15							

ERM Environmental Resources Management

SB-76
DRILLING LOG

. .oj. No. 0014419 Boring/Well ID SB-76 Date Drilled 8/30/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 35' Boring Diam. 2"

N. Coord. 728748.25' E. Coord. 3167651.47' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-15	15				48.2		15-20	SAND: greenish gray (1 Gley 5/10GY) mottled with strong brown (7.5 YR 5/6), saturated, loose, very fine to medium-grained, brown stain 50mm diameter @ 16.4'
					36.5			
-20	20				3.7		20-25	SAND: greenish gray (1 Gley 5/10GY) mottled with strong brown (7.5 YR 5/6) saturated, loose, very fine to medium-grained, strong odor, from 20.4' to 21.6' clay layer present same as at 10-15' interval
					28.4			
-25	25				159		25-25.8	SAND: greenish gray (1 Gley 5/10GY) mottled with strong brown (7.5 YR 5/6) saturated with dark brown fluid, loose, very fine to medium-grained, strong odor
							25.8-30	CLAY: strong brown (7.5 YR 5/6), mottled with gray (7.5 YR 6/1), moist, pp=4.5 tsf, slightly plastic
					358			
-30	30							

ERM Environmental Resources Management

SB-76
DRILLING LOG

. .oj. No. 0014419 Boring/Well ID SB-76 Date Drilled 8/30/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 35' Boring Diam. 2"

N. Coord. 728748.25' E. Coord. 3167651.47' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Emmanuel Mkandawire

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-30	30				152.3		30-35	CLAY: strong brown (7.5 YR 5/6), mottled with gray (7.5 YR 6/1), moist, pp=4.5 tsf, slightly plastic, strong odor, sample 31'-33' collected @ 16:20
					174.7			
-35	35				63			T.D. = 35'
-40	40							
-45	45							

ERM Environmental Resources Management

SB-85B
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-85B Date Drilled 8/7/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2' Boring Diam. 2.5"

N. Coord. 727573.83' E. Coord. 3165885.99' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Marcel St. Marie

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				161.4 170 NM 186	0-2	0-0.5 0.5-1 1-2	GRAVELLY SAND: dark brown (10 YR 3/3) sandy, trace clay, lots of gravel, moist, trace roots, gravel is mainly angular, 100% recovery SAND: some clay, lighter in color, dark brown (7.5 YR 3/3), no gravel, small amount of well rounded pieces, moist, 100% recovery SILTY SAND: silty sand, dark brown (7.5 YR 3/3), very fine, well sorted, subrounded, trace gravel, moist, red paint at 2.0 (possible indicating buried line), NOTE refusal before line 2, 100% recovery T.D. = 2'
-5	5							
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-86A
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-86A Date Drilled 8/8/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3.5' Boring Diam. 2.5"

N. Coord. 727659.2' E. Coord. 3166044.1' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Jessica Rose and Marcel St. Marie

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				137.4	0-3.5	0-0.5	SANDY CLAY: dark yellowish brown (10 YR 3/4) sandy clay, well sorted sand with non plastic clay, traces of rootlets, little to no gravel, moist, 100% recovery
							0.5-1.5	SANDY CLAY: Very dark gray (10 YR 3/1) sandy clay, well sorted sand with non plastic clay, traces of rootlets, no gravel, increasing clay content with depth, moist, odor, 100% recovery
					201.4		1.5-2	SANDY CLAY: very dark brown (10 YR 2/2) sandy clay, well sorted sand with non plastic clay, traces of rootlets, no gravel, increasing clay content with depth, wet, odor, micas, 100% recovery
					224.0		2-2.5	SANDY CLAY: very dark brown (10 YR 2/2) sandy clay, well sorted sand with non plastic clay, traces of rootlets, no gravel, increasing clay, wet, strong odor, micas, 100% recovery, appears to be product
					202.0		2.5-3.5	CLAY: native clay, black (2.5 Y 2.5), plastic pp = 1.0tsf, firm, moist, 100% recovery
					155.0			T.D. = 3.5'
-5	5							
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-86A1 DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-86A1 Date Drilled 8/8/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 1.5' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Jessica Rose and Marcel St. Marie

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 8' Northeast of SB-86A parallel to ditch.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-1.5	0-1	SANDY CLAY: light olive brown (2.5 YR 5/4) sandy clay, moist, clay is firm, plastic, pp=0.5 tsf, sand is very fine-grained, well sorted, includes large amounts of wood fragments
					20.5		1-1.5	CLAYEY SAND: black (10 YR 2/1) clayey sand, black, very fine grained, well sorted sand, wet, abundant wood fragments, strong odor, refusal - more wood fragments
					127.5			T.D. = 1.5'
-5	5							
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-86A2
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-86A2 Date Drilled 8/9/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3.5' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Marcel St. Marie

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 10' Southwest of SB-86A parallel to ditch.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-3.5	0-0.9	CLAYEY SAND: dark, yellowish brown (10 YR 3/4) clayey sand, sand grains are well sorted fine-grained, moist, clay is non-plastic, little to no gravel
					17.0		0.9-1	OTHER: black (10 YR 2/1), moist, firm, plastic (pp=1.75 tsf)
							1-2	SANDY CLAY: very dark brown (10 YR 2/2) sandy clay, sand is well sorted, moist, clay is non plastic, no gravel
					45.5		2-2.5	SAND: light olive brown (2.5 Y 5/4) sand, well rounded, fine grained sand with trace clay, moist, wood fragments, trace gravel, some rootlets, odor
					2.9		2.5-3.5	CLAY: black (2.5 Y 2.5/1) clay, moist, firm, plastic (pp=1.0 tsf) clay with some sand, odor
-5	5							T.D. = 3.5'
-10	10							
-15	15							

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SB-86A3 DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-86A3 Date Drilled 8/9/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 10' Northeast of SB-86A parallel to ditch.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-2	0-0.8	SAND: light yellowish brown (10 YR 6/1) from 0 to 0.8', sand, well sorted sand with traces of clay, moist, 100% recovery
					0.5		0.8-1	SAND: very dark brown (10 YR 2/2), sand with traces of clay, increasing with depth, moist, 100% recovery
					>252.0		1-2	CLAYEY SAND: black, clayey sand, appears to be product, strong odor, moist, 100% recovery
								T.D. = 2'
-5	5							
-10	10							
-15	15							

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SB-86A4 DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-86A4 Date Drilled 8/9/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 20' Northeast of SB-86A parallel to ditch.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-2	0-1	CLAYEY SAND: yellowish brown (10 YR 5/4) clayey sand, very fine grained, well sorted sand, moist, firm, plastic clay (pp=0.25 tsf), wood fragments abundant last 4-5 inches, 100% recovery
					2.0		1-2	CLAYEY SAND: dark brown (10 YR 3/3), clayey sand, fine grained sand with non plastic clay, moist, wood fragments, appears to be product last 2 inches, 100% recovery
					46.4			T.D. = 2'
-5	5							
-10	10							
-15	15							

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SB-86A5 DRILLING LOG

Job No. 0014419 Boring/Well ID SB-86A5 Date Drilled 8/9/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2.5' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 30' Northeast of SB-86A parallel to ditch.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-2.5	0-0.8	SAND: yellowish brown (10 YR 5/6) sand, well sorted, clay traces, gravel is small and minimal, moist
					28.6		0.8-0.9	SAND: very dark brown (10 YR 2/2) sand, well sorted, clay traces, gravel is small and minimal, increasing clay content with depth, moist
							0.9-2	SAND: yellowish brown (10 YR 5/6) well sorted, clay traces, gravel is small and minimal, moist
					32.1		2-2.5	CLAYEY SAND: dark yellowish brown (10 YR 4/6) clayey sand, fine-grained, well sorted, no gravel
								CLAY: very dark brown (10 YR 2/2) native cay, intermitent layers of sand at (1-2). staining, product
								T.D. = 2.5'
-5	5							
-10	10							
-15	15							

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SB-86A6 DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-86A6 Date Drilled 8/9/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2.2' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 40' Northeast of SB-86A parallel to ditch.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				22.2	0-2.2	0-0.3	SANDY CLAY: yellowish brown (10 YR 5/6) sandy clay, mottled rootlets, fine grained, trace mica, moist, slight plastic, soft, 100% recovery
							0.3-0.4	
							0.4-0.5	
					2.5		1-1.3	SILTY CLAY: black (10 YR 2/1) silty clay, some sand, moist, non plastic, loose, soft, 100% recovery
							1.3-1.5	SANDY CLAY: dark grayish brown (10 YR 4/2) sandy clay, moist, non plastic, trace gravels and rootlets, mica, loose, 100% recovery
					59.6		1.5-2.2	CLAYEY SAND: dark yellowish brown (10 YR 4/6) clayey sand, sand is well sorted, moist, clay is soft, non plastic, mica is abundant and coarse grained, 100% recovery
								CLAYEY SAND: black (10 YR 2/1) clayey sand, moist, non plastic, soft loose mica fine grained, 100% recovery
								SANDY CLAY: dark grayish brown (10 YR 4/2) sandy clay, moist, non plastic, trace gravels and rootlets, mica, loose, mica grain size increasing, 100% recovery
-5	5							CLAYEY SAND: black (10 YR 2/1) clayey sand, moist, odor, product, 100% recovery
								T.D. = 2.2'
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-86A7 DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-86A7 Date Drilled 8/9/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 54' Northeast of SB-86A parallel to ditch.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-3	0-0.3	SANDY CLAY: yellowish brown (10 YR 5.8) sandy clay, moist, slightly plastic, soft, rootlets, little to no gravel, 100% recovery
					403		0.3-1	CLAYEY SAND: black (10 YR 2/1) clayey sand, well sorted sand, moist, rootlets, clay is soft, non plastic, loose, minimal gravel, 100% recovery
					64.7		1-1.8	CLAYEY SAND: yellowish brown (10 YR 5/4) clayey sand, well sorted sand, fine grained, little to no gravel, clay increasing with depth, moist, 100% recovery
					120.4		1.8-2	CLAYEY SAND: very dark grayish brown (10 YR 3/2) clayey sand, well sorted sand, fine grained, little to no gravel, clay increasing with depth, moist, 100% recovery
							2-2.5	SANDY CLAY: very dark grayish brown (10 YR 3/) sandy clay, moist, slightly plastic, soft, no gravel, apparent product, odor, 100% recovery
							2.5-3	CLAY: black (10 YR 4/1) native clay, moist, plastic, soft, pp-0.25tsf, intermittent sand, no gravel, 100% recovery
-5	5							T.D. = 3'
-10	10							
-15	15							

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SB-86A8 DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-86A8 Date Drilled 8/10/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3.5' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

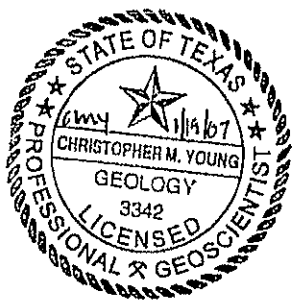
Drilling Method Hand Auger Log By Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 82' Northeast of SB-86A parallel to ditch.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-3.5	0-0.3	CLAYEY SAND: brown (10 YR 5/3) clayey sand, moist, well sorted sand, non plastic clay, soft, loose, rootlets, small gravel, odor, mica
					2.1		0.3-0.9	SILTY SAND: very dark gray (10 YR 3/1) silty sand, moist, non plastic, soft, loose, contains hard, tar-like substance, mica, odor
					0.0		0.9-1	CLAYEY SAND: dark brown (10 YR 3/3) from 0.9' to 1', clayey sand, moist, poorly sorted, large mica grains, small subangular gravel pieces, non plastic, soft, odor
					133.7		1-1.25	CLAYEY SAND: dark yellowish brown (10 YR 3/4) clayey sand, moist, well sorted, fine-grained sand, non plastic, soft, loose
					103.2		1.25-1.5	CLAYEY SAND: very dark brown (10 YR 2/2) clayey sand, moist, well sorted, fine-grained sand, non plastic, soft, loose
							1.5-2.3	CLAYEY SAND: very dark gray (5 Y 3/1) clayey sand, wet, fine-grained, well sorted sand, no gravel, non plastic, soft, loose, odor, apparent product
-5	5						2.3-3.5	SANDY CLAY: black (5 Y 2.5/1) sandy clay, wet, (pp=0.25tsf), plastic, slightly firm, very fine-grained, well sorted sand, no gravel, odor, product, moist from 2.5' to 3.5'
								T.D. = 3.5'
-10	10							
-15	15							



ERM Environmental Resources Management

SB-86A9 DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-86A9 Date Drilled 8/10/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 98' Northeast of SB-86A parallel to ditch.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-3	0-0.5	CLAYEY SAND: black (7.5 YR 2.5/1) clayey sand, moist, fine-grained, well sorted sand with abundant rounded to subangular gravel, non plastic, soft, loose, intermittent sands lenses
					0.8		0.5-1	
							1-1.5	SAND: brown (7.5 YR 5/4) sand, moist, well sorted, traces of clay, minimal gravel, clay content decreasing
							1.5-2.5	SILTY SAND: black (10 YR 2/1) silty sand, non plastic, soft, loose intermittent sand lenses, moist, no gravel
					0.8		2.5-3	SAND: yellowish brown (10 YR 5/8) sand with traces of clay to no clay at all, moist, well rounded, wel sorted, fine-grained sand, gravel, large subangular, mottled sand
					0.6			CLAY: very dark grayish brown (10 YR 3/2) clay, moist, plastic, firm (pp=1.25tsf), traces of sand, intermittent sand lenses, no gravels, no odor, no product
								T.D. = 3'
-5	5							
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-86B
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-86B Date Drilled 8/8/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3 ' Boring Diam. 2.5 "

N. Coord. _____ E. Coord. _____ Surface Elevation 0 ' Ft. MSL Datum

Screen: Type _____ Diam. 0 " Length 0 ' Slot Size 0 "

Casing: Type _____ Diam. 0 " Length 0 ' Sump Length 0 '

Top of Casing Elevation 0 ' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Jessela Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 5' Northwest of SB-86A perpendicular to ditch.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				11.9	0-3	0-0.5	SANDY CLAY: very dark grayish brown (10 YR 3/1) sandy clay, well sorted sand grains, moist, clay is slightly plastic, small, well rounded gravel pieces, 100% recovery
					NM		0.5-1.75	SAND: yellowish brown (10 YR 4/4) sand, well rounded, well sorted fine-grained sand, traces of clay lenses, increasing clay content from 1.5' to 1.75', moist, 100% recovery
					105.6		1.75-2	SANDY CLAY: very dark grayish brown (10 YR 3/2) loose sandy clay, well rounded, well sorted fine-grained sand, higher clay content from previous interval, moist, plasticity increasing, 100% recovery
					NM		2-3	CLAY: black (2.5 Y 2.5/1) clay, plastic, pp=1.0 tsf, firm, trace amounts of sand, no gravel, moist, 100% recovery
-5	5							T.D. = 3 '
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-86C
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-86C Date Drilled 8/8/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2.5' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Jessica Rose and Marcel St. Marie

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 14' Northwest of SB-86A perpendicular to ditch.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				94.9 69.3 2.8	0-2.5	0-0.5 0.5-1 1-2 2-2.5	SANDY CLAY: dark yellowish brown (10 YR 3/4) sandy clay, well sorted sand with small amounts of clay, abundant mica grains, small well rounded to subangular gravel, moist, 100% recovery SANDY CLAY: very dark grayish brown (10 YR 3/2) sandy clay, well sorted sand with small amounts of clay, abundant mica grains, small well rounded to subangular gravel, increasing clay content with depth, moist, wood fragments, rounded gravel, 100% recovery SANDY CLAY: dark grayish brown (10 YR 4/2) sandy clay, well rounded sand grains, moist, non plastic clay, minimal clay, wood fragments CLAY: clay same as clay interval noted previously, moist T.D. = 2.5'
-5	5							
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-86C1
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-86C1 Date Drilled 8/10/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2.5' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

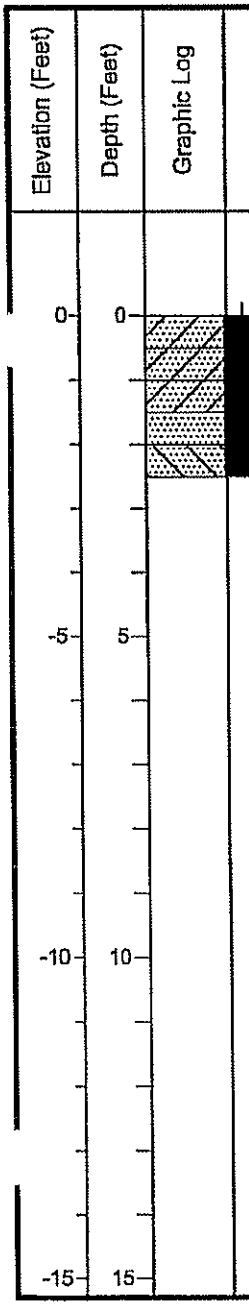
Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Jessica Rose

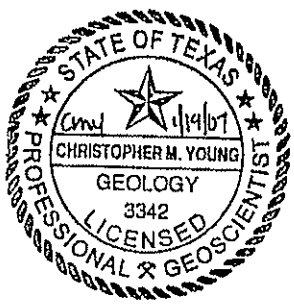
SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located from SB-86A 10' Northeast parallel to ditch followed by 11' Northwest perpendicular to ditch.



OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	0-2.5	0-0.5	CLAYEY SAND: brown (7.5 YR 4/3) from 0 to 0.5', clayey sand, moist, coarse, poorly sorted sands and gravels, abundant mica, non plastic, loose
1.4		0.5-1	
		1-1.5	CLAYEY SAND: dark brown (7.5 YR 3/3) clayey sand, moist, coarse-grained sand and gravel, soft, loose, non plastic, mica
2.0		1.5-2	
1.7		2-2.5	CLAYEY SAND: dark brown (7.5 YR 3/2) clayey sand, moist, coarse-grained sand and gravel, soft, loose, non plastic, mica, clay increasing
0.3			SAND: dark olive brown (2.5 Y 3/3) sand, moist, well sorted, fine-grained, clay traces, intermittent clay layer, no gravel, little gravel, slight odor
			SANDY CLAY: dark gray (2.5 Y 4/1) sandy clay, moist, intermittent layers, plastic, firm pp=1.25tsf
			T.D. = 2.5'



ERM Environmental Resources Management

SB-86C2 DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-86C2 Date Drilled 8/10/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 1' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located from SB-86A 30' Northeast parallel to ditch followed 10' Northwest perpendicular to ditch.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-1	0-0.9	CLAYEY SAND: dark brown (10 YR 3/3) clayey sand/gravel, moist, poorley sorted rounded to angular gravels, non plastic
					1.0		0.9-1	SILTY SAND: black (10 YR 2/1) silty sand, moist, very fine-grained sand, non plastic, soft, loose small round, subangular gravel
								T.D. = 1'
-5	5							
-10	10							
-15	15							

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SB-87B DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-87B Date Drilled 8/9/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3.5' Boring Diam. 2.5"

N. Coord. 727753.49' E. Coord. 3166225.18' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-3.5	0-1	CLAYEY SAND: dark yellowish brown (10 YR 3/4) clayey soil, poorly sorted, large mica grains, sand is fine-grained, moist, clay is soft, non plastic, loose, gravel angular
					61.6		1-1.5	SANDSTONE: yellowish brown (10 YR 5/4) clayey soil, well sorted, moist, fine-grained mica, soft, non plastic
							1.5-2	SILTY SANDY CLAY: black (10 YR 2/1) silty, sandy, clay, very fine-grained traces of hard tar, moist, non plastic, firm pp=0.5 tsf
					20.0		2-2.25	SAND: brown (7.5 YR 5/4) well sorted, fine-grained sand, no gravel, traces of clay, moist
					0.7		2.25-2.5	CLAYEY SAND: dark brown (7.5 YR 3/2) clayey sand, poorly sorted, abundant gravel, rounded-angular, moist, soft, non plastic, loose
					0.1		2.5-3	SAND: brown (7.5 YR 5/4) well sorted, fine-grained sand, no gravel, traces of clay, moist
					0.0		3-3.5	CLAY: black (7.5 YR 2.5/1) clay, native, moist, plastic, firm, pp=0.5tsf, traces of sand
-5	5							T.D. = 3.5'
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-88B
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-88B Date Drilled 8/11/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3' Boring Diam. 2.5"

N. Coord. 727843.96' E. Coord. 3166397.32' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				0.4	0-3	0-0.5	SANDY CLAY: dark yellowish brown (10 YR 4/4), sandy clay, moist, poorly sorted, slightly plastic, soft, small-large subangular to angular gravel, rootlets
					0.2		0.5-1	CLAYEY SAND: dark brown (10 YR 3/3) clayey sand, moist, poorly sorted, well sorted sand from 1' to 1.75', large mica grains, non plastic, loose, rounded to subangular gravel, rootlets
					0.0		1-1.5	CLAYEY SAND: very dark grayish brown (10 YR 3/2), clayey sand, moist, well sorted sand, non plastic, soft, loose, small rounded gravel pieces, clay content increasing with depth
					0.3		1.5-1.75	CLAYEY SAND: very dark grayish brown (10 YR 3/2), clayey sand, moist, well sorted sand, non plastic, soft, loose, small rounded gravel pieces, clay content increasing with depth
					0.9		1.75-2.5	SAND: light olive brown (2.5 Y 5/3), moist, well rounded, well sorted sand, increasing clay content from 2' to 2.5'
					0.0		2.5-3	CLAY: very dark gray (2.5 Y 3/1) clay, moist, with some sand, plastic, soft, pp=0.25 tsf
-5	5							T.D. = 3'
-10	10							
-15	15							

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SB-89B
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-89B Date Drilled 8/11/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2.5' Boring Diam. 2.5"

N. Coord. 727941.38' E. Coord. 3166585.36' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				0.0	0-2.5	0-0.5	SANDY CLAY: brown (10 YR 4/3) sandy clay, wet, poorly sorted, large mica grains, plastic, soft, small rounded subangular gravel, tar-like, hard substance
					0.0		0.5-1	FILL: yellowish brown (10 YR 5/4) sandy gravel fill material, wet
					0.0		1-1.8	GRAVEL: yellowish brown (10 YR 5/4) sandy gravel fill material, wet
					0.0		1.8-2	SANDY CLAY: very dark gray (10 YR 3/1) sandy clay, wet, poorly sorted sand and small amount of gravel, plastic, soft
					0.0		2-2.5	SANDY CLAY: very dark gray (10 YR 3/1) sandy clay, moist, well sorted sand, plastic, soft
								T.D. = 2.5'
-5	5							
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-90B
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-90B Date Drilled 8/15/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2' Boring Diam. 2.5"

N. Coord. 728045.86' E. Coord. 3166764.69' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				NM	0-2	0-1	SAND: Brown (7.5 R 5/4) sand, coarse-grained, subrounded, sorted, moist, tar-like material from 0 to 0.1', 100% recovery
							1-2	SAND: Dark gray (1 gley 4/N), sand, fine-grained, well-rounded, well sorted, moist from 1' to 1.75', wet from 1.75' to 2', appears to be product, some gravel from 1' to 1.5', odor, 100% recovery T.D. = 2'
-5	5							
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-90B
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-90B Date Drilled 8/28/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 0.5 ' Boring Diam. 2.5 "

N. Coord. 728045.86 ' E. Coord. 3166764.69 ' Surface Elevation 0 ' Ft. MSL Datum

Screen: Type _____ Diam. 0 " Length 0 ' Slot Size 0 "

Casing: Type _____ Diam. 0 " Length 0 ' Sump Length 0 '

Top of Casing Elevation 0 ' Stickup 0 '

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				NM	0-0.5	0-0.2 0.2-0.5	CLAY: brownish yellow (10 YR 6/8), clay, moist, slighlly plastic, some gravel, partially stained, 100% recovery SAND: reddish brown (5 YR 4/4), sand, medium to coarse-grained, poorly sorted, angular to rounded, moist, non-cohesive, 100% recoveryNOTE: HOLE FILLED WITH WATER T.D. = 0.5 '
-5	5							
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-90B
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-90B Date Drilled 8/29/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3' Boring Diam. 2.5"

N. Coord. 728045.86' E. Coord. 3166764.69' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-3	0-0.3	GRAVELLY CLAY: brownish yellow (10 YR 6/8), gravelly clay, moist, slightly plastic, abundant gravel, 100% recovery
					0.0		0.3-1.5	SAND: reddish brown (2.5 YR 5/4) sand, medium to coarse-grained, poorly sorted, subrounded to angular, abundant mica, carbonate gravels from 1.4 to 1.5, moist, 100% recovery
					0.0		1.5-2	GRAVELLY SAND: light gray (1 Gley 7/N), gravelly sand, medium to coarse-grained, poorly sorted, angular to rounded, moist, loose, non-cohesive, abundant carbonate & gravels, 100% recovery
					2.9		2-2.6	SAND: gray (1 Gley 5/N) with dark gray (1 Gley 4/N) mottles, sand, fine-grained, sorted, rounded, moist, some piece of wood, coarse-grained sand occuring as lens and stained with product from 2.5' to 2.6', 100% recovery
					7.3		2.6-3	SANDY CLAY: gray (1 Gley 5/N), sandy clay, moist, slightly plastic, firm, sand grains, very fine-grained, rounded, sorted, 100% recovery
					19.6			T.D. = 3'
-5	5							
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-91
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-91 Date Drilled 8/7/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 1.5' Boring Diam. 2.5"

N. Coord. 728131.23' E. Coord. 3166937.31' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				1.2 NM	0-1.5	0-1	FILL: fill material, dark gray (7.5R 4/1), moist, loose material, gravel with dark colored piece of wood & scrap metal, angular and poorly sorted, some sand, some clay material
							1-1.5	FILL: Dark gray (7.5 R 4/1), gravely, clayey and poorly sorted, moist, piece of wood, scrap metal, has odor, refusal at 1.5
								T.D. = 1.5'
-5	5							
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-91B DRILLING LOG

J. No. 0014419 Boring/Well ID SB-91B Date Drilled 8/7/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 4' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Marcel St. Marie

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 6' North of SB-91 perpendicular to tracks.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-4	0-0.2	SANDY CLAY: dark brown (10 YR 3/3) sandy clay with subangular to well rounded gravel, moist
					NM		0.2-0.5	
							0.5-1.5	SANDY CLAY: sandy clay, dark brown (10 YR 3/3), moist, clay content increasing with depth, plastic, firm
					1.0		1.5-3	SANDY CLAY: dark olive brown (25 Y 3/3) sandy clay, smaller gravel fragments, subangular gravel, moist, clay is non-plastic
								SANDY CLAY: sandy clay, well sorted, fine-grained, silty sand, black (10 YR 2/1), moist, sheen
					42.4		3-4	SANDY CLAY: sandy clay, less sand than above, increasing clay content with depth, black (10 YR 2/1), moist, clay is more plastic and firm than (1.5-2.0) interval, sheen
					7.0			T.D. = 4'
-5	5							
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-92B
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-92B Date Drilled 8/11/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3' Boring Diam. 2.5"

N. Coord. 728232.42' E. Coord. 3167118.92' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				0.0	0-3	0-0.5	GRAVEL: dark olive brown (2.5 Y 3/3) sandy gravel, moist, poorly sorted sand and gravel
					0.0		0.5-0.75	
					0.0		0.75-1	GRAVEL: dark olive brown (2.5 Y 3/3) sandy gravel, wet, poorly sorted sand and gravel
					0.0		1-1.2	
					0.0		1.2-1.5	GRAVELLY SAND: lightly yellowish brown (2.5 Y 6/4) very coarse-grained sand and gravel, moist
					3.8		1.5-2	FILL: very dark gray (2.5 Y 3/1) gravel and sand, moist, small gravel, angular-subangular [fill]
							2-2.5	SANDY CLAY: very dark sandy clay, wet, non plastic, soft, loose, contains small gravel, water in hole
							2.5-3	SANDY CLAY: very dark grey (2.5 Y 3/1) sandy clay, wet, fine-grained sand, small pebbles, plastic soft
-5	5							SANDY CLAY: very dark grey (2.5 Y 3/1) sandy clay, wet, fine-grained sand, small pebbles, plastic soft, clay increasing
								SANDY CLAY: very dark grey (2.5 Y 3/1) sandy clay, wet, fine-grained sand, small pebbles, plastic soft, clay increasing, wood fragments abundant, product
-10	10							T.D. = 3'
-15	15							

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ERM Environmental Resources Management

SB-92B
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-92B Date Drilled 8/28/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 1.5' Boring Diam. 2.5"

N. Coord. 728232.42' E. Coord. 3167118.92' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuyehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				NM	0-1.5	0-1	GRAVELLY CLAY: brownish yellow (10 YR 6/8), gravelly sandy clay, moist, slightly plastic, abundant gravel, with clayey sand lenses from 0.5' to 1', 100% recovery
							1-1.5	GRAVEL: dark gray (1 Gley 4/N), gravel, loose, poorly sorted, angular to subangular, medium to coarse-grained, wet, NOTE: hole filled with water at ~1.5, sheen on water surface
								T.D. = 1.5'
-5	5							
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-92B
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-92B Date Drilled 8/29/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 4.5' Boring Diam. 2.5"

N. Coord. 728232.42' E. Coord. 3167118.92' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				0.0	0-4.5	0-1	GRAVELLY CLAY: brownish yellow (10 YR 6/8), gravelly sandy clay, moist, slightly plastic, abundant gravel, sandy clay lenses from 0.9-1', 100% recovery
					0.0		1-2.3	GRAVEL: dark gray (1 Gley 4/N), gravel, loose, poorly sorted, angular to subangular, medium to coarse-grained, wet, shiny from 2' to 2.3', 100% recovery
					0.0		2.3-2.5	CLAYEY SAND: dark greenish gray (Gley 2 3/15 B6) clayey sand, very fine-grained, rounded, sorted, wet, stained, 100% recovery
					0.0		2.5-4.3	SAND: grayish brown (2.5 Y 5/2), sand, fine grained, rounded, sorted, wet from 2.5' to 3' and moist from 3' to 4.5', slightly cohesive, strong odor, product, stained dark gray (1 Gley 4/N), 100% recovery
					7.6			
					20.4			
					118.4			
-5	5				177.3		4.3-4.5	SANDY CLAY: dark gray (1 Gley 4/N), sandy clay, slightly plastic, sand grains very fine-grained, sorted and rounded, moist, cohesive, 100% recovery
								T.D. = 4.5'
-10	10							
-15	15							

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SB-93B(B) DRILLING LOG

Job No. 0014419 Boring/Well ID SB-93B(B) Date Drilled 8/25/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3' Boring Diam. 2.5"

N. Coord. 728411.9' E. Coord. 3167457.65' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				NM	0-3	0-0.2	SANDY CLAY: brownish yellow (10 YR 6/8), sandy clay, moist, slightly plastic, sand grains are fine-grained, rounded, sorted, abundant gravel, 100% recovery
					0.0		0.2-1	CLAYEY SAND: dark gray (1 Gley 4/N) clayey sand, medium to coarse-grained, poorly sorted, angular to subrounded, moist, stained, 100% recovery
					0.0		1-1.5	CLAYEY SAND: reddish gray (2.5 YR 5/1) clayey sand with drak gray (1 Gley 4/N) mottles, medium to coarse-grained, poorly sorted, angular to subrounded, moist, sand consists of abundant mica, stained, 100% recovery
					0.0		1.5-3	SANDY CLAY: greenish gray (1 Gley 5/1 10Y) with dark gray (1 Gley 4/N) mottles, clay, moist, plastic, firm, some sand grains, very dark gray (1 Gley 3/N), stained sand at the contact between clay and sand layers, stained clay at about 2.9', 100% recovery
					0.4			T.D. = 3'
-5	5				0.1			
-10	10							
-15	15							

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SB-93B(C) DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-93B(C) Date Drilled 8/25/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3' Boring Diam. 2.5"

N. Coord. 728413.86' E. Coord. 3167458.32' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-3	0-0.2	CLAY: brownish yellow (10 YR 6/8), clay, moist, slighly plastic, abundant gravel, 100% recovery
					0.0		0.2-1	CLAYEY SAND: dark gray (1 for Gley 4/N) clayey sand, medium to coarse-grained, poorly sorted, angular to subrounded, moist, stained, 100% recovery
					0.0		1-1.5	CLAYEY SAND: reddish gray (2.5 YR 5/1) clayey sand with dark gray (1 GLEY 4/N) mottles, medium to coarse-grained, poorly sorted, angular to subrounded, moist, stained, sand consists of abundant mica, 100% recovery
					0.0		1.5-2.5	CLAY: greenish gray (Gley 1 10 Y 5/1) with dark gray (1 Gley 3/N) mottles, clay, moist, plastic, firm, some sand grain, very dark gray (1 Gley 3/N), stained horizon from 1.8 to 2, 100% recovery
					0.7		2.5-3	CLAY: greenish gray (Gley 1 10 Y 5/1) with dark gray (1 Gley 3/N) mottles, clay, moist, plastic, firm, some sand grains, very dark gray (1 Gley 3/N), stained horizon from 2.7' to 3', 100% recovery
					11.9			T.D. = 3'
-5	5							
-10	10							
-15	15							

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SB-93B(D) DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-93B(D) Date Drilled 8/25/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3' Boring Diam. 2.5"

N. Coord. 728410.18' E. Coord. 3167457.28' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuyehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-3	0-3	NOT SAMPLED: similar to SB-93B(B) & SB-93B(C), refusal at about 3'
					NM			T.D. = 3'
-5	5							
-10	10							
-15	15							

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SB-93B(E) DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-93B(E) Date Drilled 8/25/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3' Boring Diam. 2.5"

N. Coord. 728405.9' E. Coord. 3167449.74' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-3	0-0.5	CLAY: brownish yellow (10 YR 6/8), clay, moist, slightly plastic, abundant gravel, 100% recovery
					14.9		0.5-1	CLAYEY SAND: dark gray (1 for Gley 4/N), clayey sand, medium to coarse-grained, poorly sorted, angular to subrounded, moist, stained, 100% recovery
					196.0		1-1.5	CLAYEY SAND: dark gray (1 for Gley 4/N), clayey sand, fine to medium-grained, fairly sorted, rounded to subangular, moist, stained, 100% recovery
					264.0		1.5-2	CLAYEY SAND: dark gray (1 for Gley 4/N), clayey sand, fine to medium-grained, fairly sorted, rounded to subangular, moist, stained, sand, odor, 100% recovery
					222.4		2-2.5	CLAYEY SAND: dark gray (1 for Gley 4/N), clayey sand, medium to coarse-grained, fairly sorted, rounded to subangular, moist, sand stained with product, has strong odor, 100% recovery
					156.0		2.5-3	CLAYEY SAND: dark gray (1 for Gley 4/N), clayey sand with some clay lenses, medium to coarse-grained, fairly sorted, rounded to subangular, wet, abundant piece of wood, visible apparent product, 100% recovery
-5	5							T.D. = 3'
-10	10							
-15	15							

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SB-94B
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-94B Date Drilled 8/24/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 5' Boring Diam. 2.5"

N. Coord. 728408.41' E. Coord. 3167468.37' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-5	0-1	GRAVELLY CLAY: dark gray (1 for Gley 4/N), gravelly sandy clay, moist, slightly cohesive, loose, 100% recovery
							1-2	CLAYEY SAND: dark gray (1 for Gley 4/N), clayey sand, fine to medium-grained, fairly sorted, rounded, some clay lenses, moist, sheen, very dark gray (1 for Gley 3/N) from 1.8 to 2, 100% recovery
							2-2.5	SAND: very dark gray (1 for Gley 3/N) sand, fine-grained, fairly sorted, rounded, moist, sheen, occasional gravel, odor, 100% recovery
							2.5-3	SAND: grayish brown (2.5 Y 5/2), sand, fine-grained, sorted, rounded, moist, slightly cohesive, odor, 100% recovery
							3-3.5	SAND: grayish brown (2.5 Y 5/2), sand, fine-grained, sorted, rounded, wet, slightly cohesive, odor, product, 100% recovery
							3.5-4	SAND: grayish brown (2.5 Y 5/2), sand, fine-grained, sorted, rounded, wet, slightly cohesive, odor, product, sandy clay lenses of yellow (2.5 Y 7/8) color, 100% recovery
							4-4.5	SAND: grayish brown (2.5 Y 5/2), sand, fine-grained, sorted, rounded, wet, slightly cohesive, odor, product, 100% recovery
							4.5-5	SANDY CLAY: gray (1 for Gley 5/N) sandy clay, moist, slightly plastic, sand grains very fine-grained, sorted and rounded cohesive, 100% recovery
-5	5				NM			T.D. = 5'
-10	10							
-15	15							

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SB-95B DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-95B Date Drilled 8/16/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 5.5' Boring Diam. 2.5"

N. Coord. 728508.674' E. Coord. 3167654.406' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-5.5	0-0.5	SANDY CLAY: dark gray (1 for GLEY 4/N), sandy clay, abundant gravel, moist, non plastic, slighlly cohesive, piece of wood, plant roots, 100% recovery
							0.5-2.5	CLAYEY SAND: very dark gray (1 for GLEY 3/N), clayey sand, some gravel, medium to coarse-grained, moist, slighlly cohesive, abundant tar-like substance, odor, some piece of wood, abundant mica, wet piece of wood from 2' to 2.5', patches of nodules of clay from 1.5' to 2', 100% recovery
							2.5-4.75	SAND: grayish brown (2.5 Y 5/2), sand, fine-grained, sorted, rounded to subangular, moist from 2.5' to 3', wet from 2.5' to 4.75', slighlly cohesive, apparent product, 100% recovery
-5	5				NM		4.75-5	CLAY: light olive gray (5 Y 6/2), clay, plastic, gray (5 y 5/1) motles, moist, 100% recovery
							5-5.5	SANDY CLAY: gray (5 Y 5/1), sandy clay, moist, slighlly plastic, sand grains, very fine-grained, uniformly layered, 100% recovery
								T.D. = 5.5'
-10	10							
-15	15							

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SB-95B1 DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-95B1 Date Drilled 8/17/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3.5' Boring Diam. 2.5"

N. Coord. 728508.223' E. Coord. 3167658.732' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-3.5	0-0.5	GRAVELLY CLAY: gray (5 YR 6/1) gravelly sandy clay, moist, loose, non-plastic, 100% recovery
					0.0		0.5-1	CLAYEY SAND: gray (5 YR 6/1), clayey sand, non-cohesive patches of clay, some gravel, abundant mica, medium to coarse-grained, poorly sorted, moist, 100% recovery
					0.0		1-1.5	CLAYEY SAND: gray (5 YR 6/1), clayey sand, non-cohesive patches of clay, some gravel, abundant mica, medium to coarse-grained, poorly sorted, moist, 100% recovery
					0.0		1.5-2	SAND: dark gray (1 for Gley 4/N) sand, fine-grained, sorted, subangular to rounded, moist, stained to be dark gray, sheen, odor, 100% recovery
					45.1		2-2.5	SAND: dark gray (1 for Gley 4/N) sand, fine-grained, sorted, subangular to rounded, moist, stained to be dark gray, sheen, odor, some piece of wood, 100% recovery
					88.8		2.5-2.8	SAND: dark gray (1 for Gley 4/N) sand, fine-grained, sorted, subangular to rounded, moist, stained to be dark gray, sheen, odor, some piece of wood, 100% recovery
					113.1		2.8-3	SAND: grayish brown (2.5 Y 5/2) sand, fine-grained, sorted, rounded, moist, slightly cohesive, sheen, odor, 100% recovery
					206		3-3.5	SAND: grayish brown (2.5 Y 5/2) sand, fine-grained, sorted, rounded, moist, slightly cohesive, sheen, odor, product, 100% recovery
-5	5							T.D. = 3.5'
-10	10							
-15	15							

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SB-95B2
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-95B2 Date Drilled 8/17/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 4 ' Boring Diam. 2.5 "

N. Coord. 728513.195 ' E. Coord. 3167667.507 ' Surface Elevation 0 ' Ft. MSL Datum

Screen: Type _____ Diam. 0 " Length 0 ' Slot Size 0 "

Casing: Type _____ Diam. 0 " Length 0 ' Sump Length 0 '

Top of Casing Elevation 0 ' Stickup 0 '

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-4	0-0.5	CLAYEY SAND: dark reddish gray (10 R 4/1), clayey sand, medium to coarse-grained, slightly cohesive, some gravel, poorly sorted, subangular to rounded, moist, 100% recovery
					14.1		0.5-1	CLAYEY SAND: dark gray (1 for GLEY 4/N), clayey sand, fine-grained, sorted, subangular to rounded, slightly cohesive, sand stained to be dark gray, moist, 100% recovery
					85.6		1-2	SANDY CLAY: dark gray (1 for Gley 4/N), sandy clay, slightly plastic, patches of black stained sand, sand grains very fine-grained, sorted and rounded, some piece of wood, moist, 100% recovery
					193.2		2-2.8	SAND: dark gray (1 for Gley 4/N) sand, fine-grained, sorted, rounded, patches of clay, moist, odor, 100% recovery
					253.4		2.8-3	SAND: dark gray (1 for Gley 4/N) sand, fine-grained, sorted, rounded, patches of clay, wet, sand has sheen and strong odor, some coarsed-grained sand, 100% recovery
-5	5						3-3.2	SAND: dark gray (1 for Gley 4/N) sand, fine-grained, sorted, rounded, patches of clay, wet, sand has sheen and strong odor, some coarsed-grained sand, 100% recovery
							3.2-4	SAND: grayish brown (2.5 Y 5/2), sand, fine-grained, sorted, rounded, wet, slightly cohesive, free flowing product, strong odor, 100% recovery
-10	10							T.D. = 4 '
-15	15							

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SB-95B3 DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-95B3 Date Drilled 8/17/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 5' Boring Diam. 2.5"

N. Coord. 728518.398' E. Coord. 3167678.705' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				0.0	0-5	0-0.5	SANDY CLAY: gray (5 YR 6/1), sandy clay, moist, non-plastic, some gravel, patches of clay, some gravel, 100% recovery
					1.3		0.5-1	CLAYEY SAND: gray (5 YR 6/1), clayey sand, coarse to medium-grained, poorly sorted, subangular to rounded, moist, slightly cohesive, nodules of tar-like material, 100% recovery
					49.3		1-1.5	SANDY CLAY: dark gray (1 for Gley 4/N), sandy clay, moist, plastic, patches of black stained sand, odor, 100% recovery
					179.9		1.5-2	SANDY CLAY: dark gray (1 for Gley 4/N), sandy clay, moist, plastic, patches of black stained sand, odor, 100% recovery
					25.4		2-2.5	SAND: dark gray (1 for Gley 4/N), sand, fine-grained, sorted, rounded, moist, slightly cohesive, odor, small patches of sandy clay, sheen, black stained, 100% recovery
					41.5		2.5-3	SAND: dark gray (1 for Gley 4/N), sand, fine-grained, sorted, rounded, moist, slightly cohesive, odor, small patches of sandy clay, sheen, black stained, some pieces of wood, devoid of patches of clay, 100% recovery
					349		3-3.5	SAND: grayish brown (2.5 Y 5/2), sand, fine-grained, sorted, rounded, moist, sheen, strong odor, 100% recovery
					433		3.5-4	SAND: grayish brown (2.5 Y 5/2), sand, fine-grained, sorted, rounded, moist, sheen, strong odor, 100% recovery
					312		4-4.5	SAND: grayish brown (2.5 Y 5/2), sand, fine-grained, sorted, rounded, moist, sheen, strong odor, lower section of the sand has product, sand is wet at ~4.5', 100% recovery
-5	5				160.8		4.5-5	SANDY CLAY: dark gray (1 for Gley 4/N), sandy clay, moist, slightly plastic, sand grains very fine-grained, sorted and rounded, 100% recovery
								T.D. = 5'
-10	10							
-15	15							

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SB-95B4
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-95B4 Date Drilled 8/18/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 4.5' Boring Diam. 2.5"

N. Coord. 728523.783' E. Coord. 3167687.986' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				0.0	0-4.5	0-0.5	SANDY CLAY: light reddish brown (5 YR 6/3), sandy clay, mottled with dark gray (1 for Gley 4/N), moist, plastic, some gravel, 100% recovery
					0.0		0.5-1	SANDY CLAY: light gray (10 YR 7/2) mottled with dark gray (1 for Gley 4/N) clay, moist, plastic, some gravel, 100% recovery
					0.0		1-1.5	CLAYEY SAND: reddish brown (5 YR 4/4) with black (5 YR 1/1) mottles, clayey sand, medium to coarse-grained, poorly sorted, angular to rounded, moist, non-cohesive, some nodules of tar-like material, 100% recovery
					64.9		1.5-2	CLAYEY SAND: black (1 for Gley 2.5/N), clayey sand, fine to medium-grained, sorted, subangular to rounded, moist, slightly cohesive, some mica, light odor, 100% recovery
					110.5		2-2.5	SANDY CLAY: very dark gray (1 for Gley 3/N), clay with sand lenses, plastic, sand grains are medium to coarse grained, poorly sorted, angular to rounded, moist, odor, sand grains, sheen, 100% recovery
					269		2.5-3	SAND: very dark gray (1 for Gley 3/N), sand, very fine-grained, sorted, rounded, moist, cohesive, stained, sheen, odor, 100% recovery
					206		3-3.5	SAND: very dark gray (1 for Gley 3/N), sand, very fine-grained, sorted, rounded, moist, cohesive, stained, sheen, odor, 100% recovery
					178.1		3.5-4	SAND: very dark gray (1 for Gley 3/N), sand, medium to coarse-grained, poorly sorted, angular to rounded, moist, non-cohesive, stained, sheen, strong odor, 100% recovery
-5	5				192		4-4.5	SAND: grayish brown (2.5 Y 5/2), sand, fine-grained, sorted, rounded, moist, slightly cohesive, product, strong odor, 100% recovery
								T.D. = 4.5'
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-95B5 DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-95B5 Date Drilled 8/18/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 5' Boring Diam. 2.5"

N. Coord. 728528.81' E. Coord. 3167697.239' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

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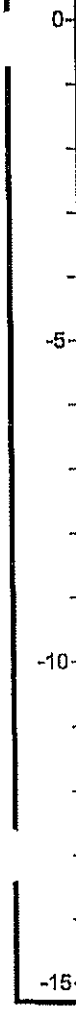
NOTES

pp = pocket penetrometer.
tsf = tons per square foot.



Depth (Feet)	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0		0-5	0-0.8	GRAVELLY CLAY: gray (5 YR 6/1), gravelly, sandy, clay, moist, loose, non-plastic, 100% recovery
	7.3		0.8-1	CLAYEY SAND: reddish brown (5 YR 4/4), clayey sand, medium to coarse-grained, poorly sorted, angular to rounded, moist, non-cohesive, some nodules of tar-like material, 100% recovery
	9.6		1-1.5	
	302		1.5-2	CLAYEY SAND: dark gray (1 Gley 4/N), clayey sand, medium to coarse-grained, poorly sorted, moist, slighlly cohesive, subangular to rounded, stained, odor, 100% recovery
	250.9		2-2.5	
	198.1		2.5-3	SANDY CLAY: very dark gray (1 Gley 3/N), sandy clay, plastic, sand grains are medium to coarse-grained, poorly sorted, subangular to rounded, moist, stained with tar-like material, odor, 100% recovery
	219.3		3-3.5	
	244.1		3.5-4	SAND: very dark gray (1 Gley 3/N), sand, very fine-grained, sorted, rounded, moist, cohesive, stained, sheen, odor, 100% recovery
	112		4-4.5	CLAYEY SAND: dark gray (1 Gley 4/N), clayey sand, medium to coarse-grained, poorly sorte, angular to rounded, moist, non-cohesive, patches of greenish gray (1 Gley 6/1) clay, 100% recovery
5	13.1		4.5-5	SAND: grayish brown (2.5 Y 5/2), sand, fine-grained, sorted, rounded, moist, slighlty cohesive, dark gray (1 for Gley 4/N) mottles, strong odor, 100% recovery
				SAND: grayish brown (2.5 Y 5/2), sand, fine-grained, sorted, rounded, moist, slighlty cohesive, dark gray (1 Gley 4/N) mottles, strong odor, spots of free flowing water, 100% recovery
				SAND: grayish brown (2.5 Y 5/2), sand, fine-grained, sorted, rounded, saturated, slighlty cohesive, dark gray (1 Gley 4/N) mottles, strong odor, 100% recovery
10				SANDY CLAY: gray (5 Y 5/1), sandy clay, moist, slighlty plastic, sand grains, very fine-grained, sorted, rounded, uniformly layered, 100% recovery
				T.D. = 5'
15				

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ERM Environmental Resources Management

SB-95B6
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-95B6 Date Drilled 8/18/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 5' Boring Diam. 2.5"

N. Coord. 728533.622' E. Coord. 3167709.932' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

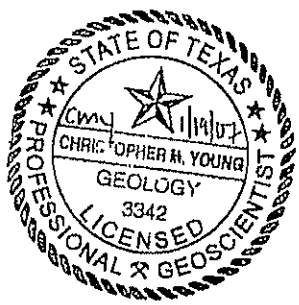
Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-5	0-0.2	GRAVELLY CLAY: gray (5 YR 6/1), gravely sandy clay, moist, loose, non-plastic, 100% recovery
							0.2-0.5	CLAY: light greenish gray (1 Gley 10GY) clay, moist, plastic, pink (2.5YR 8/4) mottles, 100% recovery
					2		0.5-1	CLAYEY SAND: dark gray (1 Gley 4/N), clayey sand, medium to coarse-grained, poorly sorted, moist, slightly cohesive, subangular to rounded, stained, 100% recovery
					28.6		1-1.5	SAND: dark reddish gray (2.5 YR 4/1), sand, medium to coarse-grained, poorly sorted, angular to rounded, moist, non-cohesive, odor, stained, 100% recovery
					225.5		1.5-4	CLAYEY SAND: dark gray (1 Gley 4/N), clayey sand, medium to coarse-grained, poorly sorted, moist, slightly cohesive, subangular to rounded, stained, odor, piece of wood, scrap metals, 100% recovery
					199.3			SAND: grayish brown (2.5 Y 5/2), sand, fine-grained, sorted, rounded, moist, slightly cohesive, dark gray (1 Gley 4/N) mottles, odor, 100% recovery
					212.8			SANDY CLAY: gray (5 Y 5/1), sandy clay, moist, slightly plastic, sand grains, very fine-grained, sorted, rounded, uniformly layered, 100% recovery
					209.1			T.D. = 5'
					252.9		4-4.5	
					182.9		4.5-5	
-5	5				122.5			
-10	10							
-15	15							



ERM Environmental Resources Management

SB-95B7 DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-95B7 Date Drilled 8/18/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 4.5' Boring Diam. 2.5"

N. Coord. 728538.664' E. Coord. 3167718.795' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				2.9	0-4.5	0-0.5	GRAVELLY CLAY: gray (5 YR 6/1), gravely, sandy clay, moist, loose, non-plastic, 100% recovery
							0.5-1	SAND: light reddish brown (2.5 YR 6/4), sand, medium to coarse-grained, poorly sorted, angular to rounded, moist, non-cohesive, 100% recovery
					224.4		1-2.5	CLAYEY SAND: dark gray (1 Gley 4/N), clayey sand, fine to medium-grained, poorly sorted, angular to rounded, moist, slighlly cohesive, stained, odor, abundant piece of wood, scrap metal and coarse-grained sand lenses, no sand lenses from 2' to 2.5', 100% recovery
					201.8		2.5-3	
					211.3		3-3.5	GRAVELLY SAND: very dark gray (1 Gley 3/N), gravely sand, coarse-grained, poorly sorted, angular to subangular, moist, non-cohesive, stained, odor, shiny, 100% recovery, BORING STOPPED ON 8/18/2006 CONTINUED ON 8/22/2006
					199.2		3.5-4	CLAYEY SAND: BORING CONTINUED ON 8/22/2006dark gray (1 Gley 4/N), clayey sand, medium to coarse-grained, poorly sorted, wet, slighlly cohesive subangular to rounded, stained, odor, 100% recovery
					178.9		4-4.5	SAND: grayish brown (2.5 Y 5/2), sand, fine-grained, sorted, rounded, wet, slighlly cohesive, odor, product, 100% recovery
-5	5				NM			NO RECOVERY: hole full of water, sample recovery impossible, i.e. sample falls off the auger
								T.D. = 4.5'
-10	10							
-15	15							

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SB-96B
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-96B Date Drilled 8/11/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2.5' Boring Diam. 2.5"

N. Coord. 728590.62' E. Coord. 3167830.51' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				0.3	0-2.5	0-0.5	GRAVEL: dark olive brown (2.5 Y 3/3) sandy gravel, moist, poorly sorted sands and gravel
					1.0		0.5-1.5	SILTY SAND: black (10 YR 2/1) silty sand, moist, poorly sorted, non plastic, soft, loose, small to large rounded to subangular to angular gravels
					57.7		1.5-2	
					331.0		2-2.5	CLAYEY SAND: very dark grayish brown (10 YR 3/3) clayey sand, moist,very poorly sorted, coarsed-grained sand and gravel, non-plastic, soft, loose, odor
					96.0			SANDY CLAY: very dark grayish brown (10 YR 3/2) sandy clay, wet, poorly sorted, plastic, firm, (pp=1.0 tsf), odor, product
								T.D. = 2.5'
-5	5							
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-96B DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-96B Date Drilled 8/28/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 5' Boring Diam. 2.5"

N. Coord. 728590.62' E. Coord. 3167830.51' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-5	0-0.5	GRAVELLY CLAY: brownish yellow (10 YR 6/8), gravelly, sandy clay, moist, slightly plastic, 100% recovery
							0.5-1	SANDY CLAY: greenish gray (2 Gley 5/10G) with reddish yellow (7.5 YR 6/8) and dark gray (1 Gley 4/N) mottles, sandy clay, sand grains very fine, sorted and rounded, moist, 100% recovery
							1-1.5	CLAYEY SAND: dark gray (1 Gley 4/N), clayey sand, fine-grained, fairly sorted, rounded, angular to subrounded, abundant gravel, moist, 100% recovery
							1.5-2.8	SAND: dark gray (1 Gley 4/N), sand, medium to coarse-grained, poorly sorted, angular to rounded, some clayey sand lenses, moist, odor, sheen, 100% recovery
							2.8-3.4	SILTY CLAY: dark gray (1 Gley 4/N), silty clay, moist, plastic, soft, stained, odor, 100% recovery
-5	5				NM		3.4-4.7	SAND: dark gray (1 Gley 4/N) from 3.4' to 4.2', grayish brown (2.5 Y 5/2) from 4.2' to 4.7', sand, fine to coarse-grained, poorly sorted, angular to rounded, stained, wet, sheen with product from 4' to 4.7', odor, 100% recovery
							4.7-5	SANDY CLAY: gray (1 Gley 5/N), sandy clay, moist, slightly plastic, sand grains very fine-grained, sorted and rounded, cohesive, 100% recovery
								T.D. = 5'
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-96B1 DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-96B1 Date Drilled 8/24/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3' Boring Diam. 2.5"

N. Coord. 726597.45' E. Coord. 3167815.93' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				0.0 0.0 0.0 7.2 64 128.2	0-3	0-0.5 0.5-1 1-3	CLAY: greenish gray (2 Gley 510G), clay, moist, plastic, soft, reddish yellow (7.5 YR 6/8) and dark gray (1 Gley 4/N) mottles, dark gray piece of wood, 100% recovery SANDY CLAY: greenish gray (2 Gley 510G) with reddish yellow (7.5 YR 6/8) and dark gray (1 Gley 4/N) mottles, sandy clay, sand grains very fine-grained, rounded, sorted, stained dark gray from 0.8 to 1, moist, 100% recovery SAND: dark gray (1 Gley 4/N), sand, fine to medium-grained, poorly sorted, angular to subangular, moist from 1' to 2', wet from 2' to 2.5, saturated from 2.5' to 3', stained, odor, clayey sand lenses, very dark gray (1 Gley 3/N) horizon having abundant piece of wood from 1.9 to 2, stained with product from 2' to 2.5', product from 2.5' to 3', 100% recovery T.D. = 3'
-5	5							
-10	10							
-15	15							

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SB-96B2
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-96B2 Date Drilled 8/24/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 1.5' Boring Diam. 2.5"

N. Coord. 728595.48' E. Coord. 3167807.31' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				54.3 NM	0-1.5	0-1	SANDY CLAY: greenish gray (2 Gley 5/10G) with reddish yellow (7.5 YR 6/8) and dark gray (1 for Gley 4/N) mottles, sandy clay, sand grains fine-grained, rounded and sorted, moist, abundant piece of wood which is stained, 100% recovery
							1-1.5	NO RECOVERY: railroad ties encountered, hard, compacted layer of piece of wood
								T.D. = 1.5'
-5	5							
-10	10							
-15	15							

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SB-96B3
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-96B3 Date Drilled 8/24/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2.5' Boring Diam. 2.5"

N. Coord. 728583.54' E. Coord. 3167797.09' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-2.5	0-1	SANDY CLAY: greenish gray (2 Gley 5/10G) with reddish yellow (7.5 YR 6/8) and dark gray (1 Gley 4/N), sandy clay, sand grains, fine grained, rounded, sorted, moist, 100% recovery
					0.0		1-2.5	CLAYEY SAND: dark gray (1 Gley 4/N), clayey sand, fine to medium-grained, fairly sorted, angular to rounded, moist from 1' to 2', wet from 2' to 2.5', sheen from 1.8 to 2, stained, product, strong odor from 2' to 2.5', 100% recovery
					44.7			T.D. = 2.5'
					171.6			
-5	5							
-10	10							
-15	15							

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Union Pacific Railroad

Log of Boring: SB-118

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/27/09	Drilling Method:	Direct Sonic
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	2
Driller:	Keith Barge	Total Depth (ft):	4.5
Driller's License:	4786	Northing:	728815.348
Field Supervisor:	Tim Jennings	Easting:	3167394.652
Sampling Method:	2"x5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				
1	3.8	4.5/4.5	FILL	FILL, sandy/gravelly clay, dark brown, moist, fine-coarse gravel, brick fragments.
2				
3	3.8		CL	SANDY CLAY, CL, dark gray, moist, soft.
4				

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1/6/2011

PBW
Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Borehole plugged with bentonite chips upon completion.

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Union Pacific Railroad

Log of Boring: SB-119

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/27/09	Drilling Method:	Direct Sonic
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	2
Driller:	Keith Barge	Total Depth (ft):	5
Driller's License:	4786	Northing:	728832.625
Field Supervisor:	Tim Jennings	Easting:	3167482.45
Sampling Method:	2"x5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				
1	3.3		FILL	FILL, clayey/gravelly sand, dark brown, moist, fine gravel, soft.
2		4.5/5.0		
3				SANDY CLAY, CL, grayish brown, moist, soft.
4	1.3		CL	
5				

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Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Borehole plugged with bentonite chips upon completion.

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Union Pacific Railroad

Log of Boring: SB-120

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/27/09	Drilling Method:	Direct Sonic
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	2
Driller:	Keith Barge	Total Depth (ft):	5
Driller's License:	4786	Northing:	728842.233
Field Supervisor:	Tim Jennings	Easting:	3167582.927
Sampling Method:	2"x5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				
1	0	5.0/5.0	FILL	FILL, gravelly sand, dark brown, moist, fine-coarse gravel.
2				
3	0		SM	SILTY SAND, SM, grayish brown, moist, soft.
4				
5			CL	SILTY CLAY, CL, grayish brown, moist, firm.

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Notes:
Borehole plugged with bentonite chips upon completion.

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Union Pacific Railroad

Log of Boring: SB-121

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/27/09	Drilling Method:	Direct Sonic
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	2
Driller:	Keith Barge	Total Depth (ft):	5
Driller's License:	4786	Northing:	728846.746
Field Supervisor:	Tim Jennings	Easting:	3167677.527
Sampling Method:	2"x5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				
1	3.4		FILL	FILL, sandy/gravelly clay, dark brown, moist, fine-coarse gravel, brick fragments.
2		4.5/5.0		
3	4.8		CL	SANDY CLAY, CL, grayish brown, moist, soft.
4				
5				

STATE OF TEXAS
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1/6/2011

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Notes:
Borehole plugged with bentonite chips upon completion.

--

Union Pacific Railroad

Log of Boring: SB-122

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/27/09	Drilling Method:	Direct Sonic
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	2
Driller:	Keith Barge	Total Depth (ft):	4.5
Driller's License:	4786	Northing:	728848.25
Field Supervisor:	Tim Jennings	Easting:	3167786.131
Sampling Method:	2"x5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0 – 2	4.2	4.5/4.5	FILL	FILL, silty sand/sand, dark brown, moist, fine-coarse gravel, odor below 1.8'
2 – 4	6.8		CL	SILTY CLAY, CL, dark gray, moist, soft to firm, odor to 4.0'.

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Union Pacific Railroad

Log of Boring: SB-123

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/27/09	Drilling Method:	Direct Sonic
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	2
Driller:	Keith Barge	Total Depth (ft):	4
Driller's License:	4786	Northing:	728862.902
Field Supervisor:	Tim Jennings	Easting:	3167880.66
Sampling Method:	2"x5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				
1	2.8	4.0/4.0	FILL	FILL, gravelly sand, dark brown, moist, fine-coarse gravel.
2				
3	1.5		CL	SANDY CLAY, CL, dark gray, moist, soft - firm.
4				

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Notes:
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Union Pacific Railroad

Log of Boring: SB-124

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/27/09	Drilling Method:	Direct Sonic
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	2
Driller:	Keith Barge	Total Depth (ft):	5
Driller's License:	4786	Northing:	728876.833
Field Supervisor:	Tim Jennings	Easting:	3168079.741
Sampling Method:	2"x5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				
1	3.6		FILL	FILL, gravelly sand, dark brown, moist, fine-coarse gravel.
2				
3	2.5	5.0/5.0	CL	SANDY CLAY, CL, gray, moist, soft - firm.
4				
5				

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Notes:
Borehole plugged with bentonite chips upon completion.

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Union Pacific Railroad

Log of Boring: SB-125

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/27/09	Drilling Method:	Direct Sonic
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	2
Driller:	Keith Barge	Total Depth (ft):	4
Driller's License:	4786	Northing:	728882.904
Field Supervisor:	Tim Jennings	Easting:	3168277.883
Sampling Method:	2"x5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0	5.1	4.0/4.0	FILL	FILL, gravelly sand, dark brown, moist, fine-coarse gravel.
1				
2				
3	2.5		CL	SANDY CLAY, CL, gray, moist, soft - firm.
4				

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Notes:
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Union Pacific Railroad

Log of Boring: SB-126

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/27/09	Drilling Method:	Direct Sonic
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	2
Driller:	Keith Barge	Total Depth (ft):	4
Driller's License:	4786	Northing:	728480.2176
Field Supervisor:	Tim Jennings	Easting:	3168202.033
Sampling Method:	2"x5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				
1	2.4		FILL	FILL, gravelly sand, dark brown, moist, fine-coarse gravel.
2		4.0/4.0		
3	2.9		CL	SANDY CLAY, CL, gray, moist, soft - firm.
4				

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Notes:
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Union Pacific Railroad

Log of Boring: SB-127

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/28/09	Drilling Method:	Hand Auger
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	3
Driller:	--	Total Depth (ft):	4
Driller's License:	--	Northing:	728080.4626
Field Supervisor:	Tim Jennings	Easting:	3168215.787
Sampling Method:	Hand Auger	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0	0.6	4.0/4.0	FILL	FILL, gravelly sand, dark brown, moist, fine-coarse gravel.
1				
2				
3	0.8		CL	SANDY CLAY, CL, gray, moist, soft - firm.
4				

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Notes:
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Union Pacific Railroad

Log of Boring: SB-129

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/28/09	Drilling Method:	Hand Auger
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	4
Driller:	--	Total Depth (ft):	4
Driller's License:	--	Northing:	727544.891
Field Supervisor:	Tim Jennings	Easting:	3167960.995
Sampling Method:	Hand Auger	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0	1.4	4.0/4.0	FILL	FILL, gravelly sand, dark brown, moist, fine-coarse gravel.
1				
2	1.4		CL	SANDY CLAY, CL, gray, moist, soft - firm.
3				
4				

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Notes:
Borehole plugged with bentonite chips upon completion.

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Union Pacific Railroad

Log of Boring: SB-130

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/27/09	Drilling Method:	Direct Sonic
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	2
Driller:	Keith Barge	Total Depth (ft):	3
Driller's License:	4786	Northing:	727145.4023
Field Supervisor:	Tim Jennings	Easting:	3167981.088
Sampling Method:	2"x5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0	0.8	3.0/3.0	FILL	FILL, gravelly sand, dark brown, moist, fine-coarse gravel.
1				
2	1.3			
3			CL	SANDY CLAY, CL, gray, moist, soft - firm, some gravel.

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Notes:
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Union Pacific Railroad

Log of Boring: SB-131

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/27/09	Drilling Method:	Direct Sonic
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	2
Driller:	Keith Barge	Total Depth (ft):	3.5
Driller's License:	4786	Northing:	726805.9605
Field Supervisor:	Tim Jennings	Easting:	3167938.124
Sampling Method:	2"x5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				
1	0	3.5/3.5	FILL	FILL, gravelly sand, dark brown, moist, fine-coarse gravel.
2				
3	0		CL	SANDY CLAY, CL, gray, moist, soft - firm, some gravel.

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Notes:
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Union Pacific Railroad

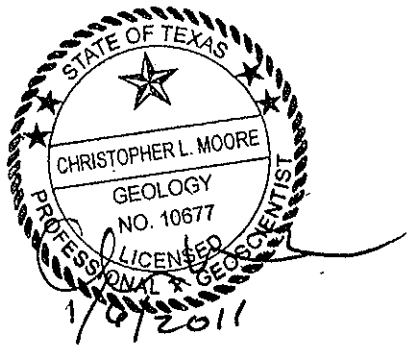
Log of Boring: SB-132

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/27/09	Drilling Method:	Direct Sonic
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	2
Driller:	Keith Barge	Total Depth (ft):	3
Driller's License:	4786	Northing:	726792.6815
Field Supervisor:	Tim Jennings	Easting:	3167538.344
Sampling Method:	2"x5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0	0	3.0/3.0	FILL	FILL, gravelly sand, dark brown, moist, fine-coarse gravel.
1				
2	2.2		CL	SANDY CLAY, CL, gray, moist, soft - firm, some gravel.
3			SP	SAND, SP, brown, moist, soft, fine to medium grained.



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Notes:
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Union Pacific Railroad

Log of Boring: SB-133

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/27/09	Drilling Method:	Direct Sonic
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	2
Driller:	Keith Barge	Total Depth (ft):	2
Driller's License:	4786	Northing:	726779.4024
Field Supervisor:	Tim Jennings	Easting:	3167138.565
Sampling Method:	2"x5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0 1 2	2.1	2.0/2.0	FILL	FILL, gravelly sand, dark brown, moist, fine-coarse gravel.

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Notes:
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Union Pacific Railroad

Log of Boring: SB-134

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/27/09	Drilling Method:	Direct Sonic
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	2
Driller:	Keith Barge	Total Depth (ft):	4.5
Driller's License:	4786	Northing:	726907.7051
Field Supervisor:	Tim Jennings	Easting:	3166869.574
Sampling Method:	2"x5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0 – 1	1.9	4.5/4.5	FILL	FILL, gravelly sand, dark brown, moist, fine-coarse gravel.
1 – 2				
2 – 3	3.2		CL	SANDY CLAY, CL, gray, moist, soft - firm, some gravel.
3 – 4			SP	SAND, SP, brown, moist, soft, fine to medium grained.

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Notes:
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Union Pacific Railroad

Log of Boring: SB-135

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/28/09	Drilling Method:	Hand Auger
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	3
Driller:	--	Total Depth (ft):	3.3
Driller's License:	--	Northing:	726799.59
Field Supervisor:	Tim Jennings	Easting:	3166569.23
Sampling Method:	Hand Auger	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0 – 1	1.8	3.3/3.3	FILL	FILL, gravelly sand, dark brown, moist, fine-coarse gravel.
2 – 3			CL	SANDY CLAY, CL, gray, moist, soft - firm, some gravel.

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Union Pacific Railroad

Log of Boring: SB-136

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/28/09	Drilling Method:	Hand Auger
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	3
Driller:	--	Total Depth (ft):	2.5
Driller's License:	--	Northing:	726783.22
Field Supervisor:	Tim Jennings	Easting:	3166169.56
Sampling Method:	Hand Auger	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0 - 1	1	2.5/2.5	FILL	FILL, gravelly sand, dark brown, moist, fine-coarse gravel.
1 - 2			CL	SANDY CLAY, CL, gray, moist, soft - firm, some gravel.

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Notes:
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Union Pacific Railroad

Log of Boring: SB-137

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/28/09	Drilling Method:	Hand Auger
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	3
Driller:	--	Total Depth (ft):	2
Driller's License:	--	Northing:	726766.78
Field Supervisor:	Tim Jennings	Easting:	3165769.9
Sampling Method:	Hand Auger	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0	--	2.0/2.0	FILL	FILL, gravelly sand, dark brown, moist, fine-coarse gravel.
1				
2			CL	SANDY CLAY, CL, gray, moist, soft - firm, some gravel.

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Union Pacific Railroad

Log of Boring: SB-138

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	6/24/10	Drilling Method:	Geoprobe
Drilling Company:	Alpine Field Services	Borehole Diameter (in.):	3
Driller:	Clay Neal	Total Depth (ft):	20
Driller's License:	56591	Northing:	728906.98
Field Supervisor:	Tim Jennings	Easting:	3167790.59
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0	0	2.4/4.0	FILL	FILL, sand and gravel.
	0		CL	SANDY CLAY, CL, brown, moist, firm.
5	0	3.5/4.0		SILTY CLAY, CL, gray, moist, hard, trace calcaroues nodules.
	1.6			
	0.9	3.3/4.0		
10	0			SANDY CLAY, CL, mottled gray and orange, moist, soft.
	0	2.9/4.0		SILTY/SANDY CLAY, gray, moist, soft.
15	0			
	0.3	3.4/4.0	SP	SAND, SP, wet, soft, slight odor.
20	0.6			

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Notes:
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Union Pacific Railroad

Log of Boring: SB-139

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	6/24/10	Drilling Method:	Geoprobe
Drilling Company:	Alpine Field Services	Borehole Diameter (in.):	3
Driller:	Clay Neal	Total Depth (ft):	20
Driller's License:	56591	Northing:	728923.38
Field Supervisor:	Tim Jennings	Easting:	3167934.48
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0	2.3	2.2/4.0	SM	SILTY SAND, SM, brown, dry, very soft.
	0		CL	SANDY CLAY, CL, brown, moist, firm.
5	0	3.2/4.0		
	0			
	0	4.0/4.0		SANDY CLAY, CL, mottled gray and orange, moist, hard, 13.5-14.2: creosote odor and hydrocarbon staining.
10	0			
	0	3.2/4.0		
15	0		SP	SAND, SP, light brown, wet, soft, few iron nodules.
	0.9	2.0/4.0		
20	0			

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Notes:
Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: SB-140

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	6/23/10	Drilling Method:	Geoprobe
Drilling Company:	Alpine Field Services	Borehole Diameter (in.):	3
Driller:	Clay Neal	Total Depth (ft):	20
Driller's License:	56591	Northing:	728933.29
Field Supervisor:	Tim Jennings	Easting:	3168026.86
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0	0.8	3.0/4.0	FILL	FILL, sand and gravel.
	0			SANDY CLAY, CL, brown, moist, firm.
5	0	4.0/4.0	CL	SANDY/SILTY CLAY, CL, gray, moist, hard, trace calcaroues nodules.
	0			
	0	4.0/4.0		SILTY CLAY, CL, mottled gray and orange, moist, hard.
10	0			
	0	4.0/4.0		
	0			
15	0	4.0/4.0	SP	SILTY SAND, SP, light brown, wet, soft.
	0			
20	0			SAND, SP, light brown, wet, soft.

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Log of Boring: SB-141

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Houston, TX

PBW Project No. 1358

Completion Date:	6/23/10	Drilling Method:	Geoprobe
Drilling Company:	Alpine Field Services	Borehole Diameter (in.):	3
Driller:	Clay Neal	Total Depth (ft):	20
Driller's License:	56591	Northing:	728934.74
Field Supervisor:	Tim Jennings	Easting:	3168099.78
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0	0.6	2.0/4.0	SC	CLAYEY SAND, SC, brown, dry, very soft.
	0		CL	SILTY CLAY, CL, light brown, moist, hard, trace calcaroues nodules.
5	0	3.0/4.0		
	0			
	0	4.0/4.0		
10	0			
	0	4.0/4.0		
15	0			
	0	4.0/4.0		SANDY CLAY, CL, mottled gray and orange, moist, soft.
	1.9		SP	SAND, SP, light brown, wet, soft.
20				

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED PROFESSIONAL GEOSCIENTIST

1/6/2011

Notes:
Borehole plugged with bentonite chips upon completion.

PBW
Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Union Pacific Railroad

Log of Boring: SB-142

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	6/22/10	Drilling Method:	Geoprobe
Drilling Company:	Alpine Field Services	Borehole Diameter (in.):	3
Driller:	Clay Neal	Total Depth (ft):	20
Driller's License:	56591	Northing:	728946.89
Field Supervisor:	Tim Jennings	Easting:	3168183.17
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0	0	2.9/4.0	SC	CLAYEY SAND, SC, brown, dry, very soft.
	0		CL	SANDY CLAY, CL, brown, moist, firm.
5	0	4.0/4.0		
	0			CLAY, light gray, moist, firm, with calcaroues nodules.
	0	4.0/4.0		
10	0		CH	CLAY, CH, mottled gray and orange, moist, soft, trace calcaroues nodules.
	0	3.0/4.0		
15	0		SM	SILTY SAND, SM, light brown, wet, soft.
	0	4.0/4.0	SP	SAND, SP, light brown, wet, soft.
20	0			

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Notes:
Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: SB-143

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	6/22/10	Drilling Method:	Geoprobe
Drilling Company:	Alpine Field Services	Borehole Diameter (in.):	3
Driller:	Clay Neal	Total Depth (ft):	20
Driller's License:	56591	Northing:	728892.91
Field Supervisor:	Tim Jennings	Easting:	3168184.12
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0	0	2.5/4.0	FILL	FILL, sand and gravel.
	0.6			SANDY CLAY, CL, brown, moist, firm.
5	0	4.0/4.0		SANDY/SILTY CLAY, CL, gray, moist, hard, trace calcaroues nodules.
	0			
	0	2.0/4.0	CL	
10				
	0	4.0/4.0		
15	0			
	0	3.3/4.0		
20	0		SP	SAND, SP, gray, wet, soft.

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Notes:
Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: SB-144

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	6/22/10	Drilling Method:	Geoprobe
Drilling Company:	Alpine Field Services	Borehole Diameter (in.):	3
Driller:	Clay Neal	Total Depth (ft):	20
Driller's License:	56591	Northing:	728854
Field Supervisor:	Tim Jennings	Easting:	3167787
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0	0.6	2.9/4.0	FILL	FILL, sand, soft, loose.
	0.6			SILTY CLAY, CL, light brown, moist, hard, below 5.6: strong odor.
5	0.6	3.7/4.0		
	9.6			
	4.8	4.0/4.0	CL	CLAY, CH, gray, moist, soft to firm, odor.
10	1.5			
	10.2	3.0/4.0		SANDY CLAY, CL, gray, moist, firm.
15	5.4			
	8.9	4.0/4.0	SP	SAND, SP, gray, wet, soft, strong odor and sheen.
20	10.3			

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1/6/2011

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Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: SB-145

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	6/22/10	Drilling Method:	Geoprobe
Drilling Company:	Alpine Field Services	Borehole Diameter (in.):	3
Driller:	Clay Neal	Total Depth (ft):	20
Driller's License:	56591	Northing:	728880.61
Field Supervisor:	Tim Jennings	Easting:	3168080.44
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0	1.8	2.5/4.0	FILL	FILL, gravelly clay, moist, soft.
	8.9			SANDY CLAY, CL, dark brown, moist, firm.
5	1.3	4.0/4.0		SILTY CLAY, CL, dark brown, moist, hard.
	0			
	0.6	4.0/4.0	CL	CLAY, CL, gray, moist, hard, trace calcaroues nodules.
10	0			
	0	4.0/4.0		
15	0.6			SANDY CLAY, CL, gray, moist, firm.
	0	4.0/4.0		
	72.1		SC	CLAYEY SAND, SC, light brown, wet, soft.
20			SP	SAND, SP, gray, wet, soft.

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1/6/2011

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Notes:
Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: SB-146

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	6/22/10	Drilling Method:	Geoprobe
Drilling Company:	Alpine Field Services	Borehole Diameter (in.):	3
Driller:	Clay Neal	Total Depth (ft):	20
Driller's License:	56591	Northing:	728848.61
Field Supervisor:	Tim Jennings	Easting:	3167715.03
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0	0	2.8/4.0	FILL	FILL, sand, soft, loose, some metal fragments.
	0			SILTY CLAY, CL, brown, moist, soft.
5	0	4.0/4.0	CL	
	0			
	0	4.0/4.0		SILTY CLAY, CL, gray, moist, hard, trace calcaroues nodules.
10	0			
	0	4.0/4.0		
15	0.6			SAND, SP, gray, wet, soft.
	0	4.0/4.0	SP	
20	0			

STATE OF TEXAS
CHRISTOPHER L. MOORE
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1/4/2011

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Notes:
Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: SB-147

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	6/22/10	Drilling Method:	Geoprobe
Drilling Company:	Alpine Field Services	Borehole Diameter (in.):	3
Driller:	Clay Neal	Total Depth (ft):	20
Driller's License:	56591	Northing:	727530
Field Supervisor:	Tim Jennings	Easting:	3165209
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	--

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0	0	2.9/4.0	FILL	FILL, sand, soft, loose, some shell fragments.
	0		CL	SANDY CLAY, CL, dark brown, moist, firm, slight odor.
5	0	4.0/4.0		
	0			SANDY CLAY, CL, mottled gray and orange, moist, firm, slight odor.
	0	4.0/4.0		
10	0			
	0	4.0/4.0		
	0			
15	0	2.0/4.0	SM	SILTY SAND, SM, light brown, wet, soft.
	0			
20	0			

STATE OF TEXAS
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NO. 10677
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1/6/2011

PBW
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Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Borehole plugged with bentonite chips upon completion.

TerraNext

LOG OF BORING No.: AOC3-E

SHEET NUMBER 1 OF 1

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	**44102069.07**
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	AOC3 Area of Contaminated Portion of Water Line
START DATE:	03/04/97
FINISH DATE:	03/04/97
START TIME:	08:39
FINISH TIME:	08:50
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	0 - 5	---	5.0	1	FILL		FILL, moist, 10YR5/4, yellowish, brown, ballast	Sample Composited And Retained For Chemical Analysis
				2	CL		CLAY, silty, slightly moist, 10YR4/1, dark gray	PP = 1.5
				3	FILL		FILL, moist, 10YR2/1, black, layer of charred material, rocks, brick	
				4	ML		SILT, very slightly moist 10YR3/2, very dark grayish brown >50% limestone & granite	
				5				
				6			Boring TD @ 5.0'	
				7				
				8				
				9				
				10				
				11				
				12				
				13				
				14				
				15				
				16				
				17				
				18				
				19				
				20				

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: AOC3-W

SHEET NUMBER 1 OF 1

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	**44102069.07**
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	AOC3 Area of Contaminated Portion of Water Line
START DATE:	03/04/97
FINISH DATE:	03/04/97
START TIME:	08:18
FINISH TIME:	08:39
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	0 - 5	---	5.0	1	FILL		FILL, slightly moist, 10YR3/3, dark brown, ballast	Sample Composited And Retained For Chemical Analysis
					ML		SILT, moist, 10YR8/4, very pale brown	
				2	CL		CLAY, silty, moist, 10YR4/1, dark gray	
							FILL, moist, 10YR2/1, black, slight odor	
				3	FILL			
							CLAY, silty, slightly moist,	PP = 2.0
				4	CL		10YR3/1, very dark gray	
				5				
				6			Boring TD @ 5.0'	
				7				
				8				
				9				
				10				
				11				
				12				
				13				
				14				
				15				
				16				
				17				
				18				
				19				
				20				

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: AOC4-NE

SHEET NUMBER 1 OF 1

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	**44102069.07**
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	AOC4 Former Incinerator Area
START DATE:	03/03/97
FINISH DATE:	03/03/97
START TIME:	11:39
FINISH TIME:	12:00

DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
					FILL		FILL, moist, 10YR3/6, dark yellowish brown	Sample Composited And
SS	0 - 5	---	5.0	1	ML		0.5-0.75' - ASH, burned material, 10YR2/1, black	Retained For Chemical
							0.75-1.00' - SILT, moist, 10YR5/3, brown	Analysis
				2	SP		1.00-1.50' - SHELL, moist, crushed up	
							1.50-2.00 - SAND, silty, moist,	
				3			10YR5/8, yellowish brown	
				4	CL		2.00 - 5.00 - CLAY, silty, 10YR2/2,	PP = 2.0
							very dark brown, wood pieces	
				5				
				6			Boring TD @ 5.0'	
				7				
				8				
				9				
				10				
				11				
				12				
				13				
				14				
				15				
				16				
				17				
				18				
				19				
				20				

Geologist: B. Goldsby

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: AOC4-NW

SHEET NUMBER 1 OF 1

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	**44102069.07**
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	AOC4 Former Incinerator Area
START DATE:	03/03/97
FINISH DATE:	03/03/97
START TIME:	12:00
FINISH TIME:	12:25
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	0 - 5	---	5.0	1	FILL	FILL, moist, 10YR3/6, dark yellowish brown	Sample Composited And Retained For Chemical Analysis
				2	SP	SAND, silty, moist, 10YR5/8 yellowish brown, pieces of crushed shell & gravel	
				3	ML / SP	2.00 - 2.25' - SILT, sandy, moist, 10YR3/3 dark brown	
				4	CL	2.25 - 3.00' - SAND, silty, moist 10YR5/8, yellowish brown	
				5		3.00 - 5.00' - CLAY, silty, very slightly moist, 10YR2/2, very dark brown	PP = 2.0
				6		Boring TD @ 5.0'	
				7			
				8			
				9			
				10			
				11			
				12			
				13			
				14			
				15			
				16			
				17			
				18			
				19			
				20			

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: AOC4-SE

SHEET NUMBER 1 OF 1

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	**44102069.07**
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	AOC4 - Former Incinerator Area
START DATE:	03/03/97
FINISH DATE:	03/03/97
START TIME:	11:00
FINISH TIME:	11:20

DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	0 - 5	----	5.0	1	FILL		FILL, slightly moist, 10YR3/6, dark yellowish brown, gravel, sand, wood debris	Sample Composited And Retained For Chemical Analysis
				2	SP		SAND, moist, 10YR6/1, gray, coarse grained with gravel	
				3	ML / SP		2.5-2.75' SILT, sandy, moist, 10YR3/3 dark brown	
				4	CL		2.75 - 3.00' SAND, very moist, 10YR6/2 light brownish gray, fine grained	
				5			3.00 - 5.00' CLAY, slightly silty, very slightly moist, 10YR2/2, very dark brown	PP = 2.0
				6				
				7			Boring TD @ 5.0'	
				8				
				9				
				10				
				11				
				12				
				13				
				14				
				15				
				16				
				17				
				18				
				19				
				20				

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: AOC4-SW

SHEET NUMBER 1 OF 1

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	**44102069.07**
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	AOC4 - Former Incinerator Area
START DATE:	03/03/97
FINISH DATE:	03/03/97
START TIME:	11:20
FINISH TIME:	11:39
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	0 - 5	---	5.0	1	FILL		FILL, slightly moist, 10YR3/6, dark yellowish brown, gravel, sand, wood debris	Sample Composited And Retained For Chemical Analysis
				2	SP		SAND, moist, 10YR6/1, gray, coarse grained with gravel	
				3	ML / SP		2.5-2.75' SILT, sandy, moist, 10YR3/3 dark brown	
				4	CL	V	2.75 - 3.00' SAND, very moist, 10YR6/2 light brownish gray, fine grained	
				5			3.00 - 5.00' CLAY, slightly silty, very slightly moist, 10YR2/2, very dark brown	
				6				
				7			Boring T.D. @ 5.0'	
				8				
				9				
				10				
				11				
				12				
				13				
				14				
				15				
				16				
				17				
				18				
				19				
				20				

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: AOC5-W

SHEET NUMBER 1 OF 1

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	**44102069.07**
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	AOC5 - Storm Sewer West
START DATE:	03/04/97
FINISH DATE:	03/04/97
START TIME:	09:24
FINISH TIME:	06:44
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	0 - 5	---	5.0	1	FILL		FILL, very slightly moist, gravel, crushed limestone	Sample Composited And Retained For Chemical Analysis
				2	FILL		Charred material, moist, 10YR6/1, gray, brick, rock	
				3	ML		SILT, moist, 10YR5/3, brown	
				4	SP / ML		3.00 - 3.25' - SAND, moist, 10YR7/3, very pale brown 3.25 - 3.50' SILT, sandy, moist	
				5	CL		3.50 - 7.00' - CLAY, silty, slightly moist, 10YR3/2, very dark	PP = 2.0
SS	5 - 7	---	2.0	6			grayish brown	
				7				
				8			Boring TD @ 7.0'	
				9				
				10				
				11				
				12				
				13				
				14				
				15				
				16				
				17				
				18				
				19				
				20				

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: AOC7

SHEET NUMBER 1 OF 1

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	**44102069.07**
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	AOC7 Former UST No. 44-023-21 Area
START DATE:	03/03/97
FINISH DATE:	03/03/97
START TIME:	13:25
FINISH TIME:	14:00
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	0 - 5	—	5.0	1	FILL		FILL, slightly moist, 10YR3/3, dark brown, gravel and brick pieces	Sample 0 - 5' And 5 - 10' Composited And Retained For Chemical Analysis
				2	ML		SILT, sandy, moist, 10YR3/3, dark brown	
				3			CLAY, silty, very slightly moist, 10YR2/2, very dark brown,	PP = 2.0
				4			3" layer of treated wood @ 2.5'	
				5				
SS	5 - 10	—	5.0	6	CL		No silt, slightly moist, 10YR6/1, gray, mottling with 10YR6/8, brownish yellow, and 10YR3/1, very dark gray	
				7				
				8				
				9				
				10				
				11			Boring TD @ 10.0'	
				12				
				13				
				14				
				15				
				16				
				17				
				18				
				19				
				20				

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

ERM Environmental Resources Management

SSO-A02R DRILLING LOG

Proj. No. 0014419 Boring/Well ID SSO-A02R Date Drilled 8/29/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2' Boring Diam. 2.5"

N. Coord. 728714.3' E. Coord. 3166185.68' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				1	0-2	0-1	GRAVELLY SAND: light greenish gray (1 Gley 7/1) gravelly sand, poorly sorted, angular to subangular, fine to coarse-grained, moist, loose, non-cohesive, abundant shell from 0.8-1, 100% recovery
					1.4		1-1.5	SAND: light gray (1 Gley 7/N), calcareous sand, fine-grained, sorted, rounded, moist, abundant shell and fragments, 100% recovery
					1.1		1.5-2	SANDY CLAY: gray (1 Gley 5/N), sandy clay, moist, slightly plastic, firm, sand grains, very fine-grained, rounded and sorted, 100% recoverycollect 0-2' for pcp confirmation analyses
					1.1			T.D. = 2'
-5	5							
-10	10							
-15	15							

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ERM Environmental Resources Management

SSO-A04R DRILLING LOG

Proj. No. 0014419 Boring/Well ID SSO-A04R Date Drilled 8/28/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2' Boring Diam. 2.5"

N. Coord. 728746.51' E. Coord. 3166617.83' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-2	0-0.2 0.2-2	GRAVELLY SAND: light gray (2.5 Y 7/2), gravelly sand, fine-grained, sorted, rounded, moist, 100% recovery SANDY CLAY: gray (1 Gley 5/N), sandy clay, moist, slightly plastic, sand grains, very fine-grained, sorted, rounded, cohesive, 100% recovery
					1.1			
					0.7			T.D. = 2'
-5	5							
-10	10							
-15	15							

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SSO-A06R DRILLING LOG

Proj. No. 0014419 Boring/Well ID SSO-A06R Date Drilled 8/30/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2' Boring Diam. 2.5"

N. Coord. 728778.57' E. Coord. 3167108.39' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-2	0-0.5	GRAVELLY CLAY: light reddish gray (2.5 YR 7/1), gravelly, sandy clay, moist, loose, non-plastic, 100% recovery
					0.0		0.5-1	SAND: reddish gray (2.5 YR 5/1), sand, poorly sorted, angular to subangular, fine to medium-grained, moist, non-cohesive, loose, 100% recovery
					2.2		1-1.7	CLAYEY SAND: dark gray (1 Gley 4/N), clayey sand, fine grained, sorted, rounded, moist, slightly cohesive, 100% recovery
					3.4		1.7-2	SANDY CLAY: dark gray (1 Gley 4/N), sandy clay, moist, non-plastic, soft, sand grains are very fine-grained, rounded and sorted, 100% recoverycollected 0-2' for PCP confirmation analyses
					0.1			T.D. = 2'
-5	5							
-10	10							
-15	15							

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ERM Environmental Resources Management

SSO-B03R DRILLING LOG

Proj. No. 0014419 Boring/Well ID SSO-B03R Date Drilled 8/30/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2' Boring Diam. 2.5"

N. Coord. 728504.05' E. Coord. 3166466.31' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-2	0-1.8	SAND: reddish brown (2.5 YR 5/4), sand, fine to medium-grained, fairly sorted, subangular to rounded, moist, loose, non-cohesive, 100% recovery
					NM		1.8-2	SANDY CLAY: dark gray (1 Gley 4/N), sandy clay, moist, non-plastic, firm, sand grains are very fine-grained, rounded, sorted, 100% recoverycollect 0-2' for PCP confirmation analyses T.D. = 2'
-5	5							
-10	10							
-15	15							

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SSO-C01R DRILLING LOG

Proj. No. 0014419 Boring/Well ID SSO-C01R Date Drilled 8/29/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2' Boring Diam. 2.5"

N. Coord. 728233.87' E. Coord. 3166038.23' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				0.6	0-2	0-1	SAND: red (10 R 5/6), sand, medium to coarse-grained, angular, poorly sorted, abundant gravel, moist, slightly cohesive, 100% recovery
					0.6		1-1.5	CLAYEY SAND: black (1 for Gley 2.5/N), clayey sand, fine to medium-grained, fairly sorted, subangular to rounded, moist, cohesive, 100% recovery
					5.3		1.5-2	SAND: dark gray (1 for Gley 4/N), sand, fine-grained, sorted, subangular to rounded, moist, slightly cohesive, 100% recoveryNOTE 0-2' collect for pcp confirmation analyses
					4.5			T.D. = 2'
-5	5							
-10	10							
-15	15							

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ERM Environmental Resources Management

SSO-C03R DRILLING LOG

Proj. No. 0014419 Boring/Well ID SSO-C03R Date Drilled 8/29/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2 ' Boring Diam. 2.5 "

N. Coord. 728293.63 ' E. Coord. 3166468.91 ' Surface Elevation 0 ' Ft. MSL Datum

Screen: Type _____ Diam. 0 " Length 0 ' Slot Size 0 "

Casing: Type _____ Diam. 0 " Length 0 ' Sump Length 0 '

Top of Casing Elevation 0 ' Stickup 0 '

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				NM	0-2	0-2	SAND: gray (1 Gley 6/1) from 0 to 1.5', light greenish gray (1 Gley 8/1 10Y) from 1.5' to 2', sand, fine to medium-grained, rounded to subangular, very fine-grained, sorted, rounded, abundant clay lenses which are very dark gray (1 Gley 3/N) from 1.5' to 2', hard, compacted, mixed with concrete, gravel, moist, 100% recovery T.D. = 2 '
-5	5							
-10	10							
-15	15							

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ERM Environmental Resources Management

AOC-4SER DRILLING LOG

oj. No. 0014419 Boring/Well ID AOC-4SER Date Drilled 8/28/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2' Boring Diam. 2.5"

N. Coord. 728190.29' E. Coord. 3166677.18' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuyehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				0.0 0.6 0.6 1.1	0-2	0-1.5 1.5-2	SAND: reddish yellow (7.5 YR 7/6) from 0 to 0.5', greenish gray (1 Gley 5/1 10Y) from 0.5' to 1.5', sand, fine-grained, fairly sorted, subangular to rounded, slightly cohesive, loose, dark gray (1 Gley 4/N) clayey sand lenses from 1' to 1.5', moist, 100% recovery SANDY CLAY: gray (1 Gley 5/N), sandy clay, moist, slightly plastic, sand grains very fine-grained, sorted and rounded, cohesive, 100% recovery T.D. = 2'
-5	5							
-10	10							
-15	15							

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ERM Environmental Resources Management

SB-70
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-70 Date Drilled 8/17/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 45' Boring Diam. 2"

N. Coord. 729213.77' E. Coord. 3168334' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Jessica Rose

SKETCH MAP

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NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-45	0-1	NO RECOVERY
					0		1-2	SANDY CLAY: very dark gray (7.5 YR 3/1) sandy clay, moist, very fine-grained sand, loose, rootlets, grass, trace carbonate nodule
							2-5	NO RECOVERY
-5	5				NM		5-5.9	DEPRECATED: SANDY SILTY CLAY: grayish brown (10YR 5/2) sandy silty clay, moist, very fine-grained sand, plastic pp=1.25tsf at 5', sand lense from 5.7-5.9', mottling
							5.9-7.6	DEPRECATED: SANDY SILTY CLAY: light yellowish brown (2.5 Y 6/3) sandy silty clay, moist, very fine-grained sand, plastic pp=2.0 tsf at 6.4', pp=0.5 tsf between 6.7-6.85', pp=2.5 tsf at 7'
					0		7.6-9.8	DEPRECATED: SANDY SILTY CLAY: light yellowish brown (2.5 Y 6/3) sandy silty clay, moist, very fine-grained sand, sand content decreasing, trace mottling, pp=2.5 tsf at 8.4', pp=2.5 tsf at 8.7', pp=<0.25 tsf at 8.8'-9.3', pp=0.5 tsf at 9.5', pp=0.75 tsf at 9.8', black and brown nodules
-10	10				NM		9.8-10	NO RECOVERY
							10-15	DEPRECATED: SANDY SILTY CLAY: light brownish gray (2.5 Y 6/2) sandy silty clay, moist, trace sand, very fine-grained sand, plastic, mottling, pp=0.75 tsf at 10', pp=0.5 tsf at 10.3 to 10.8, pp=1.75 tsf at 11.3', pp=1.75 tsf at 12.3', pp=3.5 tsf at 13.3', pp=1.75 tsf at 14', pp=0.5 tsf at 14.5', pp=2.5 tsf at 15', mottling, brown nodules
-15	15							

ERM Environmental Resources Management

SB-70
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-70 Date Drilled 8/17/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 45' Boring Diam. 2"

N. Coord. 729213.77' E. Coord. 3168334' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-15	15						15-17	DEPRECATED: SANDY SILTY CLAY: light brownish gray (2.5 Y 6/2) sandy silty clay, moist, minimal sand, very fine-grained sand, carbonate nodule at 15.8'-16.6', pp=1.0 tsf at 16', pp=1.5 tsf at 16.9'
							17-18.3	SILTY SAND: olive yellow (2.5 Y 6/6) silty sand, saturated, well sorted, fine-grained
							18.3-20	NO RECOVERY
-20	20						20-25	SILTY SAND: olive yellow (2.5 Y 6/6) silty sand, saturated, well sorted, fine-grained
-25	25						25-25.7	SILTY SAND: olive yellow (2.5 Y 6/6) silty sand, saturated, well sorted, fine-grained
					0		25.7-29	CLAY: strong brown (7.5 YR 4/6) clay with traces of sand lenses, saturated, plastic, pp=3.5 tsf at 26', pp=3.5 tsf at 27', pp=3.75 tsf at 28', pp=4.25 tsf at 29', 0.5cm carbonate nodule at ~29', mottling
					NM		29-30	NO RECOVERY
-30	30							

ERM Environmental Resources Management

SB-70
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-70 Date Drilled 8/17/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 45' Boring Diam. 2"

N. Coord. 729213.77' E. Coord. 3168334' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-30	30				0		30-30.4	CLAY: strong brown (7.5 YR 4/6) clay with traces of sand lenses, moist
							30.4-35	SILTY SANDY CLAY: yellowish brown (10 YR 5/6) silty sandy clay, moist, very fine-grained sand, plastic, pp=3.25 tsf at 31', pp=4.5 tsf at 32', pp=3.5 at 33', pp=4.5 tsf at 34', pp=4.5 tsf at 35', mottled, black nodules, carbonate nodules <1mm, <3mm, and 10mm
-35	35				0.7		35-35.3	SILTY SAND: brownish yellow (10 YR 6/4) silty sand with clay traces, moist, well sorted, fine-grained
							35.3-38.2	CLAY: dark yellowish brown (10 YR 4/6) clay, moist, plastic, pp=3.5 tsf at 36', pp=4.5 tsf at 37', pp=4.5 tsf at 38', carbonate nodules <1mm
							38.2-40	NO RECOVERY
-40	40						40-45	CLAY: strong brown (7.5 Y 4/6) clay, moist, mottled, plastic, pp=4.5 tsf at 45', pp=3.0 tsf at 44', pp=4.0 tsf at 43', pp=4.5 tsf at 42', pp=1.75 tsf at 40.5', cleavage surfaces
-45	45				0			T.D. = 45'

ERM Environmental Resources Management

SB-63
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-63 Date Drilled 8/17/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 35' Boring Diam. 2"

N. Coord. 729088.3338' E. Coord. 3167413.2507' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

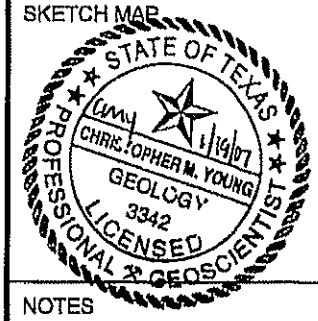
Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Jessica Rose

SKETCH MAP



NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-35	0-1	SANDY CLAY: dark grayish brown (10 YR 4/2) sandy clay, moist, poorly sorted, small rounded to subangular gravel, loose at 1.4-1.6 and 1.8-2.0', iron or brown nodules
					0		1-2	SANDY CLAY: light olive brown (2.5 Y 5/2) sandy clay, moist, fine-grained sand, plastic pp=2.25tsf at 1.2', mottled
					0.7		2-3.6	SANDY CLAY: light olive brown (2.5 Y 5/2) sandy clay, moist, fine-grained sand, mottled, sand content decreasing, carbonate lense from 2.8-3.6, iron staining
							3.6-5	NO RECOVERY
-5	5				NM		5-7.4	SILTY CLAY: grayish brown (10 YR 5/2) iron nodules, silty clay with sand, moist, plastic, pp=0.75 at 5', pp=0.75 at 1.6', mottled, iron staining, carbonate lenses at 5.6-5.7" and 6.6-7
							7.4-10	SILTY SANDY CLAY: greenish gray (Gley 1 6/1 10GY) silty sandy clay, moist, plastic pp=1.75' at 7.7', pp=1.55 at 8.7', pp=0.75 at 9.7', mottled, iron nodules, traces of carbonate nodules
-10	10				2.1		10-12	NO RECOVERY
					NM		12-13	SILTY SANDY CLAY: greenish gray (Gley 1 6/1 10GY) silty sandy clay, moist, plastic, carbonate lense from 12.3-12.6, sand content increasing, pp=0.7
					2.8		13-15	CLAYEY SAND: greenish gray (Gley 1 6/1 5GY) clayey sand, moist, well sorted, fine-grained sand, increasing sand content, WET from 14-15, pp=0.25tsf
-15	15							

ERM Environmental Resources Management

SB-63
DRILLING LOG

,oj. No. 0014419 Boring/Well ID SB-63 Date Drilled 8/17/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 35' Boring Diam. 2"

N. Coord. 729088.3338' E. Coord. 3167413.2507' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-15	15						15-17.2	CLAYEY SAND: greenish gray (Gley 1 6/1 10Y) sand with some clay, saturated, well sorted, fine-grained
							17.2-18	SILTY CLAY: light greenish gray (Gley 1 7/1 10GY) silty clay, moist, plastic pp=3.5 at 17.6'
					3.5		18-19	SILTY SAND: yellowish brown (10 YR 5/4) silty sand, wet, well sorted, fine-grained sand
							19-21.5	NO RECOVERY
-20	20							
					NM		21.5-23	SILTY SAND: brown (10 YR 5/3) silty sand, moist, well sorted, fine-grained
					4.9		23-25	SILTY CLAY: greenish gray (Gley 1 6/1 10Y) silty clay with sand, moist, plastic, pp=2.0tsf at 23', pp=4.5 at 24', pp=4.5 at 25', mottled
-25	25				2.1		25-27.7	SILTY CLAY: greenish gray (Gley 1 6/1 10Y) silty clay with sand, moist
					9.9		27.7-29	SILTY SANDY CLAY: strong brown (7.5 YR 4/6), carbonate lense from 27.7' to 27.9', silty sandy clay, moist, plastic pp=4.5 at 28', carbonate lense from 28.6' to 29.0', mottled
							29-33	NO RECOVERY
-30	30							

ERM Environmental Resources Management

SB-63
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-63 Date Drilled 8/17/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 35' Boring Diam. 2"

N. Coord. 729088.3338' E. Coord. 3167413.2507' Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe Log By Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-30	30				26.4			
							33-35	SILTY SANDY CLAY: strong brown (7.5 YR 4/6), silty sandy clay, moist, pp=2.5tsf at 33', pp=3.5tsf at 35'
-35	35							T.D. = 35'
-40	40							
-45	45							

ERM Environmental Resources Management

SB-91C
DRILLING LOG

oj. No. 0014419 Boring/Well ID SB-91C Date Drilled 8/7/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 4' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Marcel St. Marie

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 12' North of SB-91 perpendicular to tracks.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				18.4 30 0.0 76.0	0-4	0-1.8	FILL: very dark gray (7.5 YR 3/1), fill material clayey sand, some gravel, very fine-grained, well sorted, subangular, moist, trace rootlets: brown (7.5 YR 5/4) from 0.5 to 1; some cobbles, clay content increasing from 1.5' to 1.8', 100% recovery
							1.8-3.3	SAND: sand, very dark grayish brown (2.0 YR 3.2), fine, well sorted, subrounded, moist, odor, 100% recovery
					NM		3.3-4	CLAY: clay, very dark gray (2.5 Y 3/1), wet, plastic, soft, odor, 100% recovery T.D. = 4'
-5	5							
-10	10							
-15	15							

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SB-90D
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-90D Date Drilled 8/16/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 4' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 20' North of SB-90B.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-4	0-0.5	GRAVELLY CLAY: gray (5 YR 6/1), gravely sandy clay, moist, loose, non-plastic, much gravel, 100% recovery
							0.5-1	GRAVELLY SAND: dark gray (1 Gley 4/N), gravely sand, moist, loose, non-cohesive, medium to coarse-grained, sand stained black, shiny, tar-like material, 100% recovery
							1-1.5	CLAYEY SAND: very dark gray (1 Gley 3/N), clayey sand, fine to medium-grained, moist, slightly cohesive, odor, some gravel, soil stained dark gray, occasional piece of wood, 100% recovery
							1.5-2	CLAYEY SAND: very dark gray (1 Gley 3/N), clayey sand, fine to medium-grained, moist, slightly cohesive, odor, some gravel, soil stained dark gray, occasional piece of wood, 100% recovery
							2-3	CLAYEY SAND: very dark gray (1 Gley 3/N), clayey sand, fine to medium-grained, moist, slightly cohesive, odor, some gravel, soil stained dark gray, relatively abundant piece of wood, 100% recovery
							3-3.5	CLAYEY SAND: very dark gray (1 Gley 3/N), clayey sand, fine to medium-grained, moist, slightly cohesive, odor, some gravel, soil stained dark gray, relatively abundant piece of wood, the sand becoming shiny and having strong odor, 100% recovery
					NM		3.5-4	SAND: grayish brown (2.5 Y 5/2), sand, fine-grained, sorted, rounded to subangular, moist, slightly cohesive, sand is shiny, spot of product observed when water poured on sample, 100% recovery
-5	5							T.D. = 4'
-10	10							
-15	15							

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SB-90C
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-90C Date Drilled 8/16/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3.5' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

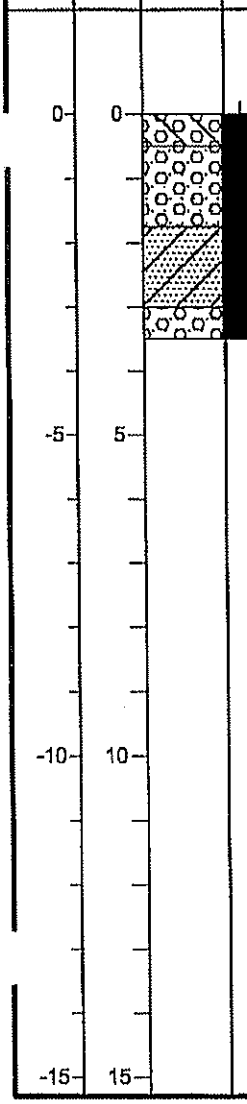
Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuyehu Ayele

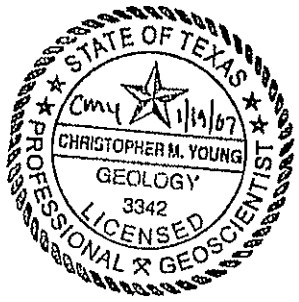
SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 10' North of SB-90B.



OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	0-3.5	0-0.5	GRAVELLY CLAY: gray (5 YR 6/1), gravely sandy clay, loose, moist, non-plastic, 100% recovery
		0.5-1.75	GRAVELLY SAND: dark gray (1 Gley 4/N), gravely sand, moist, non-cohesive, medium to coarse-grained, gravel grains stained black, 100% recovery
NM		1.75-3	CLAYEY SAND: very dark gray (1 Gley 3/N), clayey sand, some gravel, fine to medium-grained, moist, slightly cohesive, odor, some gravel, rare piece of wood, soil stained dark gray, strong odor and product from 3' to 3.5', 100% recovery
		3-3.5	GRAVELLY SAND: very dark gray (1 Gley 3/N) gravely sand, medium to coarse-grained, poorly sorted, rounded to subangular, wet, slightly cohesive, sand stained to be shiny, dark gray, strong odor, product, 100% recovery
			T.D. = 3.5'



ERM Environmental Resources Management

SB-90C DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-90C Date Drilled 8/15/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 2' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 10' North of SB-90B.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				NM	0-2	0-1	GRAVELLY CLAY: Dark gray (1 gley 4/N) gravelly sandy and clay, sand grains coarse-grained, rounded to angular, poorly sorted, moist, dark discoloration, slgthly cohesive, some plant roots
							1-2	GRAVELLY SAND: Gray (1 gley 5/N) gravely sand, medium to coarse-grained, poorly sorted, rounded to angular, moist to wet, slghtly cohesive
								T.D. = 2'
-5	5							
-10	10							
-15	15							

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SB-85D
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-85D Date Drilled 8/8/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 1.5' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Marcel St. Marie and Jessica Rose

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 18' North of SB-85B perpendicular to tracks.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				21.1 24.3 56.1	0-1.5	0-0.5 0.5-1.5	GRAVELLY SAND: dark brown (10 YR 3/6) sand with some gravel, moist, small amount of trace rootlets, sand is well sorted, little to no clay material SANDY CLAY: dark brown (10 YR 3/2) from 0.5' to 1.5', sandy clay, well sorted sand with clay, moist, non plastic (pp=1.5tsf), gravel - mixture of rounded and subangular T.D. = 1.5'
-5	5							
-10	10							
-15	15							

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SB-85C DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-85C Date Drilled 8/7/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3.3 ' Boring Diam. 2.5 "

N. Coord. _____ E. Coord. _____ Surface Elevation 0 ' Ft. MSL Datum

Screen: Type _____ Diam. 0 " Length 0 ' Slot Size 0 "

Casing: Type _____ Diam. 0 " Length 0 ' Sump Length 0 '

Top of Casing Elevation 0 ' Stickup 0 '

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Marcel St. Marie

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 5' North of SB-85B perpendicular to tracks.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				NM	0-3.3	0-1	FILL: fill, gravel, angular, up to 1" diameter, some sand, fine, well sorted, subangular, dark brown (10 YR 3/3), moist, 100% recovery
					188		1-2.8	SILTY SAND: dark gray (2.5 Y 4/1) from 1' to 2', black (10 YR 2/1) from 2' to 2.8', silty sand,very fine, well sorted, subrounded, moist from 1' to 1.5', wet from 1.5' to 2.8', red paint at 2.0, strong odor from 2' to 2.8', 100% recovery
					189			
					175			
							2.8-3.3	SILTY CLAY: silty clay, very dark gray (7.5 YR 3/1), wet, plastic, firm, odor, 100% recovery
					213			T.D. = 3.3 '
-5	5							
-10	10							
-15	15							

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SB-95B8
DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-95B8 Date Drilled 8/23/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 1.5' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 80' Northeast of SB-95B parallel to tracks.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				0.0 0.0 10.9	0-1.5	0-0.8 0.8-1.5	SANDY CLAY: greenish gray (2 Gley 5 10G), sandy clay, sand grains are very fine-grained, sorted and rounded, moist, clay plastic, some gravel, reddish yellow (7.5 YR 6/8) and dark gray (1 Gley 4/N) mottles, some plant rootlets CLAYEY SAND: very dark gray (1 Gley 3/N), clayey sand, medium to coarse-grained, poorly sorted, angular to rounded, moist from 0.8' to 1', wet from 1' to 1.5', stained, REFUSAL AT ~1.5' T.D. = 1.5'
-5	5							
-10	10							
-15	15							

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SB-91D DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-91D Date Drilled 8/7/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 4' Boring Diam. 2.5"

N. Coord. _____ E. Coord. _____ Surface Elevation 0' Ft. MSL Datum

Screen: Type _____ Diam. 0" Length 0' Slot Size 0"

Casing: Type _____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company _____ Driller _____

Drilling Method Hand Auger Log By Marcel St. Marie

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Located 17' North of SB-91 perpendicular to tracks.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				NM	0-4	0-1.5	FILL: brown (7.5 R 4/4), fill, sand, trace clay, some gravel, some cobble, very fine-grained, well sorted, subangular, moist, trace rootlets, clay content increasing from 0.5' to 1.5', 100% recovery
					60.8		1.5-2	GRAVELLY CLAY: light greenish gray (1 GLEY 7/1), gravelly sandy clay, some cobble, fine, poorly sorted, subangular, moist, trace wood pieces, moist, 100% recovery, 100% recovery
					97.2		2-3.3	SANDY CLAY: dark gray (2.5 Y 4/1), gravelly sandy clay, some cobble, fine, poorly sorted, subangular, saturated from 2' to 2.8', wet from 3' to 3.3', trace wood pieces, reduced gravel and much clay, plastic, has odor and fine sand from 2.8' to 3.3', 100% recovery
					NM		3.3-4	CLAY: dark gray (2.5 Y 4/1), clay, moist, plastic, dark discoloration, has odor T.D. = 4'
-5	5							
-10	10							
-15	15							

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SB-93B(F) DRILLING LOG

Proj. No. 0014419 Boring/Well ID SB-93B(F) Date Drilled 8/25/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 3.25' Boring Diam. 2.5"

N. Coord. 728419.7' E. Coord. 3167477.29' Surface Elevation 0' Ft. MSL Datum

Screen: Type ____ Diam. 0" Length 0' Slot Size 0"

Casing: Type ____ Diam. 0" Length 0' Sump Length 0'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (____) 2. Ft. 0 (____)

Drilling Company ____ Driller ____

Drilling Method Hand Auger Log By Bizuayehu Ayele

SKETCH MAP

NOTES

pp = pocket penetrometer.
tsf = tons per square foot.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-3.25	0-1	GRAVELLY CLAY: brownish yellow (10 YR 6/8), gravelly sandy clay, moist, slightly plastic, 100% recovery
					NM		1-1.5	CLAYEY SAND: dark gray (1 for Gley 4/N), clayey sand, medium to coarse-grained, poorly sorted, angular to subrounded, moist, stained, 100% recovery
					2.4		1.5-2	CLAYEY SAND: dark gray (1 for Gley 4/N), clayey sand, fine to medium-grained, fairly sorted, rounded, moist, stained, 100% recovery
					22.4		2-2.5	SAND: grayish brown (2.5 Y 5/2) with dark gray (1 for Gley 4/N) mottles, sand, fine, rounded, sorted, moist, slightly cohesive, occasional spots of product, odor, 100% recovery
					113		2.5-3	SAND: grayish brown (2.5 Y 5/2), sand, fine, rounded, sorted, moist, slightly cohesive, occasional spots of product, odor, 100% recovery
					248.8		3-3.25	SAND: grayish brown (2.5 Y 5/2), sand, fine, rounded, sorted, wet, slightly cohesive, product, odor, 100% recovery
-5	5				191.9			T.D. = 3.25'
-10	10							
-15	15							

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TABLE 1
SUMMARY OF GROUNDWATER MONITORING WELLS
UPRR HOUSTON WOOD PRESERVING WORKS, HOUSTON, TX

WELL NO.	DATE INSTALLED	NORTHING	EASTING	TOP OF CASING ELEVATION (FT HVD)	TOTAL DEPTH (FT BGS)	Top Screen Interval (FT BGS)	Bottom Screen Interval (FT BGS)	Zone
SWMU No. 1 Monitoring Wells								
MW-01A[1]	1/0/1900	728,006	3,165,936	47.92	19	8.5	18.5	A-TZ
MW-02[1]	4/17/1984	728,007	3,165,857	47.97	18.5	8.5	18.5	A-TZ
MW-07[1]	3/27/1991	727,779	3,165,867	48.86	23	14.1	19.1	A-TZ
MW-08[1]	3/27/1991	727,903	3,165,972	49.33	24	14.2	19.2	A-TZ
MW-10A[1]	9/13/1994	727,921	3,165,866	49.86	23	11	20.5	A-TZ
MW-10B[1]	9/14/1994	727,916	3,165,866	49.94	46	27.1	41.6	B-TZ
MW-11A[1]	9/15/1994	727,849	3,165,869	50.05	22	10	19.3	A-TZ
MW-11B[1]	9/19/1994	727,845	3,165,869	50.18	44	27.5	41.2	B-TZ
P-10[1]	3/26/1991	727,786	3,165,866	47.69	50	36.2	38.2	B-TZ
P-12[1]	3/27/1991	727,912	3,166,127	48.78	50	36.3	38.3	B-TZ
Site-Wide Monitoring Wells								
MW-03	4/17/1984	727,985	3,165,857	48.34	18.5	8.5	18.5	A-TZ
MW-04	4/18/1984	727,813	3,165,938	49.85	21	11	21	A-TZ
MW-05	1/0/1900	727,715	3,166,026	49.24	26	10	25	A-TZ
MW-09	3/26/1991	727,908	3,166,130	49.26	24	14.8	19.8	A-TZ
MW-12A	2/27/1997	728,333	3,166,004	49.96	30	17.5	27.5	A-TZ
MW-12B	2/27/1997	728,328	3,166,004	50.02	45	32.5	42.5	B-TZ
MW-12C	4/21/1997	728,345	3,166,005	50.14	75.3	69	73.5	C-TZ
MW-13	2/25/1997	728,777	3,165,977	50.65	25	9	22.5	A-TZ
MW-14	2/27/1997	728,718	3,166,550	50.66	45	28	42.5	B-TZ
MW-15A	2/25/1997	728,755	3,166,931	50.41	30	12	26.1	A-TZ
MW-15C	4/25/1997	728,761	3,166,947	50.01	75	64	73.5	C-TZ
MW-16	2/26/1997	728,305	3,167,235	51.51	30	12.5	27	A-TZ
MW-17	3/25/1997	728,787	3,167,447	50.92	35	18	32.5	A-TZ
MW-17C	12/10/2003	728,779	3,167,446	50.17	70	59.5	69.5	C-TZ
MW-18A	2/26/1997	728,839	3,168,227	51.57	35	18	32.5	A-TZ
MW-18C	4/25/1997	728,849	3,168,219	51.47	80.2	62	76.5	C-TZ
MW-19C	10/15/1998	728,620	3,167,727	53.05	73	63	73	C-TZ
MW-20A	9/28/1998	728,600	3,167,091	50.43	30	15	25	A-TZ
MW-21C	10/26/1998	727,730	3,165,884	49.05	72.5	62.5	72.5	C-TZ
MW-22A	10/1/1998	727,876	3,165,677	46.07	25	10	20	A-TZ
MW-22B	10/27/1998	727,871	3,165,678	45.86	38	27.5	37.5	B-TZ
MW-23C	10/14/1998	728,759	3,167,721	51.91	72.5	62.5	72.5	C-TZ
MW-24AR	1/27/2009	727,531	3,165,207	45.65	21	11	21	A-TZ
MW-24B	3/7/2000	727,534	3,165,208	46.06	50	38.5	48.5	B-TZ
MW-24C	3/8/2000	727,542	3,165,206	46.05	74	63	73	C-TZ
MW-25A	3/7/2000	729,089	3,168,524	44.65	29	18.5	28.5	A-TZ
MW-25C	3/7/2000	729,089	3,168,518	44.49	74	58	68	C-TZ
MW-26A	3/7/2000	729,159	3,167,519	44.62	26	14.5	24.5	A-TZ
MW-27A	3/26/2001	730,002	3,169,610	44.90	30	17	27	A-TZ
MW-27C	4/16/2001	730,009	3,169,610	45.04	73.5	60.5	70.5	C-TZ
MW-28A	3/26/2001	729,462	3,167,926	43.86	28	16	26	A-TZ
MW-28C	4/12/2001	729,461	3,167,920	43.96	88	75	85	C-TZ
MW-29A	4/19/2001	727,310	3,164,239	46.59	23	9	19	A-TZ
MW-29B	4/12/2001	727,303	3,164,239	46.26	57	44	54	B-TZ
MW-29C	4/27/2001	727,293	3,164,240	46.46	75	62.5	72.5	C-TZ
MW-30A	12/8/2003	728,759	3,167,517	50.45	31	19.5	29.5	A-TZ
MW-31A	12/8/2003	728,648	3,167,477	52.08	33	21.5	31.5	A-TZ
MW-32A	12/29/2003	728,914	3,167,401	43.77	32	20.5	30.5	A-TZ
MW-33A	12/30/2003	728,989	3,167,668	44.25	25	13	23	A-TZ
MW-33B	2/23/2007	729,150	3,167,661	44.35	42	32	42	B-CZ
MW-34C	1/13/2004	728,934	3,168,160	45.31	72	60	70	C-TZ
MW-35A	2/21/2007	728,985	3,167,045	44.75	28	13	28	A-TZ
MW-35B	2/26/2007	728,988	3,167,045	44.83	42	32	42	B-CZ
MW-36A	2/22/2007	729,148	3,168,167	44.53	28	18	28	A-TZ
MW-36B	6/24/2010	729,161	3,168,172	44.07	43	38	43	B-CZ
MW-36D	6/23/2010	729,162	3,168,180	44.33	110	100	110	D-TZ
MW-38A	2/21/2007	728,402	3,165,934	46.39	22	12	22	A-TZ
MW-38B	12/31/2003	728,319	3,165,945	45.51	37	25.5	35.5	B-TZ
MW-39B	12/16/2003	728,424	3,166,019	49.58	40	29.5	39.5	B-TZ
MW-40B	12/15/2004	728,341	3,166,122	49.59	40	29.5	39.5	B-TZ
MW-41B	1/7/2003	728,176	3,166,003	49.37	40	29.5	39.5	B-TZ
MW-42B	8/24/2006	728,257	3,166,324	50.52	42	30	40	B-TZ
MW-44A	2/22/2007	729,021	3,168,349	45.11	28	18	28	A-TZ
MW-44C	1/16/2004	729,021	3,168,349	45.03	70	57.5	67.5	C-TZ
MW-45C	1/20/2004	729,155	3,168,512	44.73	70	58	68	C-TZ
MW-46C	1/9/2004	729,121	3,168,576	44.94	72	60	70	C-TZ
MW-47C	3/16/2007	728,725	3,168,535	45.61	71	61	71	C-TZ
MW-48C	2/2/2004	728,417	3,168,241	44.68	72	60	70	C-TZ
MW-49A	2/28/2007	728,345	3,168,191	46.18	30	20	30	A-TZ
MW-49B	1/24/2009	728,375	3,168,184	46.43	35	30	35	B-CZ
MW-50A	3/1/2007	727,501	3,167,958	46.96	25	15	25	A-TZ
MW-51A	2/28/2007	726,925	3,166,885	47.80	25	15	25	A-TZ
MW-52A	2/27/2007	728,699	3,167,814	51.91	30	20	30	A-TZ

TABLE 1
SUMMARY OF GROUNDWATER MONITORING WELLS
UPRR HOUSTON WOOD PRESERVING WORKS, HOUSTON, TX

WELL NO.	DATE INSTALLED	NORTHING	EASTING	TOP OF CASING ELEVATION (FT HVD)	TOTAL DEPTH (FT BGS)	Top Screen Interval (FT BGS)	Bottom Screen Interval (FT BGS)	Zone
MW-53C	8/15/2006	729,613	3,168,481	45.49	72	60	70	C-TZ
MW-54C	8/15/2006	729,218	3,168,766	44.99	72	60	70	C-TZ
MW-55A	1/12/2009	728,540	3,167,482	52.01	25	10	25	A-TZ
MW-57A	1/22/2009	728,858	3,167,974	47.72	27	12	27	A-TZ
MW-58A	1/23/2009	728,875	3,168,176	47.76	29	14	29	A-TZ
MW-59A	1/28/2009	728,155	3,168,358	44.18	21	11	21	A-TZ
MW-59B	6/26/2010	728,145	3,168,358	44.36	33	28	33	B-CZ
MW-59D	1/27/2009	728,114	3,168,365	44.22	118	108	118	D-TZ
MW-60A	1/26/2009	728,825	3,168,823	46.79	28.5	18.5	28.5	A-TZ
MW-61A	1/26/2009	728,336	3,168,630	44.67	22	12	22	A-TZ
MW-62B	1/21/2009	728,190	3,165,880	48.16	35	25	35	B-TZ
MW-63B	1/28/2009	729,361	3,167,652	44.48	36	31	36	B-CZ
MW-64A	1/26/2009	727,496	3,165,573	44.55	19.5	14.5	19.5	A-TZ
MW-65D	1/17/2009	729,512	3,168,331	44.55	110	100	110	D-TZ
MW-66D	1/20/2009	729,137	3,169,381	46.51	103	93	103	D-TZ
MW-67B	6/26/2010	729,782	3,167,588	43.93	40	35	40	B-CZ
MW-68C	6/25/2010	729,164	3,167,346	44.8	70	60	70	C-TZ
MW-69A	6/23/2010	728,136	3,168,234	45.71	18.5	8.5	18.5	A-TZ
P-11	3/25/1991	728,049	3,166,025	48.98	50	36.2	38.2	B-TZ
TW-41B	1/22/2009	728,222	3,166,002	49.67	40	30	40	B-TZ
TW-56A	1/23/2009	728,758	3,168,070	51.89	31	21	31	A-TZ

Notes:
1 - Point of Compliance Wells for SWMU No. 1
BGS=Below Ground Surface
HVD = Elevations relative to Houston Vertical Datum, Houston Monument System
Northing/Easting = Coordinates based on NAD 1927 Texas State Plane, South Central Zone, US Survey Feet

T 2

Summary of Logs used for Hydrogeologic Cross Sections
UPRR Houston Wood Preserving Works

Corss-Sections

A-A'	B-B'	C-C'	D-D'	E-E'	F-F'	G-G'	H-H'	I-I'	AA-AA'
MW-13	MW-38B	MW-24AR	MW-13	CPT-51R-08	CPT-52R-08	MW-67B	MW-28A	MW-53C	MW-34C
CPT-23R-95	MW-12A	MW-24B	CPT-23R-95	MW-35A	MW-68C	CPT-53R-08	MW-28C	MW-65D	MW-44C
CPT-21R-95	MW-12B	MW-24C	SB-28	MW-35B	CPT-36R-08	MW-63B	MW-36A	MW-45C	SB-21
MW-14	MW-12C	SB-37	CPT-24R-95	CPT-35-03	SB-25	MW-33B	MW-36B	CPT-01R-01	MW-25A
CPT-28R-95	CPT-32R-01	CPT-08E-95	MW-39B	CPT-39-2-97	MW-32A	MW-33A	MW-36D	MW-25A	MW-25C
CPT-19R-95	MW-40B	CPT-35-5-97	CPT-20R-01	MW-20A	CPT-42R-08	CPT-43R-08	MW-34C	MW-25C	MW-46C
MW-15A	CPT-22R-95	MW-21C	SB-05	CPT-26R-95	CPT-27R-01	CPT-28R-01	CPT-31R-01	MW-47C	MW-54C
MW-15C	SB-02	CPT-02E-95	MW-12A	MW-16	MW-17	MW-23C	MW-18A	MW-59A	MW-66D
CPT-39-2-97	CPT-20R-95	P-12	MW-12B	TW-03	MW-17C	MW-19C	MW-18C	MW-59B	GB-1
CPT-18R-95	CPT-36-97	CPT-04R-95	MW-12C	MW-51A	CPT-26R-01	CPT-39-03	CPT-17R-95	MW-59D	
MW-17	CPT-31R-95	CPT-05R-95	CPT-40		CPT-10R-95	MW-50A	MW-48C		
MW-17C	MW-20A	CPT-06R-95	CPT-19R-01		SB-24		MW-49B		
CPT-27R-01	CPT-29R-95	MW-16	CPT-25R-95		SB-08		MW-49A		
CPT-28R-01	CPT-10R-95	MW-49B	CPT-17R-01		CPT-34R-95		MW-69A		
MW-23C	MW-31A	MW-49A	TW-41B		SB-07				
CPT-16R-95	CPT-33R-95	MW-48C	MW-41B		CPT-09R-95				
MW-57A	MW-19C	MW-61A	P-11						
MW-34C	CPT-38-2-97		CPT-03E-95						
MW-44C	SB-04		CPT-02E-95						
SB-21	CPT-15R-95		CPT-05E-95						
MW-25A	TW-56A								
MW-25C	MW-18A								
MW-46C	MW-18C								
MW-54C	MW-47C								
CPT-03R-01	MW-60A								

TABLE 7.3
SUMMARY OF AQUIFER TEST RESULTS AND SUSTAINABLE WELL YIELD CALCULATIONS

Groundwater Resource Classification: UPRR Houston Wood Preserving Works
Houston, Texas

Well Number	Type of Test	Analysis Method	Hydraulic Conductivity, K (cm/sec)	Average K (cm/sec)	Representative K (cm/sec)	Saturated Thickness, b (ft)	Confining Head, h_c (ft)	Average Yield, Q (GPD)
B-CZ Wells								
MW-33B	Bail Down	Bouwer - Rice	7.E-07	7.E-07	5.E-07	0.5	23	0.3
MW-35B	Bail Down	Bouwer - Rice	1.E-04	1.E-04		0.5	29	31
			1.E-04					31
			9.E-05					25
	Slug	Bouwer - Rice	1.E-04					31
			2.E-04					45
MW-36B	Bail Down	Bouwer - Rice	6.E-08	6.E-08		0.5	35	0.04
MW-49B	Bail Down	Bouwer - Rice	1.E-07	1.E-07		2	19	0.15
MW-59B	Bail Down	Bouwer - Rice	5.E-07	5.E-07		4	21	1.01
MW-63B	Bail Down	Bouwer - Rice	1.E-07	1.E-07		4	6	0.09
MW-67B	Bail Down	Bouwer - Rice	2.E-07	2.E-07		5	32	0.78
D-TZ Wells								
MW-36D	Slug	Bouwer - Rice	3.E-05	3.E-05	3.E-05	1	18	10.44
			4.E-05					13.53
			3.E-05					10.92
			3.E-05					11.04
			3.E-05					11.15
			3.E-05					11.45

JOB No. 286-45062

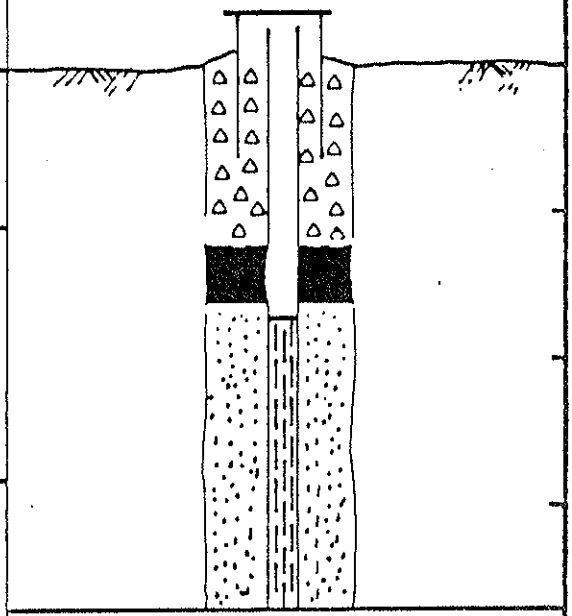
LOG OF BORING No. SP-4/MW-1

MONITOR WELL INSTALLATIONS
SOUTHERN PACIFIC TRANSPORTATION COMPANY
HOUSTON, TEXAS

TYPE BORING: Wash

LOCATION: See Plate 1

DEPTH, FT.	SAMPLE No.	SAMPLE	SOIL DESCRIPTION	MONITOR WELL INSTALLATION
			SUR. ELEV.:	
0			Red clay - black below 3'	
5			Light gray and tan sandy clay - tan and light gray below 9'	
10				
15			Light gray and tan sand	
20				
25				
30				
35				
40				
45				



Note:
For Description Of Material Used, See Plate 3.

5

COMPLETION DEPTH: 18.5'
DATE: April 17, 1984

DEPTH TO WATER:
DATE:

JOB No. 286-45062

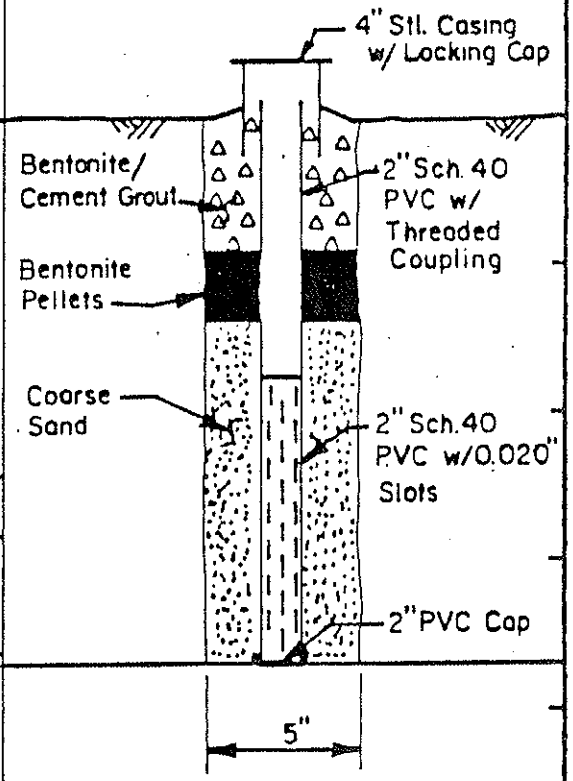
LOG OF BORING No. SP-2 /MW-2

MONITOR WELL INSTALLATIONS
SOUTHERN PACIFIC TRANSPORTATION COMPANY
HOUSTON, TEXAS

TYPE BORING: Auger & Wash

LOCATION: See Plate 1

DEPTH, FT.	SAMPLE No.	SAMPLE	SOIL DESCRIPTION	MONITOR WELL INSTALLATION
			SUR. ELEV.:	
0			Dark gray clay - light gray and tan w/calcareous nodules below 7' - tan and light gray w/silt pockets 10' - 11'	
10			Light gray silty clay	
15			Tan and light gray sand w/chemical odor - free water at 14'	
20			Light gray clay	
25				
30				
35				
40				
45				



3

COMPLETION DEPTH: 18.5'
DATE: April 17, 1984

DEPTH TO WATER:
DATE:

NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

PLATE 3

JOB No. 286-45062

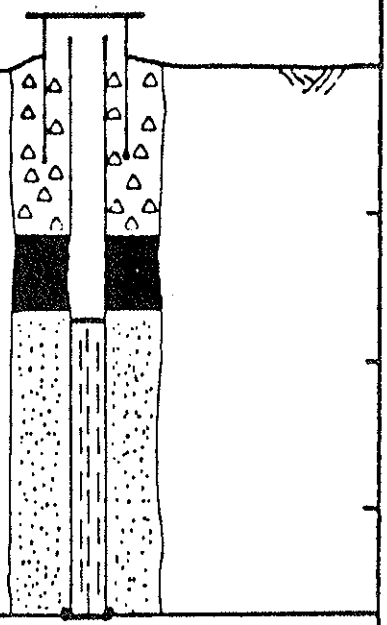
LOG OF BORING No. SP-3/MW-3

MONITOR WELL INSTALLATIONS
SOUTHERN PACIFIC TRANSPORTATION COMPANY
HOUSTON, TEXAS

TYPE BORING: Wash

LOCATION: See Plate 1

DEPTH, FT.	SAMPLE No.	SAMPLE	SOIL DESCRIPTION	MONITOR WELL INSTALLATION
			SUR. ELEV.:	
0			Black sandy clay	
5			- tan and light gray below 3'	
			- light gray and tan below 7'	
10			- tan and light gray w/sand seams below 9'	
15			Tan and light gray sand	
20				
25				
30				
35				
40				
45				



Note:
For Description Of Material Used, See Plate 3.

4

COMPLETION DEPTH: 18.5'
DATE: April 17, 1984

DEPTH TO WATER:
DATE:

NATIONAL SOIL SERVICES
CONSULTING ENGINEERS

PLATE 4

JOB No. 286-45062

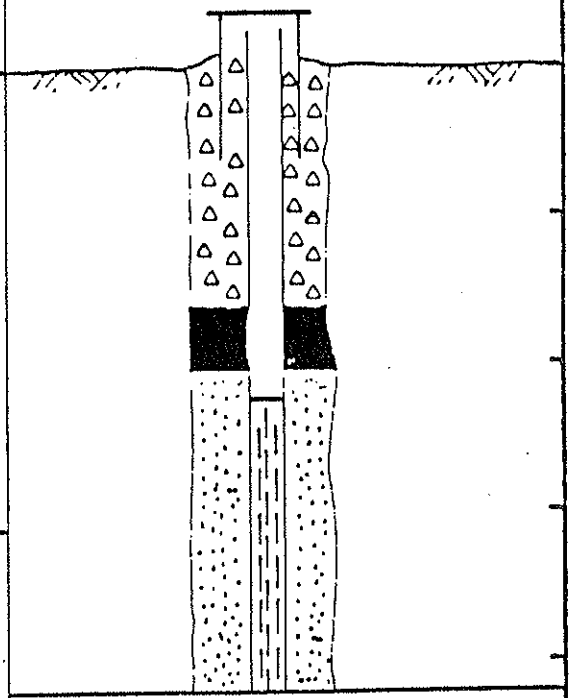
LOG OF BORING No. SP-5 /MW-4

MONITOR WELL INSTALLATIONS
SOUTHERN PACIFIC TRANSPORTATION COMPANY
HOUSTON, TEXAS

TYPE BORING: Wash

LOCATION: See Plate 1

DEPTH, FT.	SAMPLE No.	SAMPLE	SOIL DESCRIPTION	MONITOR WELL INSTALLATION
			SUR. ELEV.:	
0			Tan and dark gray sandy clay	
			- dark gray below 3'	
5			- light gray and tan below 7'	
10			- tan and light gray w/calcareous nodules below 12'	
15			Light gray sand	
20				
25				
30				
35				
40				
45				



Note:
For Description Of Material Used, See Plate 3.

6

COMPLETION DEPTH: 21'
DATE: April 18, 1984

DEPTH TO WATER:
DATE:

PLATE 6

Client: SP ENVIRONMENTAL SYSTEMS, INC.

Date: MARCH 27, 1991

Location: N 727866.10; E 3166206.30

Ground Elev. 46.00

Boring Type: WASH/SHELBY TUBE SAMPLER/SPLIT SPOON

LOG OF BORING

No. 7/MW-7

GEO ASSOCIATES

Job No. 241

Water Level Depth=

Caving Depth=

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	OVA RDG (ppm)	BLOW COUNTS
			FIRM RED CLAY FILL		
			STIFF BLACK SANDY CLAY	10	
5				10	
				10	
			STIFF GRAY SANDY CLAY -with oil -with red clay and sand fill, 8'-9' -very calcareous, 9'-10'	30	
10				40	
				60	
			MEDIUM DENSE GRAY SAND -with brown stains, 13'-14'	20	
15		SS		60	28
		SS		70	41
20			VERY STIFF GRAY SANDY CLAY		
25					
30					
35					
40					

FIELD OVA ppm: 0, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000; 0x, 1, 2

SHEAR STRENGTH ESTIMATE POCKETPEN tsf: 0

Total Depth= 23.0

OIL IN PIT, 3'-20'

Logged By: D. BRAGG

Drilled By: GULF COAST CORING

Client: SP ENVIRONMENTAL SYSTEMS, INC.

Date: MARCH 27, 1991

Location: N 727983.88; E 3166311.99

Ground Elev. 46.60

Boring Type: WASH/SHELBY TUBE SAMPLER/SPLIT SPOON

LOG OF BORING

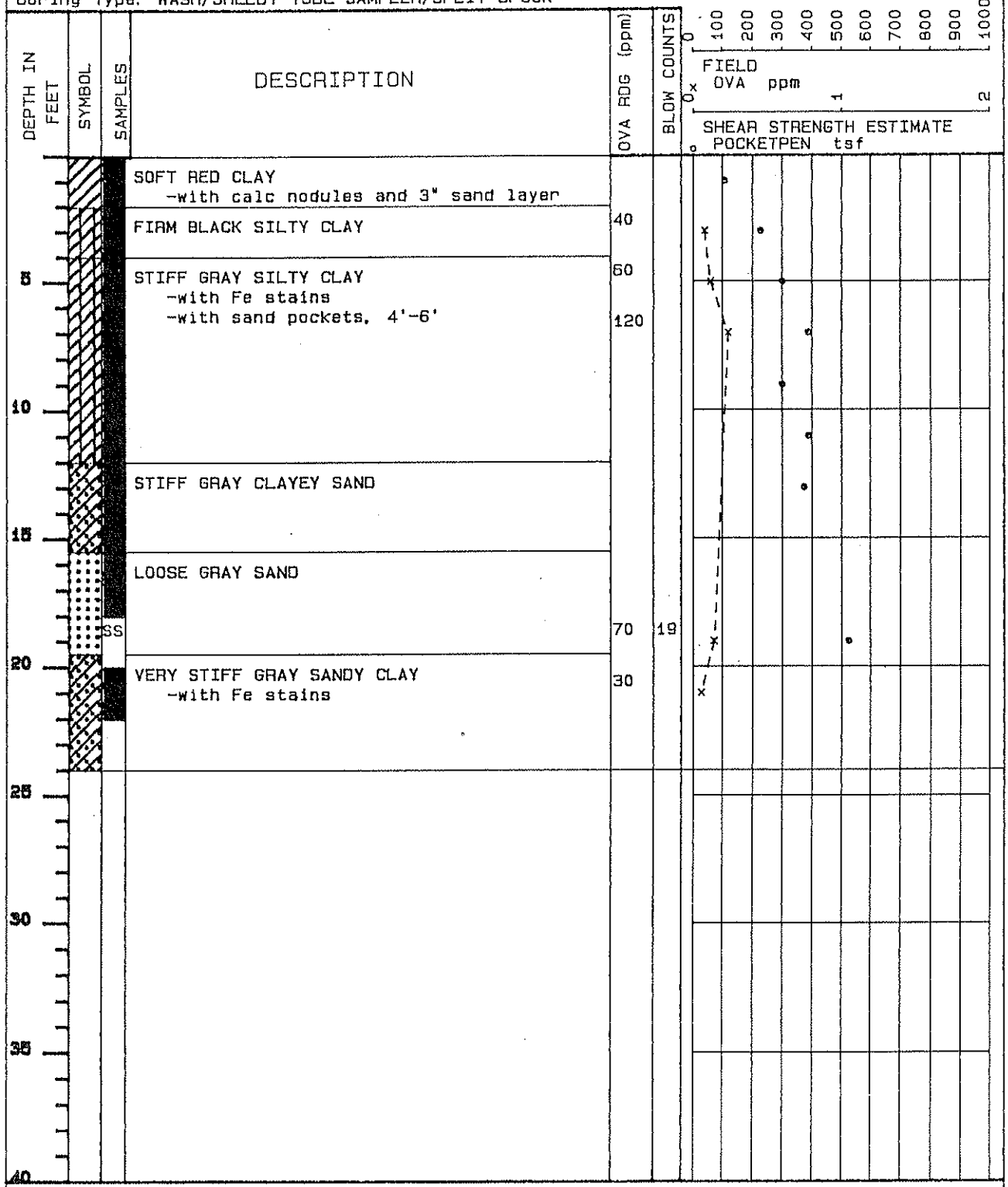
No. 8 /MW-8

GEO ASSOCIATES

Job No. 241

Water Level Depth=

Caving Depth=



Total Depth= 24.0

Logged By: D. BRAGG

Drilled By: GULF COAST CORING

Client: SP ENVIRONMENTAL SYSTEMS, INC.

Date: MARCH 26, 1991

Location: N 727992.46; E 3166467.08

Ground Elev. 47.10

Boring Type: WASH/SHELBY TUBE SAMPLER/SPLIT SPOON

LOG OF BORING

No. 9 /MW-9

GEO ASSOCIATES

Job No. 241

Water Level Depth=

Caving Depth=

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	OVA RDG (ppm)	BLOW COUNTS
			GRAVEL AND CLAY BASE MATERIAL		
			STIFF BLACK SANDY CLAY	100	
5			STIFF GRAY SANDY CLAY -firm, 8'-10' -with Fe stains below 4' -with calc nodules, 9'-10'	100 4 1	
10				3	
			STIFF GRAY SANDY CLAY -with Fe stains	5	
15			LOOSE GRAY SAND -medium dense below 18'	3	
		SS		1	9
		SS		2	23
20			VERY STIFF GRAY SANDY CLAY	2	
25					
30					
35					
40					

FIELD OVA ppm: 0, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000; 1; 2

SHEAR STRENGTH ESTIMATE POCKETPEN tsf

Total Depth= 24.0

Logged By: D. BRAGG

Drilled By: GULF COAST CORING

IC INDUSTRIAL COMPLIANCE

LOG OF BORING No.: MW-10A

SHEET NUMBER 1 OF 2

CLIENT:	SPTCo
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	44102069
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	
START DATE:	09/13/94
FINISH DATE:	09/13/94
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	PSI
DRILLING METHOD:	6.25" - Hollow Stem Auger
SAMPLING METHOD:	Shelby Tube and Split Spoon
SURFACE ELEVATION:	47.2'
TOC ELEVATION:	49.90'
WATER LEVEL:	7.1'
WATER ELEVATION:	42.80'
DATE:	09/19/94

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
				1	FILL		Fill - crushed concrete 0-0.5'	
ST			0.9	2			clay dark brown and gray	
ST			0.9	3				
				4	CL		Silty clay - dark gray, stiff, moist, laminated rootlets	PP 1.75
ST			1.2	5			4-6' medium gray and dark yellow orange calcareous nodules	PP 2.0 - 2.25 PP 3.0
				6				
ST			1.5	7				
				8				
ST			1.1	9			very calcareous with small iron nodules	PP 2.5
				10				
ST			1.6	11			very sandy, light gray and dark yellow orange, moist to wet stiff to hard	PP 1.25 - 4.5+
				12				
ST			1.5	13				
				14				
ST			1.0	15	SM		Sand - light greenish gray, some clay, wet	
				16				
ST			2.0	17			wet, creosote odor	
				18				
ST			1.8	19	CL		Silty Clay, slight creosote odor light gray / iron stained;	PP 3.0
				20				

Geologist: Shiman

Checked By:

LEGEND:

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

IC INDUSTRIAL COMPLIANCE

LOG OF BORING No.: MW-10A

SHEET NUMBER 2 OF 2

:NT:	SPTCo
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	44102069
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	
START DATE:	09/13/94
FINISH DATE:	09/13/94
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	PSI
DRILLING METHOD:	6.25" - Hollow Stem Auger
SAMPLING METHOD:	Shelby Tube and Split Spoon
SURFACE ELEVATION:	47.2'
TOC ELEVATION:	49.90'
WATER LEVEL:	7.1'
WATER ELEVATION:	42.80'
DATE:	09/19/94

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS
ST			2.0	21	CL		very stiff, moist, no creosote odor to very mild creosote odor, some very fine grained sand
				22			
				23			
				24	///		Total Depth of Boring: 23 ft Well Screened Interval: 11.0 - 20.5 ft Well Total Depth: 23 ft
				25			
				26			
				27			
				28			
				29			
				30			
				31			
				32			
				33			
				34			
				35			
				36			
				37			
				38			
				39			
				40			

NOTES:

Geologist: Shiman

Checked By:

LEGEND:

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

IC INDUSTRIAL COMPLIANCE

LOG OF BORING No.: MW-10B

SHEET NUMBER 1 OF 3

ENT: SPTCo

PROJECT NAME: Houston Wood Preserving Works

PROJECT NUMBER: 44102069

PROJECT LOCATION: 4910 Liberty Road Houston, TX

BORING LOCATION:

START DATE: 09/12/94 FINISH DATE: 09/14/94

START TIME: FINISH TIME:

DRILLING CONTRACTOR: PSI

DRILLING METHOD: 6.25" Hollow Stem Auger Ream 0-19' with 16" Auger Bit

SAMPLING METHOD: Shelby Tube and Split Spoon

SURFACE ELEVATION: 47.3'

TOC ELEVATION: 49.97'

WATER LEVEL: 7.0'

WATER ELEVATION: 42.97'

DATE: 09/19/94

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
				1	FILL		Fill - crushed concrete 0-0.9'; clay; dark gray with black discoloration, calcareous nodules, dark to medium gray	Borehole diameter 16" from 0 to 19 ft
ST			0.6	2				
ST			0.7	3				
				4				
ST			1.5	5			With fine-grained gravel, woody fragments, moist to wet	poor sample
				6				
ST			2.0	7	CL		Silty Clay - medium light gray, soft, wet, with large wood fragments	PP 0.5
				8				
ST			1.5	9			light olive gray, stiff to very stiff, moist, with dark yellow orange iron staining	PP 1.75 - 2.75
				10				
ST			0.3	11			soft boggy / woody fragments with sandy clay	very poor recovery
				12				
ST			1.7	13			Silty Sandy Clay - light greenish gray and dark yellow orange mottled; stiff, moist to wet	PP 1.25 - 2.0
				14				
ST			0.9	15	SP		Sand - light greenish gray, some clay, wet, with woody fragments	
				16				
SS			1.5	17			light gray, very fine-grained, trace silt, wet, creosote odor	
				18				
SS			1.2	19	CL		Sandy Clay - light gray, moist to wet	PP 1.5
				20				Set 12" surface casing 0-20'

Geologist: Shiman

Checked By:

LEGEND:

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

IC INDUSTRIAL COMPLIANCE

LOG OF BORING No.: MW-10B

SHEET NUMBER 2 OF 3

CLIENT:	SPTCo
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	44102069
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	
START DATE:	09/12/94
FINISH DATE:	09/14/94
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	PSI
DRILLING METHOD:	6.25" Hollow Stem Auger Ream 0-19' with 16" Auger Bit
SAMPLING METHOD:	Shelby Tube and Split Spoon
SURFACE ELEVATION:	47.3'
TOC ELEVATION:	49.97'
WATER LEVEL:	7.0'
WATER ELEVATION:	42.97'
DATE:	09/19/94

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
ST			1.5	21			with dark yellow orange iron staining; very stiff, moist, no creosote odor	PP 3.25 - 3.75
				22				
ST			1.8	23			some silt, very mild creosote odor light gray and orange brown mottled clay	PP 3.0 - 3.75
				24			silty, sandy, hard, moist	PP > 4.5
SS			2.0	25				
				26				
SS			1.7	27				PP 4.0
				28				
SS			1.9	29			color is light gray and light brown	
				30	SM		mottled, become silty sand @ 29', wet 6" layer silty clay (30-30.5)	
SS			1.0	31				
				32			Silty Sand - brown, wet, very fine-grained; sand, light brown, vfg very dense, saturated,	
SS			1.7	33	SP		10-20% silt, mild creosote odor, light brown and gray	PID 2.5 ppm MAX
				34				
SS			0.7	35				PID 2.9 ppm MAX
				36				
SS			0.5	37				
				38				
SS			2.0	39			Clay - moderate reddish-brown with light greenish	strata break @ 38.5'
				40	CH		gray markings, hard, moist, with light brown silty sand (40.5'-41.4').	

Geologist: Shiman
Checked By:

LEGEND:

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

IC INDUSTRIAL COMPLIANCE

LOG OF BORING No.: MW-10B

SHEET NUMBER 3 OF 3

Location Diagram

ENT:	SPTCo
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	44102069
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	
START DATE:	09/12/94
FINISH DATE:	09/14/94
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	PSI
DRILLING METHOD:	6.25" Hollow Stem Auger Ream 0-19' with 16" Auger Bit
SAMPLING METHOD:	Shelby Tube and Split Spoon
SURFACE ELEVATION:	47.3'
TOC ELEVATION:	49.97'
WATER LEVEL:	7.0'
WATER ELEVATION:	42.97'
DATE:	09/19/94

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS			1.8	41	SM			
				42			wet, with very mild creosote odor	
SS			2.0	43	CH		Clay - moderate reddish brown with light greenish	
				44			gray marks; hard, moist	
SS			2.0	45				
				46			Total Depth of boring: 46'	
				47	///		Well screen (completion) interval: 27.1' - 41.6'	
				48			Total Depth of Well: 44'	
				49				
				50				
			1	51				
				52				
				53				
				54				
				55				
				56				
				57				
				58				
				59				
				60				Set 12" surface casing 0-20'

Geologist: Shiman

Checked By:

LEGEND:

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

IC INDUSTRIAL COMPLIANCE

LOG OF BORING No.: MW-11A

SHEET NUMBER 1 OF 2

'IENT:	SPTCo
ROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	44102069
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	
START DATE:	09/15/94
FINISH DATE:	09/15/94
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	PSI
DRILLING METHOD:	6.25" Hollow Stem Auger
SAMPLING METHOD:	Shelby Tube and Split Spoon
SURFACE ELEVATION:	47.5'
TOC ELEVATION:	50.00'
WATER LEVEL:	7.4'
WATER ELEVATION:	42.06'
DATE:	09/19/94

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
				1	FILL		Fill - crushed concrete	
							brown/gray silty clay	
ST			0.9	2				
ST			1.3	3				
				4	CL		Silty Clay - blackish gray	
ST			1.4	5			medium light gray and dark yellow orange,	PP 2.0
				6			stiff, moist, rootlets	
ST			1.2	7			medium light gray with iron staining, some sand,	PP 1.75 - 2.0
				8			Fe nodules, creosote odor	
ST			1.3	9			calcareous deposit @ 8 ft, creosote odor	PP 2.25
				10				
ST			1.7	11			grayish yellow green with Fe staining, with dark	PP 1.0
				12			gray vertical silt pocket, wet, creosote odor	
ST			1.6	13			calcareous deposits, iron black staining, very	PP 2.25 - 3.0
				14			stiff, very mild creosote odor	
ST			1.3	15	SC-SM		Clayey to Silty Sand - greenish gray with dark	
				16			yellow orange markings, wet, no odor	
SS			2.0	17	SM		Silty Sand - very fine-grained, medium dense,	No creosote odor @
				18			wet, no creosote odor	bottom of sand
ST			1.8	19	CL		Silty Clay - light gray with light olive brown	PP 1.25 - 1.5
				20			markings, stiff, moist to wet	

Geologist: Shiman
Checked By:

LEGEND:

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

IC INDUSTRIAL COMPLIANCE

LOG OF BORING No.: MW-11A

SHEET NUMBER 2 OF 2

ENT:	SPTCo
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	44102069
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	
START DATE:	09/15/94
FINISH DATE:	09/15/94
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	PSI
DRILLING METHOD:	6.25" Hollow Stem Auger
SAMPLING METHOD:	Shelby Tube and Split Spoon
SURFACE ELEVATION:	47.5'
TOC ELEVATION:	50.00'
WATER LEVEL:	7.4'
WATER ELEVATION:	42.06'
DATE:	09/19/94

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
ST			1.7	21	CL		light gray, with dark yellow orange markings, very stiff, moist	PP 3.75
				22				
				23	///		Total Depth of boring: 22'	
				24			Well screen (completion) interval: 10.0' - 19.3'	
				25			Total Depth of Well: 21.5'	
				26				
				27				
				28				
				29				
				30				
				31				
				32				
				33				
				34				
				35				
				36				
				37				
				38				
				39				
				40				

Geologist: Shiman
Checked By:

LEGEND:

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

IC INDUSTRIAL COMPLIANCE

LOG OF BORING No.: MW-11B

SHEET NUMBER 1 OF 2

ENT:	SPTCo
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	44102069
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	
START DATE:	09/16/94
FINISH DATE:	09/19/94
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	PSI
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Shelby Tube and Split Spoon
SURFACE ELEVATION:	47.6'
TOC ELEVATION:	50.19'
WATER LEVEL:	7.55'
WATER ELEVATION:	42.64'
DATE:	09/20/94

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
							12" isolation casing set 0' to 20'	
				21				
				22				
SS			2.0	23	CL		Silty Clay - light gray, very stiff, moist, some vfg sand, tr, Fe stain, no creosote odor	PP 3.25 - 4.25
				24				
SS			2.0	25			light gray and light brown mottled, trace calcareous deposits, trace sand	PP 4.5+
				26				
SS			2.0	27			light gray and orange-brown mottled, hard, becomes sandier	PP > 4.5
				28			Sandy Clay - with wet sand pockets, green, gray staining, very slight creosote odor.	
SS			2.0	29				
				30				
SS			0.2	31			mild creosote odor	very poor recovery hit calcareous hard zone
				32				
SS			2.0	33	SP		Sand - moderate yellowish brown, vfg, wet, ~10% silt, with creosote product in calcareous deposits with yellowish gray color, no visible product,	
				34				
SS			1.2	35				
				36			slight creosote odor	
SS			0.5	37			slight creosote odor	
				38				
SS			1.4	39	CL		Silty Sandy Clay - moderate reddish brown and light greenish gray, hard, moist, slight creosote odor. Becomes high plastic clay below 40'	break @ 38.3' PP 4.5+ PP 4.5+
				40				

Geologist: Shiman
Checked By:

LEGEND:

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

IC INDUSTRIAL COMPLIANCE

LOG OF BORING No.: MW-11B

SHEET NUMBER 2 OF 2

ENT:	SPTCo
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	44102069
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	
START DATE:	09/16/94
FINISH DATE:	09/19/94
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	PSI
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Shelby Tube and Split Spoon
SURFACE ELEVATION:	47.6'
TOC ELEVATION:	50.19'
WATER LEVEL:	7.55'
WATER ELEVATION:	42.64'
DATE:	09/20/94

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	C I	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS			2.0	41	CN			
				42			slickenside fracture planes	
SS			2.0	43			questionable creosote odor	
				44				
					///		Total Depth of boring: 44'	
				45			Well screen (completion) Interval: 27.5' - 41.2'	
				46			Total Depth of Well: 43.5'	
				47				
				48				
				49				
				50				
				51				
				52				
				53				
				54				
				55				
				56				
				57				
				58				
				59				
				60				

Geologist: Shiman

Checked By:

LEGEND:

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: MW-12A

SHEET NUMBER 1 OF 2

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	**44102069.07**
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	West Side
START DATE:	02/27/97
FINISH DATE:	02/27/97
START TIME:	07:45
FINISH TIME:	09:40
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	5.52'
WATER ELEVATION:	
DATE:	03/25/97

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	0 - 5	---	3.75	1	FILL		FILL, moist, 10YR3/1, very dark gray, gravel, roots, brick, slight odor	Sample Retained For Chemical Analysis
				2				
				3			Slightly moist	
				4	CL		CLAY, silty, slightly moist, 10YR4/1, dark gray, calcareous nodules	PP = 2.0
				5				
SS	5 - 10	---	5.0	6			Moist, 10YR5/1, gray,silt seams	
				7				
				8			Silt content decreases, 25% calcareous nodules 10YR7/1	
				9			Light gray with 10YR6/8 brownish yellow and 10YR4/1 dark gray mottling, silt seams	
				10				
SS	10 - 15	---	5.0	11			silt seams	
				12				
				13				
				14				
				15	ML		SILT, clayey, slightly moist, 10YR5/1, gray, odor, clay seams	
SS	15 - 20	---	3.75	16				
				17	SP		SAND, wet, 10YR7/1, light gray with greenish tint, fine grained,	
				18			odor, staining with 10YR2/1, black,	
				19			and 10YR3/3 dark brown	
				20				

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: MW-12A

SHEET NUMBER 2 OF 2

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	West Side
START DATE:	02/27/97
FINISH DATE:	02/27/97
START TIME:	07:45
FINISH TIME:	09:40
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	5.52'
WATER ELEVATION:	
DATE:	03/25/97

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	20 - 25	---	5.0	21	SP		SAND, wet, 10YR7/1, light gray, with greenish tint, fine grained, odor, staining with 10YR2/1 black and 10YR3/3 dark brown	Sample Retained For Chemical Analysis
				22				
				23				
				24				
				25				
SS	25 - 30	---	5.0	26	CL		CLAY, slightly silty, very slightly moist, 10YR7/1, light gray, >25% mottling with 10YR6/8, brownish yellow, green and black staining, odor	PP = 4.0 Sample Retained For Chemical Analysis
				27				
				28				
				29				
				30			Silt content = 50%, strong odor	
				31			Boring TD @ 30.0'	
				32				
				33				
				34				
				35				
				36				
				37				
				38				
				39				
				40				

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: MW-12B

SHEET NUMBER 1 OF 1

DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	5.60'
WATER ELEVATION:	
DATE:	03/25/97

Location Diagram

NT:	Southern Pacific Lines
CT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road, Houston, TX
BORING LOCATION:	West Side
START DATE:	02/27/97
FINISH DATE:	02/27/97
START TIME:	10:15
FINISH TIME:	13:10

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	25 - 30	—	5.0	26	CL	CLAY, slightly silty, very slightly moist, 10YR7/1, light gray, >25% mottling with 10YR6/8 brownish yellow, green and black staining, creosote @ 30', strong odor	0 - 25' not logged because of close proximity to MW-12A
				27			
				28			
				29			
				30			
ST	30 - 35	—	2.5	31	SP	SAND, saturated, 7.5YR4/6, strong brown with 7.5YR6/1 gray, fine grained, silt nodules, sheen, strong odor	Sample Retained For Chemical and Geotechnical Analysis
				32			
				33			
				34			
				35			
SS	35 - 40	—	5.0	36			
				37			
				38			
				39			
				40			
SS	40 - 45	—	5.0	41	CH	CLAY, very slightly moist, 10R4/6, red, hard, firm, fat, scattered small calcareous nodules	Sample Retained For Chemical and Geotechnical Analysis
				42			PP = 4.5
				43			
				44			
				45		Boring TD @45.0'	

ologist: B. Goldsby

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: MW-12C

SHEET NUMBER 1 OF 1

T:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	MW-12C
START DATE:	4/21/97
FINISH DATE:	4/21/97
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger through 10" PVC casing
SAMPLING METHOD:	CME 5-foot Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
								Boring Advanced with 8 1/4-inch O.D., 4 1/4-inch I.D. HSA
CB1			4.2	61	ML		Clayey SILT; reddish brown; firm; low plasticity; moist	
				62				
				63				
				64			grading with trace sand	
	65.0			65				
CB2			1.5	66	SP		Silty SAND; reddish brown; very fine grained; wet with nodules of cemented sand.	Sand heaves ~ 1.0 foot into auger
				67				
				68				
				69				
	70.0			70				
CB3			2.7	71				
				72				
				73				
				74	CH		CLAY; reddish brown; hard; medium plasticity	
	75.0			75				Bottom of boring @ 75.0 Install MW-12C
				76				
				77				
				78				
				79				
				80				

Geologist: R. Lamb

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval

OVM - Organic Vapor Meter

PP - Pocket Penetrometer

TOC - Top Of Casing

TerraNext

LOG OF BORING No.: MW-12C

SHEET NUMBER 2 OF 2

T:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	MW-12C
START DATE:	FINISH DATE:
START TIME:	FINISH TIME:
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger through 10" PVC casing
SAMPLING METHOD:	CME 5-foot Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
								Boring Advanced with 8 1/4-inch O.D., 4 1/4-inch I.D. HSA
CB1			4.2	61	ML		Clayey SILT; reddish brown; firm; low plasticity; moist	
				62				
				63				
				64			grading with trace sand	
	65.0			65				
CB2			1.5	66	SP		Silty SAND; reddish brown; very fine grained; wet with nodules of cemented sand.	Sand heaves ~ 1.0 foot into auger
				67				
				68				
				69				
	70.0			70				
CB3			2.7	71				
				72				
				73				
				74	CH		CLAY; reddish brown; hard; medium plasticity	
	75.0			75				Bottom of boring @ 75.0
				76				Install MW-12C
				77				
				78				
				79				
				80				

eologist: R. Lamb
necked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: MW-13

SHEET NUMBER 1 OF 2

DRILLING CONTRACTOR: Best Drilling Services

DRILLING METHOD: Hollow Stem Auger

SAMPLING METHOD: Split Spoon

SURFACE ELEVATION:

TOC ELEVATION:

WATER LEVEL: 9.43'

WATER ELEVATION:

DATE: 03/25/97

Location Diagram

CLIENT: Southern Pacific Lines

PROJECT NAME: Houston Wood Preserving Works

PROJECT NUMBER: **44102069.07**

PROJECT LOCATION: 4910 Liberty Road Houston, TX

BORING LOCATION: NW Corner of Site

START DATE: 02/25/97 FINISH DATE: 02/25/97

START TIME: 10:00 FINISH TIME: 12:00

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	0 - 5	---	5.0	1	ML		0 - 4" Fill, asphalt gravel SILT, very slightly moist, odor, 10YR3/1 very dark gray	Sample Submitted For Chemical Analysis
				2				
				3				
				4				
				5	CL		CLAY, silty, very slightly moist, 10YR3/1 very dark gray, firm odor	PP = 2.5
SS	5 - 10	---	5.0	6				
				7				
				8			10YR6/1 Gray with dark green staining; 1/4" - 1/2" calcium nodules	
				9				
				10				
SS	10 - 15	---	5.0	11				
				12				
				13				
				14				
				15				
SS	15 - 20	---	5.0	16	SP		SAND, wet, loose, fine-grained, 10YR7/1 - light gray	Sample Submitted For Chemical Analysis
				17				
				18				
				19				
				20				

Geologist: B. Goldsby

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval

OVM - Organic Vapor Meter

PP - Pocket Penetrometer

TOC - Top Of Casing

TerraNext

LOG OF BORING No.: MW-13

SHEET NUMBER 2 OF 2

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road, Houston, TX
BORING LOCATION:	NW Corner of Site
START DATE:	02/25/97
FINISH DATE:	02/25/97
START TIME:	10:00
FINISH TIME:	12:00
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	9.43'
WATER ELEVATION:	
DATE:	03/25/97

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	20 - 25	---	5.0	21	SP		SAND, wet, loose, fine-grained, 10YR7/1 gray	
				22	CH		CLAY, slightly moist, 10YR7/1 Light gray, mottling with 10YR6/8 brownish yellow, firm	PP = 4.0 Sample Submitted For Chemical Analysis
				23				
				24				
				25			DRY	
				26			Boring TD = 25.0 Feet	
				27				
				28				
				29				
				30				
				31				
				32				
				33				
				34				
				35				
				36				
				37				
				38				
				39				
				40				

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: MW-14

SHEET NUMBER 1 OF 3

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	
START DATE:	02/27/97
FINISH DATE:	02/27/97
START TIME:	13:45
FINISH TIME:	15:30
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	7.71'
WATER ELEVATION:	
DATE:	03/25/97

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	0 - 5	---	3.75	1	FILL		FILL, moist, 10YR4/6 dark yellowish brown grades to 10YR3/1 very dark gray, wood pieces	
				2	SP		1.5 - 1.75' SAND, slightly moist, 10YR6/4 light yellowish brown, fine-grained	
				3	CL		1.75 - 5 CLAY, silty, very slightly moist, 10YR2/2 very dark brown grades to 10YR4/1 dark gray, odor	PP = 2.75
				4				
				5				
ST	5 - 7	---	2.0	6			CLAY	Sample Collected In A Shelby Tube For Geotechnical Analysis
				7				
SS	7 - 10	---	3.0	8	CL		CLAY, silty, moist, 10YR6/2 light yellowish gray, mottling with 10YR6/8 brownsih yellow and 10YR4/1 dark gray, calcareous nodules, Fe nodules, greenish tint, interbedded silt lenses	PP = 2.5
				9				
				10				
SS	10 - 15	---	5.0	11				
				12				
				13				
				14				
				15			ODOR	
ST	15 - 17	---	2.0	16			SAND	Sample Collected In A Shelby Tube For Geotechnical Analysis
				17				
SS	17 - 20	---	3.0	18	SP		SAND, wet, 10YR6/1, gray, odor, sheen, greenish tint	Sampe Retained For Chemical Analysis
				19				
				20			2" Clay seam with creosote staining and globules	

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: MW-14

SHEET NUMBER 2 OF 3

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	**44102069.07**
PROJECT LOCATION:	4910 Liberty Road, Houston, TX
BORING LOCATION:	
START DATE:	02/27/97
FINISH DATE:	02/27/97
START TIME:	13:45
FINISH TIME:	15:30
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	7.71'
WATER ELEVATION:	
DATE:	03/25/97

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	20 - 25	----	5.0	21	SP		SAND, wet, 10YR6/1, gray, slight odor, no staining	
				22				
				23				
				24				
				25				
SS	25 - 30	---	5.0	26	CL		CLAY, silty, slightly moist 10YR7/2, light gray, with 10YR6/8 brownish yellow mottling, firm, hard	PP = 4.0
				27				
				28				
				29			CLAY	Sample Retained For Geotechnical Analysis
				30				
SS	30 - 35	---	5.0	31	CL		CLAY, slightly moist, 10R4/8, red with 10YR7/1; light gray mottling, calcareous seams, 1/2 - 3/4" thick, moist @ 31', 32', 33', and 34'. Very silty 31 - 35'	PP = 2.0
				32				
				33				
				34				
				35				
SS	35 - 40	---	2.5	36	SP		SAND, slightly silty, wet, 2.5 YR5/8, red, fine grained, clay nodules. 2" clay @ bottom, then 2" hard cemented sandstone or claystone, 2.5YR5/8, red, with 10YR7/2, light gray mottling	Sample Retained For Chemical Analysis
				37				
				38				
				39				
				40				

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: MW-14

SHEET NUMBER 3 OF 3

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	**44102069.07**
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	
START DATE:	02/27/97
FINISH DATE:	02/27/97
START TIME:	13:45
FINISH TIME:	15:30
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	7.71'
WATER ELEVATION:	
DATE:	03/25/97

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
ST	40 - 43	---	3.0	41	CH		CLAY, dry, 2.5YR5/8, red, mottling with 10YR7/2, light gray, fractures, black staining (probably manganese oxide) scattered throughout.	
				42				
				43				
ST	43 - 45	---	2.0	44			CLAY	Sample Collected In A Shelby Tube For Geotechnical Analysis
				45				
				46			Boring TD @ 45.0'	
				47				
				48				
				49				
				50				
				51				
				52				
				53				
				54				
				55				
				56				
				57				
				58				
				59				
				60				

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: MW-15

SHEET NUMBER 1 OF 2

DRILLING CONTRACTOR: Best Drilling Services

Location Diagram

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	**44102069.07**
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	East of Entrance Gate North Side of Office
START DATE:	02/25/97
FINISH DATE:	02/25/97
START TIME:	13:30
FINISH TIME:	15:00

DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	8.22'
WATER ELEVATION:	
DATE:	03/25/97

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
							Fill, moist, sandy, 10YR5/3 brown	
SS	0 - 5	---	3.5	1	CL		CLAY, silty, slightly moist,	PP = 1.0
				2			10YR3/1 very dark gray	Sample Submitted For
								Chemical Analysis
				3				
				4				
							CLAY, very slightly moist, 10YR3/1	PP = 1.0
				5			Very dark gray	
								PP = 1.5
SS	5 - 10	---	5.0	6				
				7	CH			
				8			10YR6/1 Gray with 10YR6/8 brownish yellow	
							mottling + 10YR4/1 dark gray Fe nodules;	
				9			8.5 - 9.0 calcareous nodule seam	PP = 3.0
				10				
SS	10 - 15	---	3.5	11				
				12				
				13	CL		Very silty	
				14				
				15				
							SAND, saturated, 10YR7/1 light gray	
SS	15 - 20	---	5.0	16				
				17				
				18	SP			
				19				
				20				

Geologist: B. Goldsby

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval

OVM - Organic Vapor Meter

PP - Pocket Penetrometer

TOC - Top Of Casing

LOG OF BORING No.: MW-15

SHEET NUMBER 2 OF 2

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road, Houston, TX
BORING LOCATION:	East of Entrance Gate, North Side of Office
START DATE:	02/25/97
FINISH DATE:	02/25/97
START TIME:	13:30
FINISH TIME:	15:00
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	8.22'
WATER ELEVATION:	
DATE:	03/25/97

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	20 - 25	---	5.0	21	SP		SAND, saturated, 10YR7/1, light gray	Sample Submitted For Chemical Analysis
				22				
				23				
				24				
				25	CH		CLAY, very slightly moist, 10YR 7/1	PP = 3.0
							Light gray with 10YR6/8	
SS	25 - 27	—	2.0	26			Browish yellow mottling, firm	Sample Submitted For Chemical Analysis
				27				
				28			Boring TD @ 27'	
				29				
				30				
				31				
				32				
				33				
				34				
				35				
				36				
				37				
				38				
				39				
				40				

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

Union Pacific Railroad

Log of Boring: MW-15B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	12/19/2011	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	5
Driller:	Tim Beach	Total Depth (ft):	40
Driller's License:	58141	Northing:	728761.26
Field Supervisor:	Tim Jennings	Easting:	3166959.61
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	47.05

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				PAV.	(0 - 0.2) Asphalt Pavement
					(0.2 - 0.7) Gravel Base Material
			DO	CH	(0.7 - 11.9) SANDY CLAY, CL, dark gray, moist, becomes light gray with orange mottling at 6-feet, ~10-20% fine sand, firm, abundant FeOx
5		0.5			
		0.2	6.0/6.0		
		0.4			
10		0.2			
		0.6		SC	(11.9 - 14.9) CLAYEY SAND, SC, greenish gray, moist, ~30-40% high plasticity clay, fine sand
15		0.3	7.5/10.0	SM	(14.9 - 20.2) SILTY SAND, SM, light gray and light grayish brown, wet, ~10% fines in very fine to fine sand, soft, no odor to slight odor near base
20		0.6		CL/CH	(20.2 - 28.8) SANDY CLAY, CL, light gray with orange and reddish brown mottling, moist, ~10-30% fine sand, decreasing downward in high plasticity clay, becomes medium plasticity clay below 24.5-feet
		0.8	5.0/5.0		
25		1.7			
		0.8	5.0/5.0		
30		0.9		CL	(28.8 - 37.4) SANDY CLAY, CL, reddish brown with gray mottling, moist to locally wet, ~10-20% very fine sand in medium plasticity clay, sand to gravel sized carbonate nodules are common mostly as thin beds (≤ 0.1'), sandy zone (~50% fine sand) 32.6-34", wet with very minor oily staining in sandy zone, slight to moderate odor
		1.6	5.0/5.0		
35		2.4			
		1.8	5.0/5.0	CL	(37.4 - 40) CLAY, CL, reddish brown, moist, medium plasticity clay, hard, thin zone of carbonate nodules at 37.9 feet, slight odor
40					

PBW
Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Top 4 feet drilled out (DO) with a hydrovac to clear for utilities.
8-inch sonic isolation casing advanced to 25' then removed during grouting.

Initial Fluid Level (01/27/12)
Depth to water: 10.13 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 22.0) Portland/Bentonite Grout
(22.0 - 26.0) Bentonite Pellets
(26.0 - 38.0) 20/40 Silica Sand
(38.0 - 40.0) Bentonite Pellets

Well Materials
(0 - 28.0) Casing, 2" FJT Stainless Steel
(28.0 - 38.0) Screen, 2" FJT Stainless Steel, 0.01 slot

TOC Elevation (ft AMSL)
50.2

TerraNext

LOG OF BORING No.: MW-15C

SHEET NUMBER 1 OF 2

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	
START DATE:	FINISH DATE:
START TIME:	FINISH TIME:
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	CME 5-foot Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	C L	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
				50				Boring advanced with 14-inch rotary bit using water as drilling fluid
				51				
				52				
				53	CH		CLAY, reddish brown; hard; medium plasticity	
				54				
				55				
				56				
				57				
				58	ML		SILT, reddish brown; firm; non-plastic; wet with trace clay and sand	Boring advanced with 8 1/4-inch O.D., 4 1/4-inch I.D. HSA
				59				
CB1			4.2	60				
				61				
				62				
				63			2" thick layer at CaCO3 cemented sand @ 63.5'	
				64				
	65.0			65			grades with some sand	
CB2				66	SP		Silty SAND; reddish brown, very fine grained; wet	
				67				
				68			grading very fine to fine grained	
				69				
	70.0			70			~2" thick layer CaCO3 cemented sand @ 70.0'	

Geologist: R. Lamb

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: MW-15C

SHEET NUMBER 2 OF 2

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	
START DATE:	4/25/97
FINISH DATE:	04/25/97
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	CME 5-foot Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram:

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS
CB3			4.2	70			
				71			
				72			
				73			
				74	CL		Silty CLAY; reddish brown; hard
	75.0			75			low plasticity; moist
				76			
				77			
				78			
				79			
				80			
				81			
				82			
				83			
				84			
				85			
				86			
				87			
				88			
				89			

NOTES:

For geolog, to 50 feet, see log of boring MW-15

Bottom of boring @ 75.0'

Install MW-15C on 4/28/97

Geologist: R. Lamb

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval

OVM - Organic Vapor Meter

PP - Pocket Penetrometer

TOC - Top Of Casing

TerraNext

LOG OF BORING No.: MW-16

SHEET NUMBER 1 OF 2

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	**44102069.07**
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	Adjacent to Main Line
START DATE:	02/26/97
FINISH DATE:	02/26/97
START TIME:	13:50
FINISH TIME:	15:30
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	7.41'
WATER ELEVATION:	
DATE:	03/25/97

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS
SS	0 - 5	---	1.5	1	ML		SILT, moist, 10YR3/3, dark brown, gravel
				2			
				3			
				4			
				5			
SS	5 - 10	---	5.0	6	CL		CLAY, silty, moist, 10YR3/3, dark brown, calcareous nodules throughout
				7			
				8			
				9			
				10			
SS	10 - 15	---	5.0	11			
				12			
				13			
				14			
				15			
SS	15 - 20	---	5.0	16	ML		SILT, sandy, wet, 10YR7/1 light gray, green tint,odor
				17			
				18			
				19	SM		SAND, silty, wet, 10YR7/1 light gray, green tint, odor
				20			

NOTES:

Sample Retained For Chemical Analysis

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: MW-16

SHEET NUMBER 2 OF 2

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	**44102069.07**
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	Adjacent to Main Line
START DATE:	02/26/97
FINISH DATE:	02/26/97
START TIME:	13:50
FINISH TIME:	15:30
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	7.41'
WATER ELEVATION:	
DATE:	03/25/97

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
				21	SM		SAND, silty, wet, 10YR7/1, light gray, odor	Sample Retained For Chemical Analysis
				22				
				23				
				24				
				25	CL		CLAY, silty, slightly moist,	
				26			10YR4/8 red with 10YR7/1 light gray mottling, firm, odor	Sample Retained For Chemical Analysis
				27				
				28				
				29				
				30				
				31			Boring TD = 30.0'	
				32				
				33				
				34				
				35				
				36				
				37				
				38				
				39				
				40				

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: MW-17

SHEET NUMBER 1 OF 2

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	**44102069.07**
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	East of Entrance Gate
START DATE:	02/25/97
FINISH DATE:	02/25/97
START TIME:	15:30
FINISH TIME:	17:45
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	9.97'
WATER ELEVATION:	
DATE:	03/25/97

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	0 - 5	----	1.5	1	CL		Fill, moist, gravel, CLAY, silty, slightly moist, 10YR3/1 very dark gray	
				2				
				3				
				4				
				5	CH		CLAY; very slightly moist	
SS	5 - 10	---	5.0	6	CL		CLAY; silty; 10YR6/1; gray, very slightly moist; mottling with 10YR6/8 brownish yellow and 10YR3/1 very dark gray; scattered Fe nodules, scattered calcareous nodules (1/4" - 3/4")	PP = 3.0
				7				
				8				
				9				
				10				
SS	10 - 15	----	3.5	11			Silt content increases	PP = 3.0
				12				
				13				
				14	SM		SAND, moist, very silty, 10YR6/1 gray, greenish tint, odor	
				15				
SS	15 - 20	---	5.0	16			Saturated, slightly silty	
				17				
				18				
				19				
				20				

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: MW-17

SHEET NUMBER 2 OF 2

Location Diagram

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	**44102069.07**
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	East of Entrance Gate
START DATE:	02/25/97
FINISH DATE:	02/25/97
START TIME:	15:30
FINISH TIME:	17:45
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	9.97'
WATER ELEVATION:	
DATE:	03/25/97

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	20 - 25	1.5	2.5	21			SAND, saturated, 10YR6/1 gray, odor, brown staining	
				22				
				23				
				24				
				25				
SS	25 - 30	---	2.5	26	SP		10YR7/3 very pale brown	Sample Submitted For Chemical Analysis
				27				
				28				
				29				
				30				
SS	30 - 35	---	5.0	31			CLAY, moist, 10YR4/8 red with 5YR7/1 light gray mottling, Highly fractured, odor, contaminant staining	Sample Submitted For Chemical Analysis
				32				
				33	CH			
				34				
				35				
				36			Boring TD @ 35 Feet	
				37				
				38				
				39				
				40				

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

ERM.

MW-17C
DRILLING LOG

J.O. NO.	422-102	Boring/Well ID	MW-17C	Date Drilled	12/10/2003
Project	Houston Wood Preserving Works	Owner	Union Pacific Railroad Company		
Location	Houston, Texas	Boring T.D.	72'	Boring Diam.	7.88"
N. Coord.	728778.5050'	E. Coord.	3167446.4830'	Surface Elevation	47.56' Ft. MSL Datum
Screen: Type	Stainless Steel	Diam.	2"	Length	10' Slot Size 0.0"
Casing: Type	Stainless Steel	Diam.	2"	Length	59.5' Sump Length 2.5'
Top of Casing Elevation	50.17'			Stickup	3'
Depth to Water:	1. Ft. 24.45	(12/29/03)	2. Ft. 0	(_____)	
Drilling Company	Fugro Geosciences, Inc.	Driller	Steve Bender		
Drilling Method	Hollow stem auger	Log By	Marcel St. Marie		

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
47.56	0					0-3	0-0.4	FILL: Asphalt, cobbles, and some sand.
							0.4-3	SILTY SAND: Black (5YR 2.5/1), very fine-grained, subrounded, sorted, trace rootlets, trace gravels, strong odor, moist, 100 % recovery.
					9.2	3-5	3-5	SILTY CLAY: Gray (5YR 5/1), mottled, plastic, stiff (pp= 2.0 tsf), poorly developed cleavage, trace fractures, some iron staining, trace gravel, trace sand, trace rootlets, odor, moist, 50 % recovery.
45	5				8.7	5-7	5-7	NO RECOVERY
					NM	7-9	7-8	SILTY CLAY: Gray (5YR 5/1), light brown mottling, plastic, very stiff (pp= 3.25 tsf), poorly developed cleavage, trace fractures, some iron staining, trace gravel, trace sand, trace rootlets, odor, moist, 100 % recovery.
					3.3		8-10.3	SANDY CLAY: Gray (5YR 5/1), plastic, soft (pp= 0.5 tsf) at 8', very soft (pp = 0.25 tsf) at 10', gravels up to >10 mm in diameter, odor, moist, 100 % recovery.
					3.6	9-11		
40	10				2.6		10.3-13.7	SILTY CLAY: Light brownish gray (2.5YR 6/2) from 10.3'-11', light olive brown (2.5YR 5/3) from 11'-15', very stiff (pp= 3.5 tsf) at 11', very soft (pp= 0.0 tsf) at 13', some gravel (up to 5mm in diameter) from 13'-13.7', some wood fragments from 13'-13.7', trace sand increasing with depth, moist, 100% recovery.
					2.2	11-13		
					NM	13-15		
					1.9		13.7-21	SILTY SAND: Greenish gray (GLEY 6/10GY) from 13.7'-19', yellowish brown (10YR 5/4) from 19'-21', fine-grained, sorted, subangular, trace of clay, some medium sand (up to 2 mm in diameter), moist from 13.7'-15', saturated from 15'-21', 25% recovery.
	15							

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ERM.

MW-17C DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-17C Date Drilled 12/10/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 72 ' Boring Diam. 7.88 "

N. Coord. 728778.5050 ' E. Coord. 3167446.4830 'Surface Elevation 47.56 ' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.0 "

Casing: Type Stainless Steel Diam. 2 " Length 59.5 ' Sump Length 2.5 '

Top of Casing Elevation 50.17 ' Stickup 3 '

Depth to Water: 1. Ft. 24.45 (12/29/03) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Hollow stem auger Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
35	15				1.5	15-17		
					1.9	17-19		
					1.9	19-21		
30	20				4.7	21-23	21-25	NO RECOVERY
						23-25		
25	25				NM	25-27	25-28	SILTY CLAY: Gray (10YR 6/1), plastic, stiff (pp=1.75 tsf) at 25.5', hard (pp= >4.5 tsf) at 26.8', slightly fractured, black staining from 25'-25.8', some pink discoloration, strong odor, moist, 67 % recovery.
					282			
					52.2	27-28		
					NM	28-30	28-44	CLAY: Gray (5Y 6/1) from 28'-34', red (10R 4/6) from 34'-40', red (10R 4/4) from 40'-42', mottled, plastic, hard (pp= 4.5 tsf) at 29', 33', 35', 37', 41', and 43', hard (pp= 4.25 tsf) at 39', fractured, product in some fractures, some iron staining, some black staining, trace silt lenses, trace rootlets, slicken sides, some sand seams at 36.2' and 37.5', trace white nodules (up to 5mm in diameter) from 38'-40', odor, moist, 72 % recovery.
	30							

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ERM.

MW-17C DRILLING LOG

J.O. NO. 422-102 Boring/Well ID MW-17C Date Drilled 12/10/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 72' Boring Diam. 7.88"

N. Coord. 728778.5050' E. Coord. 3167446.4830' Surface Elevation 47.56' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2" Length 10' Slot Size 0.0"

Casing: Type Stainless Steel Diam. 2" Length 59.5' Sump Length 2.5'

Top of Casing Elevation 50.17' Stickup 3'

Depth to Water: 1. Ft. 24.45 (12/29/03) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Hollow stem auger Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
20	30				33.5	30-32		
					65.9	32-34		
					113.4	34-36		
15	35				26.4	36-38		
					96.8	38-40		
10	40				59.9	40-42		
					8.9	42-44		
	45				18.1	44-46	44-45.3	SANDY CLAY: Light gray (5Y 7/1), light brown mottling, plastic, hard (pp= 4.0 tsf), fractured, trace silt lenses, some black staining, odor, moist, 100% recovery.

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H:\DWG\E04\Log\422-102-MW-17C.dwg 06-07-04 13:54:26

ERM.

MW-17C DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-17C Date Drilled 12/10/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 72' Boring Diam. 7.88"

N. Coord. 728778.5050' E. Coord. 3167446.4830' Surface Elevation 47.56' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2" Length 10' Slot Size 0.0"

Casing: Type Stainless Steel Diam. 2" Length 59.5' Sump Length 2.5'

Top of Casing Elevation 50.17' Stickup 3'

Depth to Water: 1. Ft. 24.45 (12/29/03) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Hollow stem auger Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
5	45				23.3	46-48	45.3-45.7 45.7-48	SILTY CLAY: Dusky red (10R 3/4), plastic, very soft (pp= 0.25 tsf), odd moist, 100% recovery. SANDY CLAY: Light gray (5Y 7/1), mottled, plastic, hard (pp= >4.5 tsf), fractured, trace silt lenses, some black staining, odor, moist, 100 % recovery.
					13.8	48-50	48-48.2 48.2-61	SAND: Light gray (5Y 7/1), cemented, fine-grained, sorted, subangular, moist, 100% recovery. SANDY CLAY: Light gray (5Y 7/1) from 48.2'-60', red (10R 5/6) from 60'-61'. mottled, plastic, hard (pp= >4.0 tsf) at 49', 51', 53', 55', 57', 59', and 61', fractured, trace silt lenses, some black staining, trace silt lenses at 54', trace black nodules from 58'-60', odor, moist, 100 % recovery.
0	50				16.4	50-52		
					9.6	52-54		
					4.0	54-56		
-5	55				4.0	56-58		
					0.0	58-60		
	60							

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ERM.

MW-17C
DRILLING LOG

J.O. NO. 422-102 Boring/Well ID MW-17C Date Drilled 12/10/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 72' Boring Diam. 7.88"

N. Coord. 728778.5050' E. Coord. 3167446.4830' Surface Elevation 47.56' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2" Length 10' Slot Size 0.0"

Casing: Type Stainless Steel Diam. 2" Length 59.5' Sump Length 2.5'

Top of Casing Elevation 50.17' Stickup 3'

Depth to Water: 1. Ft. 24.45 (12/29/03) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Hollow stem auger Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-10	60				7.2	60-62		
							61-64	SILTY CLAY: Red (10R 5/6), plastic, stiff (pp= 2.0 tsf) at 62', very soft (pp= 0.25 tsf) at 63', silt increasing with depth, trace sand, moist, 75 % recovery.
					2.9	62-64		
					1.9	64-66	64-66.3	CLAYEY SILT: Red (10R 5/6), firm (pp= 1.0 tsf), sheen observed throughout interval, trace sand, odor, moist, 100 % recovery.
-15	65				30.3	66-68	66.3-69.7	SANDY SILT: Red (10R 5/6) from 66.3'-68', yellowish red (5YR 5/6) from 68'-69.7', soft (pp= 0.5 tsf) from 68'-69.7', some clay increasing with depth, saturated from 66.3-68', wet from 68'-69.7', 38 % recovery.
					14.9	68-70		
-20	70				3.0	70-72	69.7-70	SANDY SILTY CLAY: Red (10R 5/6), plastic, stiff (pp=1.25 tsf), some black staining, wet, 50% recovery.
							70-72	CLAY: Red (10R 5/6), plastic, hard (pp=>4.5 tsf), some fractures, some black staining in fractures, some silt lenses, moist, 100 % recovery.
					1.2			T.D. = 72'
	75							

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TerraNext

LOG OF BORING No.: MW-18

SHEET NUMBER 1 OF 2

Location Diagram

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	**44102069.07**
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	East End
START DATE:	02/26/97
FINISH DATE:	02/26/97
START TIME:	10:10
FINISH TIME:	12:30
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	15.41'
WATER ELEVATION:	
DATE:	03/25/97

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	0 - 5	---	5.0	1	FILL		Fill, slightly moist, 10YR3/1, very dark gray to 10YR2/1, black, gravel, brick, roots	Sample Retained For Chemical Analysis
				2				
				3	CL		CLAY, silty, very slightly moist, very dark gray 10YR3/1	
				4				
				5				
SS	5 - 10	---	5.0	6			Silt decreases, 10YR6/1 gray, odor	PP = 3.0
				7				
				8			50% calcareous nodules	
				9			Calcareous nodules decrease, mottling with 10YR6/8 brownish yellow and 10YR4/1 dark gray	PP = 2.5
				10				
SS	10 - 15	---	5.0	11			Scattered calcareous and FE nodules	PP = 2.5
				12				
				13				
				14				
				15			Very silty	PP = 1.0
SS	15 - 20	---	5.0	16	ML		SILT, clayey, moist, 10YR6/1, gray, mottling with 10YR4/1, dark gray, and 2.5R4/8, red, scattered calcareous and Fe nodules, green staining, no odor.	
				17				
				18				
				19				
				20	SM		SAND, silty, moist, 10YR6/1 gray, green tint, odor	

Geologist: B. Goldsby

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval

OVM - Organic Vapor Meter

PP - Pocket Penetrometer

TOC - Top Of Casing

TerraNext

LOG OF BORING No.: MW-18

SHEET NUMBER 2 OF 2

Location Diagram

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Preserving Works
PROJECT NUMBER:	**44102069.07**
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	East End
START DATE:	02/26/97
FINISH DATE:	02/26/97
START TIME:	10:10
FINISH TIME:	12:30
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	Split Spoon
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	15.41'
WATER ELEVATION:	
DATE:	03/25/97

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	CI	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
SS	20 - 25	---	5.0	21	SP		SAND, saturated, 10YR6/2, light brownish gray, greenish staining, odor, calcareous material at bottom.	Sample Retained For Chemical Analysis
				22				
				23				
				24				
				25				
SS	25 - 30	---	3.75	26				
				27				
				28				
				29				
				30				
SS	30 - 35	---	5.0	31	CH		CLAY, slightly moist, 2.5R4/8, red, with mottling 10YR7/1, light gray, firm, hard, fractures, odor.	PP = 3.0
				32				Sample Retained For Chemical Analysis
				33			Very slightly moist, 5YR6/6 reddish yellow with light gray 10YR7/1 mottling, hard, firm, no fractures, no odor, silt content increases, calcareous nodules.	PP = 4.0
				34				
				35				
				36			Boring TD = 35'	
				37				
				38				
				39				
				40				

Geologist: B. Goldsby
Checked By:

LEGEND:
SS - Split Spoon

CI - Completion Interval
OVM - Organic Vapor Meter
PP - Pocket Penetrometer
TOC - Top Of Casing

TerraNext

LOG OF BORING No.: MW-18C

SHEET NUMBER 1 OF 2

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	East corner of site
START DATE:	04/24/97
FINISH DATE:	04/25/97
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	CME 5-foot Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram:

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	C	SOIL DESCRIPTION AND DRILLING CONDITIONS
				51			
				52			
				53			
				54			
CB1			4.7'	55	CH		CLAY; reddish brown; hard; medium plasticity; moist
				56			
				57			
				58			
				59			
	60.0			60			
CB 2			3.7	61			
				62			
				63			
				64	ML		SILT; reddish brown; firm; non-plastic; dilatent; moist
	65.0			65	CL		Silty CLAY; reddish brown; very stiff; low plasticity; moist with CaCO3 nodules, pea size
CB 3			3.4	66	SP		Silty SAND; reddish brown; mild creosote odor very fine grained; wet

NOTES:

Boring Advanced with 8 1/4-inch O.D., 4 1/4-inch I.D. HSA

See log of MW-18 for geology from 0 to 50 feet.

TerraNext

LOG OF BORING No.: MW-18C

SHEET NUMBER 2 OF 2

CLIENT:	Southern Pacific Lines
PROJECT NAME:	Houston Wood Perserving Works
PROJECT NUMBER:	44102069.07
PROJECT LOCATION:	4910 Liberty Road Houston, TX
BORING LOCATION:	East corner of site
START DATE:	04/23/97
FINISH DATE:	04/24/97
START TIME:	
FINISH TIME:	
DRILLING CONTRACTOR:	Best Drilling Services
DRILLING METHOD:	Hollow Stem Auger
SAMPLING METHOD:	CME 5-foot Sampler
SURFACE ELEVATION:	
TOC ELEVATION:	
WATER LEVEL:	
WATER ELEVATION:	
DATE:	

Location Diagram

SAMPLER TYPE	SAMPLE DEPTH	OVM (PPM)	RECOVERY (FT)	DEPTH IN FEET	SOIL GRAPH	C l	SOIL DESCRIPTION AND DRILLING CONDITIONS	NOTES:
CB 4			3.2	71			grading fine to very fine grained	
				72			3" thick clay lens @ 71.5'	
				73			grading fine to medium grained; creosote odor	
				74			grading with trace gravel and oil sheen and creosote odor	
	75.0			75			grading fine to very fine grained; oil sheen grades out	
CB 5			4.1	76	CH		CLAY; reddish brown; hard; medium plasticity	
				77				
				78				
				79			grading reddish brown; and light gray	
	80.0			80			grading light gray	Bottom of boring @ 80.0'
				81				Install monitoring well 18C on 4/24/97
				82				
				83				
				84				
				85				
				86				
				87				
				88				
				89				
				90				

Geologist: R. Lamb

Checked By:

LEGEND:

SS - Split Spoon

CI - Completion Interval

OVM - Organic Vapor Meter

PP - Pocket Penetrometer

TOC - Top Of Casing

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MW-19C DRILLING LOG

W.O. NO. 422-09 Boring/Well ID MW-19C Date Drilled 10/15/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 75.2' Boring Diam. 10"

N. Coord. 728619.81' E. Coord. 3167726.90' Surface Elevation 50.08' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.010"

Casing: Type Schedule 40 PVC Diam. 2" Length 63' Sump Length 0.5'

Top of Casing Elevation 53.05' Stickup 3.05'

Depth to Water: 1. Ft. 29.34 (11/10/98) 2. Ft. ( )

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method HSA/Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
50.08	0					0-2.5	0-2.5	SILTY SAND: Light yellowish brown 10YR6/4; very dense; fine grained; dry; angular to subangular; abundant gravel, poorly sorted. At 0-1' collect surface soil sample MW19C-00
							2.5-3.7	SANDY CLAY: Dark grayish brown 2.5Y4/2; loose; low plasticity; moist; abundant gravel; slight odor.
					35		3.7-5	CLAYEY SILT: Black, soft to loose; non-plastic; moist; with some very fine grained sand; somewhat shiny coating; no fluoresence; slight odor.
45	5					5-10	5-8.6	SILTY CLAY: Very dark gray 2.5Y3/1; soft to firm; plastic; moist; large blocky ped structure.
							8.6-11.4	SILTY CLAY: Gray 2.5Y5/1; hard; plastic; moist; many small caliche nodules; no staining; very slight odor.
40	10					10-15		
							11.4-15.7	SILTY CLAY: Gray 2.5Y5/1 mottled with olive yellow 2.5Y6/8; soft to firm; very plastic; moist; trace small caliche nodules; no staining; very slight odor.
					3			
35	15					15-20		
							15.7-18	SILTY SANDY CLAY: Greenish gray 5GY6/1 mottled with gray 2.5Y5/1; soft; plastic; moist; no staining; no odor.
							18-20	SANDY CLAY: Gray 2.5Y5/1; soft; plastic; moist; no staining; no odor.
30	20					20-25	20-31	CLAYEY SAND: Gray 2.5Y6/1; loose; fine grained; subrounded; well sorted; wet; no staining; no odor.
	25							

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MW-19C DRILLING LOG

W.O. NO. 422-09 Boring/Well ID MW-19C Date Drilled 10/15/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 75.2' Boring Diam. 10"

N. Coord. 728619.81' E. Coord. 3167726.90' Surface Elevation 50.08' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.010"

Casing: Type Schedule 40 PVC Diam. 2" Length 63' Sump Length 0.5'

Top of Casing Elevation 53.05' Stickup 3.05'

Depth to Water: 1. Ft. 29.34 (11/10/98) 2. Ft. ( )

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method HSA/Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
25	25					25-30		At 25.0' grades to olive gray 5Y5/2; strong odor
								At 28.0' NAPL present throughout saturated matrix
20	30					30-35		
					14		31-34.5	SILTY CLAY: Gray 2.5Y6/1 mottled with yellowish brown 10YR5/8; very hard; plastic; moist; trace to some microfractures; fluorescence in and around microfractures; strong odor.
15	35					35-40	34.5-35	SILTY CLAY: Varigated (brown, white, pink, olive, gray); many caliche nodules; very hard; moist; some microfractures; strong odor.
					36		35-40	SILTY CLAY: Yellowish red 5Y4/6; hard to very hard; plastic; moist; small, angular, blocky ped structure; no staining; no fluorescence; strong odor.
								At 38-40' collect soil sample MW19C-38 & SPLP
								At 38.4' lens of small caliche nodules
								At 38.8' lens of small caliche nodules
10	40					40-45	40-50	At 39.5' lens of small caliche nodules
								CLAY: Red 2.5YR4/6 mottled with greenish gray 10GY6/1; very hard; plastic; moist; some microfractures; strong odor.
								At 41.0' to 42.0 NAPL present; slight light-brown staining inside microfractures; slight fluorescence.
								At 43.0' no NAPL or staining; strong odor.
5	45					45-50		At 45.0' some macrofractures(horizontal).
	50							

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MW-19C DRILLING LOG

W.O. NO. 422-09 Boring/Well ID MW-19C Date Drilled 10/15/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 75.2' Boring Diam. 10"

N. Coord. 728619.81' E. Coord. 3167726.90' Surface Elevation 50.08' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.010"

Casing: Type Schedule 40 PVC Diam. 2" Length 63' Sump Length 0.5'

Top of Casing Elevation 53.05' Stickup 3.05'

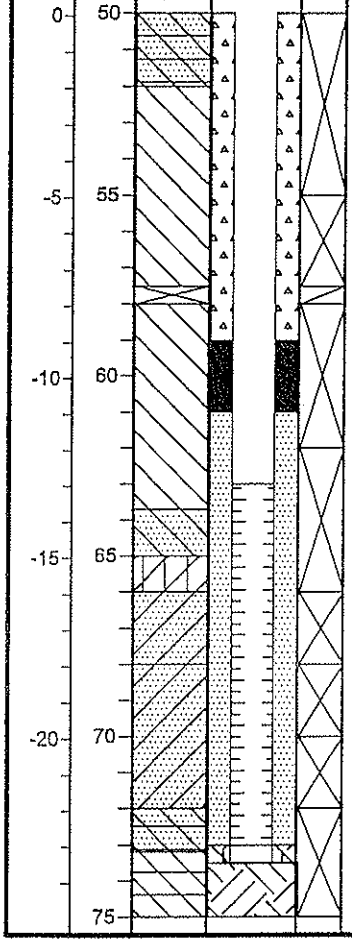
Depth to Water: 1. Ft. 29.34 (11/10/98) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method HSA/Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES



Elevation (Feet)	Depth (Feet)	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	50		50-55	50-52	SANDY SILTY CLAY: Yellowish red 5YR4/6; soft to firm; low plasticity; moist to wet; no staining; slight odor.
		7		52-57.5	CLAY: Red 2.5YR5/6, very hard; plastic; moist; no staining; very slight odor.
-5	55	4	55-57.5		At 55-57' collect soil sample MW19C-55 & SPLP
			57.5-58	57.5-58	At 57.5' bottom of 8-inch diameter steel surface casing
			58-62	58-63.7	OTHER: Not sampled CLAY: Red 2.5YR4/6; very hard; plastic; moist; no staining; no odor.
-10	60	0.7			At 60-62' collect soil sample MW19C-60 & SPLP
			62-66		
				63.7-65	SANDY CLAY: Yellowish red 5YR4/6; soft; plastic; wet; no staining; no odor. Sand is very fine grained, well sorted, subrounded.
-15	65			65-66	CLAYEY SILT: Yellowish red 5YR4/6; soft; plastic; moist to wet; no staining; no fluorescence; no odor.
			66-68	66-68	CLAYEY SAND: Yellowish red 5YR4/6; loose; very fine grained; subrounded; well sorted; wet; no staining; no odor.
			68-70	68-72	NO RECOVERY: Probable clayey sand zone. Clayey sand sheen recovered inside core-barrel. Driller reported very easy to drill through this interval.
-20	70		70-72		
			72-75.2	72-73.2	SANDY SILTY CLAY: Yellowish red 5YR4/6; soft to firm; plastic; moist to wet; very fine grained; no staining; no odor.
		0.7		73.2-75.2	At 73.0' to 75.0' collect soil sample MW19C-73 & SPLP SILTY CLAY: Yellowish red 5YR4/6; trace reddish yellow 7.5YR6/8 mottling; very hard; plastic; moist; no staining; no fluorescence; no odor.
	75				

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MW-19C DRILLING LOG

W.O. NO. 422-09 Boring/Well ID MW-19C Date Drilled 10/15/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 75.2 ' Boring Diam. 10 "

N. Coord. 728619.81 ' E. Coord. 3167726.90 ' Surface Elevation 50.08 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.010 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 63 ' Sump Length 0.5 '

Top of Casing Elevation 53.05 ' Stickup 3.05 '

Depth to Water: 1. Ft. 29.34 (11/10/98) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method HSA/Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-25	75							T.D. = 75.2 '
-30	80							
-35	85							
-40	90							
-45	95							
	100							

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MW-20A DRILLING LOG

W.O. NO. 422-09 Boring/Well ID MW-20A Date Drilled 09/28/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 30 ' Boring Diam. 8.25 "

N. Coord. 728600.42 ' E. Coord. 31670990.58 ' Surface Elevation 47.47 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.010 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 15 ' Sump Length 0.5 '

Top of Casing Elevation 50.43 ' Stickup 2.96 '

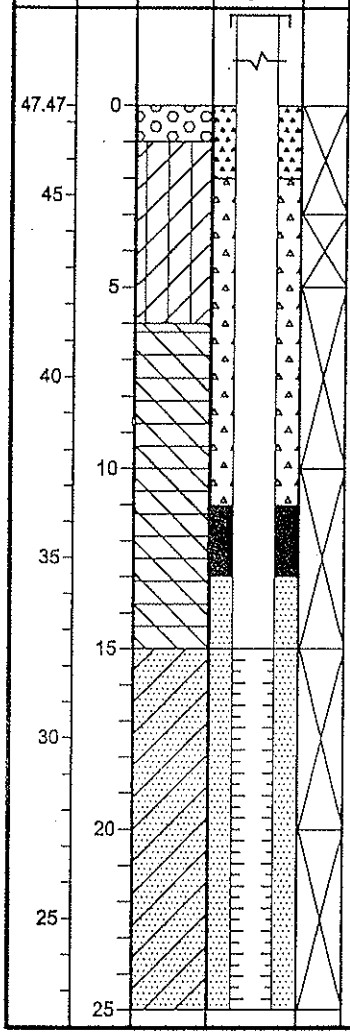
Depth to Water: 1. Ft. 8.54 (11/16/98) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES



Elevation (Feet)	Depth (Feet)	Sample Interval (Feet)	Description Interval (Feet)	OVM READING (PPM)	Description/Soil Classification (Color, Texture, Structure)
47.47	0	0-3	0-1		SANDY GRAVEL: Pink to white to gray; loose; dry; angular to subangular gravel; fine to medium grained sand (Fill).
			1-6		CLAYEY SILT: Dark gray 2.5Y4/1; firm; non-plastic; moist; some gravel; no odor.
45		3-5			At 3.0' grades to very dark gray 2.5Y3/1, hard
	5	5-10			
			6-15		SILTY CLAY: Dark gray 2.5Y4/1 mottled with light olive brown 2.5Y5/6; firm to very stiff; PP = 1.25-2.5; plastic; moist; no odor.
40					At 6.0-6.5' trace caliche, subrounded, 0.1 to 1" diameter
					At 8.0-9' trace caliche, subrounded, 0.1 to 1" diameter
	10	10-15			At 10.0' grades to light olive gray 5Y6/2 mottled with olive 5Y5/6 and dark gray 5Y4/1; with trace very fine grained sand
35					At 11.3' trace caliche nodules, subrounded, 0.5" diameter
				0.5	
	15	15-20	15-25		CLAYEY SAND: Greenish gray; 10GY5/1; loose; wet; very fine to fine grained; well sorted; no fluorescence; slight odor.
30					
				10	
	20	20-25			
25					
				18	At 24-26' collect soil samples MW20A-24 and MW20A-24D
	25				

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MW-20A DRILLING LOG

W.O. NO. 422-09 Boring/Well ID MW-20A Date Drilled 09/28/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 30 ' Boring Diam. 8.25 "

N. Coord. 728600.42 ' E. Coord. 31670990.58 ' Surface Elevation 47.47 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.010 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 15 ' Sump Length 0.5 '

Top of Casing Elevation 50.43 ' Stickup 2.96 '

Depth to Water: 1. Ft. 8.54 (11/16/98) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
20	25				3	25-30	25-30	SILTY CLAY: Greenish gray 10GY5/1 mottled with yellowish red 5YR4/6; very stiff PP = 0.5-2.75; plastic; moist; with very fine grained sand; no odor. At 28-30' collect soil sample MW20A-28 T.D. = 30 '
15	30							
10	35							
5	40							
0	45							
	50							

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MW-21C DRILLING LOG

W.O. NO. 422-09 Boring/Well ID MW-21C Date Drilled 10/26/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 76 ' Boring Diam. 16 "

N. Coord. 727730.42 ' E. Coord. 3165884.50 ' Surface Elevation 46.62 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.010 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 62.5 ' Sump Length 0.5 '

Top of Casing Elevation 49.05 ' Stickup 2.43 '

Depth to Water: 1. Ft. 28.38 (11/11/98) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method HSA/Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
46.62	0					0-4	0-0.4	SANDY SILTY CLAY: Very dark grayish brown 10YR3/2; soft; plastic; moist; many roots; some small gravel, subrounded.
							0.4-0.8	At 0-1' collect surface soil sample MW21C-00 & SPLP
45							0.8-1.5	SILTY SAND: with some small gravel; very coarse; sub angular; wet; loose (FILL).
					16		1.5-5	OTHER: Wood-like fibers: Black, shiny; mulch-like odor.
						4-5		SILTY CLAY: Greenish gray 5G6/1 mottled with light olive brown 2.5Y5/6; firm to hard; plastic; moist; no staining; slight to no odor.
	5					5-10	5-12.5	SILTY CLAY: Greenish gray 10GY6/1 mottled with light olive brown 2.5Y5/6; firm; plastic; moist; with some sand; many caliche nodules; with some lenses of silty clay, greenish gray 5GY5/1, soft, plastic, moist; no staining; no odor.
40								At 8-10' collect soil sample MW21C-08 & SPLP
					44			
	10					10-14		
35							12.5-14.5	SANDY CLAY: Light greenish gray 10Y7/1; firm; low plasticity; moist; no staining; no odor.
						14-18	14.5-18.5	CLAYEY SAND: Light greenish gray 10Y7/1; loose; fine grained; subrounded; well sorted; wet; no staining; no odor.
	15							
30					23			
						18-22	18.5-22	SILTY CLAY: Greenish gray 10GY6/1 mottled with strong brown 7.5YR4/6; firm; plastic; moist; no staining; no fluorescence; no odor.
	20				1.2			At 20-22' collect soil sample MW21C-20
								At 20.0' strong brown grades to yellowish brown 10YR5/8
25						22-24	22-24	At 22.0' bottom of 12-Inch diamter steel casing. Continue with mud rotary drilling
								Not sampled.
						24-28	24-31	SILTY CLAY: Yellowish red 5YR4/6 mottled with light gray 5Y7/1; firm; plastic; moist; no staining; no odor.
	25							

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MW-21C DRILLING LOG

W.O. NO. 422-09 Boring/Well ID MW-21C Date Drilled 10/26/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 76 ' Boring Diam. 16 "

N. Coord. 727730.42 ' E. Coord. 3165884.50 ' Surface Elevation 46.62 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.010 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 62.5 ' Sump Length 0.5 '

Top of Casing Elevation 49.05 ' Stickup 2.43 '

Depth to Water: 1. Ft. 28.38 (11/11/98) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method HSA/Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	25							
20						28-32		
	30							
15							31-32	SANDY CLAY: Light gray 5Y7/2 mottled with red 2.5YR4/6; hard; low plasticity; moist; no staining; no odor.
						32-34	32-36	CLAYEY SAND: Strong brown 7.5YR5/6; very fine grained; well sorted; subrounded; wet; no staining; no odor.
	35					34-36		
10						36-38	36-37.5	SILTY SANDY CLAY: Strong brown 7.5YR5/8; soft; plastic; wet; no staining; no fluorescence; very slight odor.
						38-42	37.5-38	CLAYEY SAND: Strong brown 7.5YR4/6; loose; very fine grained; well sorted; subrounded; no staining; no fluorescence; very slight odor.
	40						38-42	SILTY CLAY: Reddish brown 2.5YR4/4; very hard; very plastic; moist; no staining; no odor.
5						42-46	42-46	CLAY: Red 2.5YR4/6; very hard; very plastic; moist; no staining; no odor.
								At 44-46' Collect soil sample MW21C-44 and MW21C-44D
	45							
0						46-48	46-48	At 46' Bottom of 8-inch diameter steel casing NOT SAMPLED:
						48-52	48-56	CLAY: Red 2.5YR4/6; very hard; very plastic; moist; trace microfractures; no staining; no odor.
	50							

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MW-21C DRILLING LOG

W.O. NO. 422-09 Boring/Well ID MW-21C Date Drilled 10/26/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 76' Boring Diam. 16"

N. Coord. 727730.42' E. Coord. 3165884.50' Surface Elevation 46.62' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.010"

Casing: Type Schedule 40 PVC Diam. 2" Length 62.5' Sump Length 0.5'

Top of Casing Elevation 49.05' Stickup 2.43'

Depth to Water: 1. Ft. 28.38 (11/11/98) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method HSA/Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	50							
-5						52-56		
	55							
-10						56-60	56-58	CLAY: Yellowish red 5YR4/6; hard; very plastic; moist; some PVC pieces; no staining; no odor.
					0		58-60	SILTY CLAY: Yellowish red 5YR4/6; hard; plastic; moist; no staining; no odor.
	60					60-64	60-62.5	SANDY CLAY: Yellowish red 5YR4/6; soft to firm; low plasticity; wet; no staining; no odor.
-15					0		62.5-64	SILTY CLAY: Yellowish red 5YR4/6; firm to hard; plastic; moist; trace microfractures; no staining; no odor.
						64-66	64-66	NO RECOVERY: Driller reports that interval drilled like sand.
	65							
-20						66-68	66-68	CLAYEY SAND: Strong brown 7.5YR4/6; loose; fine grained; subangular; well sorted; wet; no staining; no odor.
						68-72	68-72	NO RECOVERY: Driller reports that interval drilled like sand.
	70							
-25					0	72-76	72-76	CLAY: Brown 7.5YR4/3; hard; plastic; moist; iron coloration in macrofracture; no odor. At 72-74' collect MW21C-72 and MW21C-72D
	75							

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MW-21C DRILLING LOG

W.O. NO. 422-09 Boring/Well ID MW-21C Date Drilled 10/26/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 76 ' Boring Diam. 16 "

N. Coord. 727730.42 ' E. Coord. 3165884.50 ' Surface Elevation 46.62 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.010 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 62.5 ' Sump Length 0.5 '

Top of Casing Elevation 49.05 ' Stickup 2.43 '

Depth to Water: 1. Ft. 28.38 (11/11/98) 2. Ft. ( )

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method HSA/Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-30	75							T.D. = 76 '
-35	80							
-40	85							
-45	90							
-50	95							
	100							

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MW-22A DRILLING LOG

W.O. NO. 422-09 Boring/Well ID MW-22A Date Drilled 10/01/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 25 ' Boring Diam. 8.25 "

N. Coord. 727875.63 ' E. Coord. 3165677.21 ' Surface Elevation 45.88 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.010 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 10 ' Sump Length 0.5 '

Top of Casing Elevation 46.07 ' Stickup 0 '

Depth to Water: 1. Ft. 4.12 (11/10/98) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
45.88	0					0-3	0-1	SILTY SAND: Dark grayish brown 10YR4/2; loose; moist; with gravel, 0.2-0.5" diameter, subangular; some small roots; some angular shell fragments; 1 bottle cap.
45							1-3	At 0-1' Collect surface soil sample MW22A-00 & SPLP
						3-5	3-13.8	SILTY SANDY CLAY: Dark grayish brown 2.5Y4/2; stiff; plastic; moist; trace small roots; no odor.
	5					5-10		SILTY CLAY: Gray 2.5Y5/1 mottled with olive yellow 2.5Y6/8; stiff; plastic; moist; trace small roots; no odor.
40								At 5.8-6.3' some medium caliche-like gravel (0.5-1" diam.)
								At 8.0-9.3' some small to large caliche nodules (<1.5")
	10					10-15		
35							13.8-15	SANDY CLAY: Light gray 5Y7/2 mottled with olive yellow 5Y6/6; stiff; plastic; moist; no odor.
	15					15-20	15-18	CLAYEY SAND: Light gray 5Y7/2; very fine to fine grained; well sorted; rounded; wet; no odor.
30							18-20	SILTY CLAY: Light gray 5Y7/2 mottled with yellowish red 5YR4/6; hard; plastic; moist; with some very fine grained sand; no odor.
								At 19.1-19.2' fine grained sand lens, light gray 5Y7/2.
	20					20-25	20-25	SILTY CLAY: Light gray 2.5Y7/2 mottled with olive yellow 2.5Y6/8; very stiff; plastic; moist; no odor.
25								
	25							T.D. = 25 '

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MW-22B DRILLING LOG

W.O. NO. 422-09 Boring/Well ID MW-22B Date Drilled 10/27/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 42 ' Boring Diam. 10 "

N. Coord. 727871.34 ' E. Coord. 3165678.00 ' Surface Elevation 45.61 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.010 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 27.5 ' Sump Length 0.5 '

Top of Casing Elevation 45.86 ' Stickup 0 '

Depth to Water: 1. Ft. 3.70 (11/10/98) 2. Ft. ( )

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method HSA/Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
45.61	0					0-24	0-1	MW-22A, located 5' north, was cored continuously from ground surface to 25' and accordingly, MW-22B was not cored through this interval. The MW-22A lithology is presented for informational purposes; refer to the MW-22A log for soil descriptions.
45							1-3	SILTY SANDY CLAY
							3-13.8	SILTY CLAY
40	5							
35	10						13.8-15	SANDY CLAY
							15-18	CLAYEY SAND
30	15						18-20	SILTY CLAY
25	20						20-25	SILTY CLAY
								At 22-24' collect soil samples MW22B-22 and MW22B-22D
	25					24-25		At 24.0' bottom of 8-inch diameter steel casing

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MW-22B DRILLING LOG

W.O. NO. 422-09 Boring/Well ID MW-22B Date Drilled 10/27/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 42 ' Boring Diam. 10 "

N. Coord. 727871.34 ' E. Coord. 3165678.00 ' Surface Elevation 45.61 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.010 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 27.5 ' Sump Length 0.5 '

Top of Casing Elevation 45.86 ' Stickup 0 '

Depth to Water: 1. Ft. 3.70 (11/10/98) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method HSA/Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
20	25					25-27	25-27.8	SANDY SILTY CLAY: Light gray 5Y7/2 mottled with strong brown 7.5YR5/6; firm; low plasticity; moist; no staining; no odor.
						27-31	27.8-35	CLAYEY SAND: Strong brown 7.5YR5/8; loose to medium dense; very fine grained; well sorted; wet; no staining; no odor.
15	30							At 30.5' grades yellowish red 5YR5/6 mottled with light gray 5Y7/2
						31-33		
						33-35		
10	35					35-37	35-38	NO RECOVERY: Driller reports interval drilled like sand.
						38-42	38-42	SILTY CLAY: Yellowish red 5YR5/6; firm; very plastic; moist; no staining; no odor.
5	40							T.D. = 42 '
0	45							
	50							

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MW-23C DRILLING LOG

W.O. NO. 422-09 Boring/Well ID MW-23C Date Drilled 10/14/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 76' Boring Diam. 10"

N. Coord. 728759.11' E. Coord. 3167721.35' Surface Elevation 48.85' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.010"

Casing: Type Schedule 40 PVC Diam. 2" Length 62' Sump Length 0.5'

Top of Casing Elevation 51.91' Stickup 3.06'

Depth to Water: 1. Ft. 29.34 (11/10/98) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
48.85	0					0-2	0-2	SILTY SAND: Grayish brown 2.5Y5/2; very dense; angular to subangular; very fine grained; some to many gravel (0.1" to 1" diameter). At 0.0-1' collect surface soil sample SB23-00 and SPLP
						2-5	2-5	CLAYEY SANDY SILT: Black 2.5Y2.5/1; hard; friable; moist; some small gravel (0.1-0.3" diameter); trace sheen; very faint fluorescence; slight odor.
45	5					5-7	5-7	SANDY CLAY: Light gray 2.5Y7/1 hard; plastic; moist; some small gravel (0.1" diameter); no staining; no fluorescence; no odor.
						7-9	7-11	SILTY CLAY: Light gray 2.5Y7/2; firm to hard; plastic; moist; some small gravel (0.1-0.3" diameter); angular to subangular; no staining; no odor.
40	10				3	9-11		
						11-15	11-15	SANDY CLAY: Light gray 2.5Y7/2; firm to hard; plastic; moist; trace organic matter; no staining; very slight odor.
35	15				11	15-19	15-25	CLAYEY SAND: Light gray 2.5Y7/2; loose; wet; very fine to fine grained; well sorted; no staining; no fluorescence; slight odor.
30	20					19-23		At 19.0' grades light yellowish brown 2.5Y6/3
25	25					23-25		At 23.0' with NAPL, strong odor.

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MW-23C DRILLING LOG

W.O. NO. 422-09 Boring/Well ID MW-23C Date Drilled 10/14/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 76 ' Boring Diam. 10 "

N. Coord. 728759.11 ' E. Coord. 3167721.35 ' Surface Elevation 48.85 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.010 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 62 ' Sump Length 0.5 '

Top of Casing Elevation 51.91 ' Stickup 3.06 '

Depth to Water: 1. Ft. 29.34 (11/10/98) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	25					25-29	25-26	CLAY: Yellowish red 5YR4/6; very hard;very plastic; moist; angular blocky substructure; no staining; strong odor.
					21		26-33	SILTY CLAY: Light gray 2.5Y7.1 mottled with light yellowish brown 2.5Y6/4; hard to very hard; plastic; moist; trace light to medium brown staining in microfractures; strong odor.
20						29-33		At 29.0' light yellowish brown grades to yellowish brown 10YR5/6
	30				64			At 31.0-33' collect soil sample SB23-31 and SPLP
								At 32.0' trace small gravel-size caliche nodules
15						33-37	33-37	CLAY: Brown 7.5YR5/4 mottled light greenish gray 10GY7/1; hard; very plastic; moist; no staining; odor to strong odor.
	35							
						37-41	37-45	CLAY: Yellowish red 5YR4/6 mottled with light greenish gray 5GY7/1; very hard; very plastic; moist; small angular blocky substructures trace to some microfractures; trace to no fluorescence; odor to strong odor.
10					28			
	40					41-45		At 41.0' grades very slight odor to no odor; no fluorescence.
5								
	45					45-49	45-47	CLAY: Red 2.5YR4/6; very hard; very plastic; moist; trace to some microfractures; small angular blocky substructure; no staining; no odor; no fluorescence
					4		47-53	SILTY CLAY: Red 2.5YR4/6; very hard; very plastic; trace to some microfractures; moist; no staining; no fluorescence; upon fresh break of the core there is a very faint odor.
0						49-53		At 49.0' no odor upon fresh break
	50							

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MW-23C DRILLING LOG

W.O. NO. 422-09 Boring/Well ID MW-23C Date Drilled 10/14/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 76' Boring Diam. 10"

N. Coord. 728759.11' E. Coord. 3167721.35' Surface Elevation 48.85' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.010"

Casing: Type Schedule 40 PVC Diam. 2" Length 62' Sump Length 0.5'

Top of Casing Elevation 51.91' Stickup 3.06'

Depth to Water: 1. Ft. 29.34 (11/10/98) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-5	50					53-57	53-57	CLAY: Red 2.5YR4/6; very hard; very plastic; moist; trace to some microfractures; no staining; no odor; no fluorescence.
	55				3			At 55-57' collect soil sample SB23-55 and SPLP
-10							57-58	At 57' bottom of 6-inch diameter steel surface casing
						58-62	58-62	OTHER: Not Sampled CLAY: Red 2.5YR4/6, very hard; very plastic; moist; no staining, no odor.
	60				0.4			At 60-62' collect soil sample SB23-60
-15						62-66	62-66	CLAYEY SILT: Yellowish red 5YR4/6; soft; plastic; moist to wet; no staining; no fluorescence; no odor; no sheen on the water.
	65							At 65.5' very slight odor
						66-68	66-68	CLAYEY SAND: Yellowish red 5YR4/6; loose; wet; very fine to fine grained; subrounded; well sorted; no staining; very slight odor; one very small (1mm) NAPL globule observed.
-20						68-72	68-72	NO RECOVERY: Driller reported probable sand zone.
	70							
						72-76	72-75	SILTY CLAY: Yellowish red 5YR4/6; very hard; plastic; moist; no staining; no odor.
-25					0.4			At 73-75' collect soil sample SB23-73 and SPLP At 74.0' trace reddish yellow 7.5YR6/8 mottling
	75							

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MW-23C DRILLING LOG

W.O. NO. 422-09 Boring/Well ID MW-23C Date Drilled 10/14/98

Project Phase 2B RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 76 ' Boring Diam. 10 "

N. Coord. 728759.11 ' E. Coord. 3167721.35 ' Surface Elevation 48.85 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.010 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 62 ' Sump Length 0.5 '

Top of Casing Elevation 51.91 ' Stickup 3.06 '

Depth to Water: 1. Ft. 29.34 (11/10/98) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	75						75-76	SILTY CLAY: Brown 7.5YR4/3; very hard; plastic; moist; no staining; no odor. T.D. = 76 '
-30	80							
-35	85							
-40	90							
-45	95							
-50	100							

Union Pacific Railroad

Log of Boring: MW-24AR

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/27/09	Drilling Method:	Direct Push Sonic
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	2
Driller:	Keith Barge	Total Depth (ft):	30.5
Driller's License:	4786	Northing:	727530.67
Field Supervisor:	Tim Jennings	Easting:	3165206.96
Sampling Method:	2"x6.5' Barrel	Ground Elev. (ft AMSL):	46.28

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0		--	DO	CL	(0 - 6.0) SANDY/GRAVELLY CLAY, CL, gray, moist, moderate creosote odor.
5					
10		0.9	3.0/3.0		(6.0 - 14.3) SANDY CLAY, CL, gray, moist, firm, slight creosote odor, few carbonate nodules at 11.0.
		4	5.0/6.5		
15		4.7		SC/SM	(14.3 - 19.8) SILTY/CLAYEY SAND, light brown, wet, soft, no odor.
		5.1	6.5/6.5		
20		3.5			(19.8 - 30.5) SILTY CLAY, CL, gray, moist, firm to hard.
		3.2	6.5/6.5	CL	
25		1.6			
30					

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

1/6/2011

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.
Replacement well for MW-24AR.

Initial Fluid Level (2/05/09)
▼ Depth to water: 5.18 ft BTOC

Annular Materials
(0.0 - 9.0) Bentonite Chips
(9.0 - 21.0) 16/30 Silica Sand
(11.0 - 21.0) Pre Pack Silica Sand
(21.0 - 30.5) Cuttings cave-in

Well Materials
(0 - 11.0) Casing, 1" Sch 40 FJT PVC
(11.0 - 21.0) Screen, 1" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
45.65

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MW-24B DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-24B Date Drilled 03/15/00

Project Phase 2C RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 50' Boring Diam. 14.5"

N. Coord. 727534.32' E. Coord. 3165208.21' Surface Elevation 46.46' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.010"

Casing: Type Schedule 40 PVC Diam. 2" Length 38.5' Sump Length 0.5'

Top of Casing Elevation 46.06' Stickup 0'

Depth to Water: 1. Ft. 1.57 (03/16/2000) 2. Ft. 11.91 (3/27/00)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method HSA/Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES
8" Dia. steel surface casing installed to 25 feet bgs.
NAPL = Non-Aqueous Phase Liquid
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
100	0					0-25	0-10	SILTY CLAY: MW-24A, located ~9' north, was cored continuously from ground surface to 25' and accordingly, MW-24B was not cored through this interval. The MW-24A lithology is presented for informational purposes; refer to the MW-24A log for soil descriptions.
95	5							
90	10						10-16	SANDY CLAY
85	15						16-20	CLAYEY SAND
80	20						20-25	SILTY CLAY
75	25					25-26 26-30	25-26 26-30	At 25.0' bottom of 8-inch diameter steel casing
70	30				0		72	At 33.5-34.0' fractured clay; small to medium, hard, indurated brecciated pieces.

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MW-24B
DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-24B Date Drilled 03/15/00

Project Phase 2C RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 50 ' Boring Diam. 14.5 "

N. Coord. 727534.32' E. Coord. 3165208.21' Surface Elevation 46.46 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.010 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 38.5 ' Sump Length 0.5 '

Top of Casing Elevation 46.06 ' Stickup 0 '

Depth to Water: 1. Ft. 1.57 (03/16/2000) 2. Ft. 11.91 (3/27/00)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method HSA/Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES
8" Dia. steel surface casing installed to 25 feet bgs.
NAPL = Non-Aqueous Phase Liquid
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
70	30				0	30-34	30-45	NOT SAMPLED SILTY CLAY: strong brown 7.5YR5/6 mottled with light gray 2.5Y7/2; very stiff PP=2.0-4.0 tsf; plastic; moist; no odor; no NAPL; no defining structure.
65	35				0	34-38		CLAY: yellowish red 5YR4/6 mottled with light gray 5Y7/2 stiff to very stiff PP=1.5-2.5 tsf; plastic; moist; no odor; no NAPL.
60	40				0	38-42		
55	45				0	42-46		At 34' grades with less mottling of light gray 5Y7/2 At 34-37' some fine grained caliche At 34-38' trace freckly-black coloration
50	50				0	46-48.5	45-48.5	At 38-45' microfractures are filled with light gray clay 5Y7/2; filled microfractures are small and irregular. SILTY CLAY: yellowish red 5YR5/6 stiff PP=3.0 tsf; plastic; moist; massive; no odor.
45	55					48.5-50	48.5-50	CLAY: yellowish red 5YR4/6; hard PP=4.5 tsf; plastic; moist; massive; no odor. T.D. = 50 '
40	60							

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MW-24C DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-24C Date Drilled 03/14/00

Project Phase 2C RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 74 ' Boring Diam. 14.5 "

N. Coord. 727541.75' E. Coord. 3165205.52' Surface Elevation 46.27 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.010 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 63 ' Sump Length 0.5 '

Top of Casing Elevation 46.05" Stickup 0 '

Depth to Water: 1. Ft. 22.6 (03/16/2000) 2. Ft. 25.77 (3/27/00)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method HSA/Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES
12" Dia. Steel Surface Casing Installed to 25 feet bgs.
8" Dia. Steel Surface Casing Installed to 50 feet bgs.
NAPL = Non-Aqueous Phase Liquid
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
100	0		4			0-26	0-10	SILTY CLAY: MW-24A, located ~9' north, was cored continuously from ground surface to 25' and accordingly, MW-24C was not cored through this interval. The MW-24A lithology is presented for informational purposes; refer to the MW-24A log for soil descriptions.
95	5							
90	10						10-16	SANDY CLAY
85	15						16-20	CLAYEY SAND
80	20						20-25	SILTY CLAY
75	25						25-26	At 25.0' bottom of 12-inch diameter steel casing
						26-30	26-30	NOT SAMPLED: PVC end cap.
70	30				0		74	SILTY CLAY: strong brown 7.5YR5/6 mottled with light gray 2.5Y7/2; very stiff PP=2.0-4.0 tsf; plastic; moist; no odor; no NAPL; no defining structure.

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MW-24C DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-24C Date Drilled 03/14/00

Project Phase 2C RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 74' Boring Diam. 14.5"

N. Coord. 727541.75' E. Coord. 3165205.52' Surface Elevation 46.27' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.010"

Casing: Type Schedule 40 PVC Diam. 2" Length 63' Sump Length 0.5'

Top of Casing Elevation 46.05" Stickup 0'

Depth to Water: 1. Ft. 22.6 (03/16/2000) 2. Ft. 25.77 (3/27/00)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method HSA/Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES
12" Dia. Steel Surface Casing Installed to 25 feet bgs.
8" Dia. Steel Surface Casing Installed to 50 feet bgs.
NAPL = Non-Aqueous Phase Liquid
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
70	30					30-34	30-45	CLAY: yellowish red 5YR4/6 mottled with light gray 5Y7/2 stiff to very stiff pp=1.5-2.5; plastic; moist; no odor; no NAPL.
					0			At 33.5-34.0' fractured clay; small to medium, hard, indurated brecciated pieces
						34-38		At 34' grades with less mottling of light gray 5Y7/2 At 34-37' some fine grained caliche At 34-38' trace freckly-black coloration
65	35				0			
						38-42		At 38-45' microfractures are filled with light gray clay 5Y7/2; filled microfractures are small and irregular
60	40							
					0	42-46		
55	45						45-48.5	SILTY CLAY: yellowish red 5YR5/6 stiff PP=3.0 tsf; plastic; moist; massive; no odor.
						46-48.5		
						48.5-50	48.5-60	CLAY: yellowish red 5YR4/6; hard PP=4.5 tsf; plastic; moist; massive; no odor.
50	50					50-55		At 50.0' bottom of 8-inch diameter steel casing
								At 54-54.3' laminated zone with light gray clayey silt; laminae are 1/4" thick
45	55					55-60		
					0			
40	60						75	

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MW-24C DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-24C Date Drilled 03/14/00

Project Phase 2C RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 74 ' Boring Diam. 14.5 "

N. Coord. 727541.75' E. Coord. 3165205.52' Surface Elevation 46.27 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.010 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 63 ' Sump Length 0.5 '

Top of Casing Elevation 46.05" Stickup 0 '

Depth to Water: 1. Ft. 22.6 (03/16/2000) 2. Ft. 25.77 (3/27/00)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method HSA/Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES
12" Dia. Steel Surface Casing installed to 25 feet bgs.
8" Dia. Steel Surface Casing installed to 50 feet bgs.
NAPL = Non-Aqueous Phase Liquid
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
40	60				0.7	60-62	60-62	CLAYEY SILT: yellowish red 5YR5/6; very loose; wet; with some very fine grained sand; no NAPL; no odor.
						62-64	62-66	CLAYEY SAND: yellowish red 5YR5/6; well sorted; subangular; very loose; wet; almost fluidized; very fine grained; no NAPL; no odor.
						64-66		
35	65				0.3			
						66-68	66-73	NO RECOVERY: driller reports that it drills like sand.
						68-73		
30	70							
					0.3	73-74	73-74	CLAY: reddish brown 5YR4/4 laminated with yellowish brown 10YR5/8; stiff PP=2.0 tsf; plastic; moist; thin, horizontal laminae; laminae are approx 2" apart; no NAPL; no odor. T.D. = 74 '
25	75							
20	80							
15	85							
10	90							

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MW-25A DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-25A Date Drilled 03/07/00

Project Phase 2C RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 29 ' Boring Diam. 8 "

N. Coord. 729088.52 ' E. Coord. 3168524.46 ' Surface Elevation 44.94 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.010 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 18.5 ' Sump Length 0.5 '

Top of Casing Elevation 44.65' Stickup 0.0 '

Depth to Water: 1. Ft. 9.2 (03/15/2000) 2. Ft. 9.15 (3/27/00)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

No Surface Casing Installed
NAPL = Non-Aqueous Phase Liquid
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
100	0					0-2	0-2	FILL: organic.
					0	2-5	2-5	SANDY SILTY CLAY: light gray 10YR7/1 with browinish yellow 10YR6/6 and gray 10YR5/1; stiff PP=1.0 tsf; plastic; moist; some fine grained (1/8 inch dia.) caliche nodules; trace iron staining; no fluorescence; no odor.
95	5					5-10	5-10	At 3-5' firm PP=0.5 tsf SILTY CLAY: very dark grey 10YR3/1 mottled with dark gray 10YR4/1 and browinish-yellow 10YR6/8; firm PP=0.5-0.75 tsf; plastic; moist; trace Fe and black (Mn-like) concretions; no NAPL staining; no fluorescence; no odor.
					0			At 5-8' many small (1/8-1/2 inch dia.) and one large (2 inch dia.) caliche concretions
90	10					10-15	10-17	SANDY CLAY: light gray 10YR7/2 mottled with brownish-yellow 10YR5/8; very fine grained; firm PP=0.5-1.0 tsf; plastic; moist; no odor.
					0			
85	15					15-20		At 13.5' trace Fe and Mn-like concretions
					0		17-27	CLAYEY SAND: light greenish gray G1 7/5GY; very fine grained; well sorted: trace Fe-like concretions, moist, no NAPL staining; no fluorescence, no odor.
80	20					20-25		At 15-17' dense PP=2.5-3.0 tsf At 17-20' medium dense PP=1.5-2.0 tsf
					0			At 19-20' Collect soil sample MW25A-19
75	25					25-29		At 20' grades dark yellowish brown 10YR4/4 mottled with light greenish gray 1G6/5GY; very fine grained; well sorted; loose; wet (fluidized); slight odor; sheen on water
							27-29	SILTY CLAY: yellowish-red 5YR5/6; very stiff PP=3.5 tsf; very plastic; massive; moist; no NAPL staining; no fluorescence; slight odor.
					1.2			
70	30							T.D. = 29 '

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MW-25C DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-25C Date Drilled 03/13/00

Project Phase 2C RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 74' Boring Diam. 14.5"

N. Coord. 729089.28' E. Coord. 3168517.87' Surface Elevation 44.99' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.010"

Casing: Type Schedule 40 PVC Diam. 2" Length 58.0' Sump Length 0.5'

Top of Casing Elevation 44.49' Stickup 0'

Depth to Water: 1. Ft. 20.9 (03/16/2000) 2. Ft. 19.92 (3/27/00)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method HSA/Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES
8" Dia. Steel Surface Casing Installed to 55 feet bgs
NAPL = Non-Aqueous Phase Liquid
SPLP = Synthetic Precipitate Leachate Procedure
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
100	0					0-15	0-2	FILL: MW-25A, located ~9' east, was cored continuously from ground surface to 29' and accordingly, MW-25C was not cored through this interval. The MW-25A lithology is presented for informational purposes. Refer to the MW-25A log for soil descriptions.
							2-5	SANDY SILTY CLAY
95	5						5-10	SILTY CLAY
90	10				0		10-15	SANDY CLAY
85	15				0	15-20	15-20	SILTY CLAY: light greenish gray 7/5G; stiff PP=1.5 tsf; low plasticity; moist; no structure; no NAPL staining; no odor. At 15-16' some Fe nodules and Fe staining; some small caliche nodules
80	20				0.3	20-25	20-30	At 19' grades with some very fine grained sand; strong brown 7.5YR5/6 CLAYEY SAND: brown; very fine grained; well sorted; saturated (fluidized); loose; no odor; no sheen.
75	25				1.0	25-35		At 25' moderate odor
70	30				0.3			

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MW-25C DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-25C Date Drilled 03/13/00

Project Phase 2C RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 74' Boring Diam. 14.5"

N. Coord. 729089.28' E. Coord. 3168517.87' Surface Elevation 44.99' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.010"

Casing: Type Schedule 40 PVC Diam. 2" Length 58.0' Sump Length 0.5'

Top of Casing Elevation 44.49' Stickup 0'

Depth to Water: 1. Ft. 20.9 (03/16/2000) 2. Ft. 19.92 (3/27/00)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method HSA/Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES
8" Dia. Steel Surface Casing Installed to 55 feet bgs
NAPL = Non-Aqueous Phase Liquid
SPLP = Synthetic Precipitate Leachate Procedure
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
70	30						30-32	CLAY: yellowish red 5YR4/6; very stiff PP=2.25 tsf; massive structure; plastic; moist; no NAPL staining; very slight odor.
					0		32-40	At 31' grades to strong brown 7.5YR5/6; no odor SILTY CLAY: gray 2.5YR7/1 mottled with olive yellow 2.5Y6/6; very stiff PP=2.0 to 2.25 tsf; plastic, moist; slight odor.
65	35					35-40		At 35' moderate odor; Fe staining; no NAPL staining
								At 38' trace small to medium caliche
					12.5			At 39' grades to yellowish red 5YR4/6 and black freckle-like black specks; soil core breaks along black splotches; odor present
60	40					40-45	40-57	CLAY: yellowish red 5YR4/6 slightly mottled with light gray 7.5GY(1G); stiff PP=3.5-4.0 tsf; plastic, moist; strong odor; trace small black coloration; NAPL in microfractures, approximately 1 microfracture every 2" with depth; NAPL sheens in microfractures fluoresce with U.V. light (long wavelength); upon fresh break of the core, NAPL will ooze out of the microfracture, evident as golden sheen.
					12.2			
55	45					45-50		At 43-45' Collect soil sample MW25C-43 & SPLP At 45-50' grades with less mottling
								At 47-50' caliche powdery zones (no measurable nodules) At 48.5' no more NAPL sheen present in fractures, moderate odor At 49' grades to red 2.5YR4/6; small black concretions present
50	50					50-55		
								At 53-55' Collect soil sample MW25C-53 & SPLP
					5.1			At 55.0' Bottom of 8-inch diameter steel surface casing
45	55					55-60		CLAYEY SILT: red 2.5YR4/6; with some very fine grained sand; soft (fluidized); saturated; no NAPL; no sheen; no fluorescence; slight odor.
					0		57-61.5	
40	60							

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MW-25C DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-25C Date Drilled 03/13/00

Project Phase 2C RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 74' Boring Diam. 14.5"

N. Coord. 729089.28' E. Coord. 3168517.87' Surface Elevation 44.99' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.010"

Casing: Type Schedule 40 PVC Diam. 2" Length 58.0' Sump Length 0.5'

Top of Casing Elevation 44.49' Stickup 0'

Depth to Water: 1. Ft. 20.9 (03/16/2000) 2. Ft. 19.92 (3/27/00)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method HSA/Mud Rotary Log By M. Ylagan

SKETCH MAP

NOTES
8" Dia. Steel Surface Casing Installed to 55 feet bgs
NAPL = Non-Aqueous Phase Liquid
SPLP = Synthetic Precipitate Leachate Procedure
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
40	60				0.3	60-64		At 60-61' Collect soil sample MW25C-60
					0.7		61.5-62	CLAY: red 2.5YR4/6; very stiff PP=3.0 tsf; massive; plastic; moist; no NAPL; no fluorescence; slight odor.
							62-64	CLAYEY SILT: yellowish red 5YR5/6; with some very fine grained sand; soft; wet (saturated); sheen on inside of soil core upon fresh break of the core; no sheen develops on standing water; moderate odor.
35	65					64-68	64-70	NO RECOVERY: driller reports drilling like sand.
					0			
						68-70		At 68' driller reports drilling like sandstone or siltstone, or possibly a caliche unit.
30	70					70-74	70-74	CLAY: yellowish red 5YR4/6; very stiff PP=3.0 tsf; plastic; moist; with thin (<1/16"), horizontal, yellowish brown 10YR5/8 laminae, 2" apart vertically; soil core breaks along laminae; no NAPL; no odor.
					0			At 70-72' Collect soil sample MW25C-70 and request SPLP prep
25	75							At 72-74' dark yellowish brown 10YR 4/6; very stiff PP=2.75 tsf; with thin, horizontal, gray 5Y6/1, laminae; core breaks along laminae as above
								T.D. = 74'
20	80							
15	85							
10	90						80	

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MW-26A
DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-26A Date Drilled 03/13/00

Project Phase 2C RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 26' Boring Diam. 8"

N. Coord. 729159.27' E. Coord. 3167518.51' Surface Elevation 45.01' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.010"

Casing: Type Schedule 40 PVC Diam. 2" Length 14.5' Sump Length 0.5'

Top of Casing Elevation 44.62' Stickup 0'

Depth to Water: 1. Ft. 6.0 (03/15/2000) 2. Ft. 7.40 (3/27/00)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

No Surface Casing Installed
NAPL = Non-Aqueous Phase Liquid
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
100	0						0-1	NOT SAMPLED
						1-5	1-8	SILTY CLAY: very dark gray 5Y3/1 very stiff PP=2.5 tsf; plastic; moist; organic-rich; some root hairs; no NAPL; no odor.
					0			At 3' grades gray 2.5Y5/1 mottled with very dark gray 2.5Y3/1 and olive yellow 2.5Y3/1; stiff PP=1.25 tsf
95	5					5-10		At 4'2" small (1/8") to med. (1/2" diam.) caliche nodules At 4'10" small (1/8") to med. (1/2" diam.) caliche nodules
					0		8-11	At 7-8' interbedded with clayey sand; light gray 2.5Y7/1; very fine grained
90	10				0	10-15		SANDY CLAY: light gray 2.5Y7/1 mottled with olive yellow 2.5Y6/8; stiff PP=2.0 tsf; very fine grained; well sorted; angular to subangular; low plasticity; moist; no NAPL; no odor.
					0		11-25	At 9-11' Collect soil sample MW26A-09 and duplicate sample MW26A-09D
85	15					15-20		CLAYEY SAND: greenish gray 6/10GY; wet; loose; fluidized; fine grained; well sorted; angular to subangular; no NAPL; no sheen; no odor.
					0			
80	20					20-26		
					0			
75	25						25-26	SILTY CLAY: brown 7.5YR5/4 mottled with gray 5Y6/1; very stiff PP=3.0 tsf; plastic; moist; no NAPL; no odor.
70	30							

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MW-26A DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-26A Date Drilled 03/13/00

Project Phase 2C RFI Owner Southern Pacific Trans. Co.

Location Houston Wood Preserving Works Boring T.D. 26 ' Boring Diam. 8 "

N. Coord. 729159.27 ' E. Coord. 3167518.51 ' Surface Elevation 45.01 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.010 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 14.5 ' Sump Length 0.5 '

Top of Casing Elevation 44.62 ' Stickup 0 '

Depth to Water: 1. Ft. 6.0 (03/15/2000) 2. Ft. 7.40 (3/27/00)

Drilling Company Best Drilling Services Driller Keith Barge

Drilling Method Hollow Stem Auger Log By M. Ylagan

SKETCH MAP

NOTES

No Surface Casing Installed
NAPL = Non-Aqueous Phase Liquid
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM READING (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
70	30							At 25-26' Collect soil sample MW26A-25
65	35							T.D. = 26 '
60	40							
55	45							
50	50							
45	55							
40	60						82	

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MW-27A DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-27A Date Drilled 3/26/01

Project Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 30' Boring Diam. 8.25"

N. Coord. 730002.11' E. Coord. 3169610.22' Surface Elevation 45.3' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Schedule 40 PVC Diam. 2" Length 17' Sump Length 0'

Top of Casing Elevation 44.9' Stickup 0'

Depth to Water: 1. Ft. ( ) 2. Ft. ( )

Drilling Company Best Drilling Services, Inc. Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By Shari Bauman

SKETCH MAP

NOTES

No Surface Casing Installed.
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
45.3	0					0-3	0-0.25 0.25-0.8 0.8-24.5	ASPHALT: Road material. FILL: Sandy Silty Clay; strong brown 7.5YR 4/6; damp; shell fragments; gravel; road-base material. SILTY CLAY: Very dark gray 5YR 3/1; damp; plastic. At 3.5 ft. - becomes mottled with brown 7.5YR 4/2 and trace mottled with light olive brown 2.5Y 5/4; stiff, PP=2.0 tsf; iron oxide concentrations At 8.5 ft. - trace to some calcium carbonate nodules with depth; stiff, PP=2.0 tsf At 10.5 ft. - becomes light brownish gray 10YR 6/2 mottled with brownish yellow 10YR 6/8; stiff, PP=2.0 tsf At 12.0 ft. - no calcium carbonate nodules present At 18.0- 19.0 ft. - calcium carbonate nodules and concentrations in seams and layers At 19.0 ft. - becomes yellowish red 5YR 4/6 mottled with light brownish gray 10YR 5/2; very stiff, PP=3.5 tsf At 21.0 ft. - layer of calcium carbonate nodules
					0	3-5		
40	5					5-10		
					0			
35	10					10-15		
					0			
30	15					15-20		
					0			
25	20					20-25		
					0			
	25						24.5-26.5	SAND: Fine grained; strong brown 7.5YR 4/6; saturated; loose; trace gray clay pockets.

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MW-27A
DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-27A Date Drilled 3/26/01

Project Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 30' Boring Diam. 8.25"

N. Coord. 730002.11' E. Coord. 3169610.22' Surface Elevation 45.3' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Schedule 40 PVC Diam. 2" Length 17' Sump Length 0'

Top of Casing Elevation 44.9' Stickup 0'

Depth to Water: 1. Ft. ( ) 2. Ft. ( )

Drilling Company Best Drilling Services, Inc. Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By Shari Bauman

SKETCH MAP

NOTES

No Surface Casing Installed.
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
20	25					25-30		
							26.5-30	CLAY: with trace silt; strong brown 7.5YR 4/6; damp; plastic; hard, PP>4.0 tsf.
					0			
15	30							T.D. = 30'
10	35							
5	40							
0	45							
	50							

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MW-27C DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-27C Date Drilled 04/16/01

Project Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 73.5' Boring Diam. 8.25"

N. Coord. 730008.65' E. Coord. 3169609.94' Surface Elevation 45.3' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Schedule 40 PVC Diam. 2" Length 60.5' Sump Length 2.5'

Top of Casing Elevation 45.04' Stickup 0'

Depth to Water: 1. Ft. ( ) 2. Ft. ( )

Drilling Company Best Drilling Services, Inc. Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By Shannon Greenan

SKETCH MAP

NOTES
10" inner diameter new carbon steel surface casing installed to 29 feet bgs.
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
45.3	0					0-30	0-0.25	ASPHALT; MW-27A, located ~6' south, was cored continuously from the ground surface to 30' and accordingly MW-27C was not cored through this interval. The MW-27A lithology is presented for informational purposes; refer to the MW-27A log for soil discriptions.
							0.25-0.8	FILL
40	5						0.8-24.5	SILTY CLAY
35	10							
30	15							
25	20							
							24.5-26.5	SAND
	25						85	

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MW-27C DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-27C Date Drilled 04/16/01

Project Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 73.5' Boring Diam. 8.25"

N. Coord. 730008.65' E. Coord. 3169609.94' Surface Elevation 45.3' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Schedule 40 PVC Diam. 2" Length 60.5' Sump Length 2.5'

Top of Casing Elevation 45.04' Stickup 0'

Depth to Water: 1. Ft. ( ) 2. Ft. ( )

Drilling Company Best Drilling Services, Inc. Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By Shannon Greenan

SKETCH MAP

NOTES
10" inner diameter new carbon steel surface casing installed to 29 feet bgs.
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
20	25						26.5-30	CLAY
								At 29.0' bottom of 10-inch diameter new carbon steel surface casing
15	30					30-35	30-35	NO RECOVERY.
10	35					35-40	35-40	SILTY CLAY: Brown 2.5YR 6/6 mottled with trace yellowish-tan 10YR 6/8; moist; plastic; stiff PP=1.5 tsf.
					0.0			At 37.0' less moist
								At 38.5' moist At 39.0' irregular shaped (mm to cm diameter) tan 7.5YR 6/4 and gray 5Y 6/2 gravels; more moist
5	40					40-45	40-50	SILTY CLAY: Red 5YR 5/6 with trace gray 5Y 6/2 mottling; moist to damp; plastic.
					0.0			At 42.0' very stiff PP=3.5 tsf
					0.0			At 44.0' stiff PP=2.5 tsf
0	45					45-50		
					0.7			At 46.0' very stiff PP=3.5 tsf
								At 47.0' stiff PP=2.5 tsf
					0.4		86	At 49.0' very stiff PP=3.5 tsf At 49.5' sandy clay; gray 5Y 7/1 with trace red 10YR 6/6; moist to slighlty wet
	50							

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MW-27C DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-27C Date Drilled 04/16/01

roject Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 73.5 ' Boring Diam. 8.25 "

N. Coord. 730008.65 ' E. Coord. 3169609.94 ' Surface Elevation 45.3 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 60.5 ' Sump Length 2.5 '

Top of Casing Elevation 45.04' Stickup 0 '

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services, Inc. Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By Shannon Greenan

SKETCH MAP

NOTES
10" inner diameter new carbon steel surface casing installed to 29 feet bgs.
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-5	50					50-55	50-64	CLAYEY SAND: Gray 10YR 7/2; wet; slightly plastic; soft PP=0.5 tsf
					0.4			At 50.1' 3-inch sandy and silty clay pocket; red 7.5YR 5/6 with trace gray.
-10	55					55-60		At 55.0' tan-brown 2.5Y 6/6 with minor gray 2.5Y 7/2; very wet
								At 56.0' increased clay content; soft PP=0.5 tsf
					0.7			At 57.0' decreased clay content; very soft PP=0.0 tsf
								At 57.0' increased clay content; soft PP=0.5 tsf
					0.4			At 58.0' decreased clay content; very soft PP=0.0 tsf
								At 59.0' increased clay content; soft PP=0.5 tsf
-15	60					60-65		At 60.0' gray 5Y 6/2 with trace red 10YR 5/8; higher plasticity; less wet; stiff PP=1.5 tsf
					0.4			
								At 63.0' lower clay content; soft PP=1.0 tsf
							64-65.3	CLAY: Fine; red 2.5YR 4/6 with trace gray 5Y 6/2 mottling; damp; plastic; slight silt content.
					0.4	65-67		
-20	65						65.3-70.5	At 65.0' silty clay; red 5YR 4/6 with trace gray 5Y 6/3 mottling in matrix; stiff PP=2.5 tsf
					0.7			CLAYEY SAND: Red 5YR 5/6 and red 5YR 4/6; very wet; plastic; soft PP=0.5 tsf
						67-72		At 67.0' trace gray mottling 5Y 6/3; very soft PP=0.0 tsf
					0.7			
-25	70						70.5-72	SILTY CLAY: Red 2.5YR 4/6; damp; plastic; hard PP=4.5 tsf; trace black organic-like layering.
						72-73.5	72-73.5	SILTY CLAY: Red 5YR 4/6 with trace gray 10YR 6/3 and pink 2.5Y 7/2 mottling; damp to dry; plastic; stiff PP=2.5 tsf
					0.4			At 73.25' very stiff PP=3.5 tsf
	75							T.D. = 73.5 '

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MW-28A DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-28A Date Drilled 3/26/01

Project Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 28 ' Boring Diam. 8.25 "

N. Coord. 729461.71 ' E. Coord. 3167925.77 ' Surface Elevation 44.29 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 16 ' Sump Length 0 '

Top of Casing Elevation 43.86' Stickup 0 '

Depth to Water: 1. Ft. ( ) 2. Ft. ( )

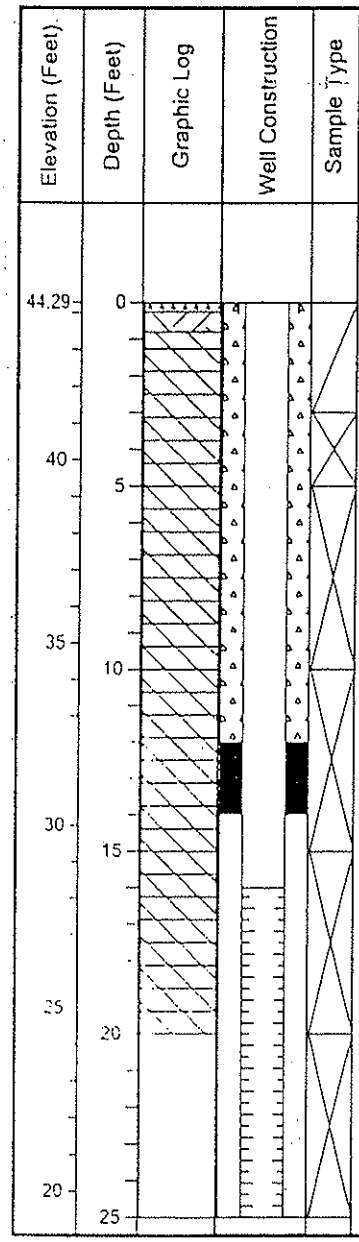
Drilling Company Best Drilling Services, Inc. Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By Sharl Bauman

SKETCH MAP

NOTES

No Surface Casing Installed
PP = Pocket Penetrometer
tsf = Tons per square foot



Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0-3	0-0.25 0.25-0.8 0.8-20	ASPHALT: Road material. FILL: Sandy Silty Clay; strong brown 7.5YR 4/6; dry; gravel; road-base material. SILTY CLAY: Gray 10YR 5/1 mottled with yellowish brown 10YR 5/8; damp; plastic; some fine to medium grained sand pockets and calcium carbonate nodule pockets. At 3.5ft. - very stiff, PP=3.5 tsf At 7.5 ft. - becomes yellowish brown 10YR 5/8 mottled with dark gray 10YR 4/1;wet; very plastic; soft, PP<0.5 tsf; no sand or calcium carbonate pockets present At 12.0 ft. - becomes mottled with black organic-like concentrations and orange iron-like concentrations; damp; trace damp fine-grained sand pockets; very stiff, PP=3.0 tsf At 14.0 ft. - becomes trace mottled with red 10YR 4/8; very stiff, PP=2.5 tsf At 18.5 ft. - becomes wet
3-5		
5-10		
10-15		
15-20		
20-25	20-25.5	SAND: Fine-grained; brown 7.5YR 5/4; saturated; loose.

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MW-28A
DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-28A Date Drilled 3/26/01

Project Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 28 ' Boring Diam. 8.25 "

N. Coord. 729461.71 ' E. Coord. 3167925.77 ' Surface Elevation 44.29 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 16 ' Sump Length 0 '

Top of Casing Elevation 43.86' Stickup 0 '

Depth to Water: 1. Ft. ( ) 2. Ft. ( )

Drilling Company Best Drilling Services, Inc. Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By Shari Bauman

SKETCH MAP

NOTES

No Surface Casing Installed
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
25	25				0	25-28	25.5-28	CLAY: Yellowish red 5YR 4/6; damp; very plastic; very stiff, PP=3.5 tsf; trace silt, trace light gray clay seams with black organic-like mottling in seam. T.D. = 28 '
15	30							
10	35							
5	40							
0	45							
-5	50							

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MW-28C DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-28C Date Drilled 04/12/01

Project Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 88' Boring Diam. 8.25"

N. Coord. 729461.28' E. Coord. 3167919.72' Surface Elevation 44.3' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Schedule 40 PVC Diam. 2" Length 75' Sump Length 2.5'

Top of Casing Elevation 43.96' Stickup 0'

Depth to Water: 1. Ft. ( ) 2. Ft. ( )

Drilling Company Best Drilling Services, Inc. Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By Shannon Greenan

SKETCH MAP

NOTES
10" Inner Diameter. New Carbon Steel Surface Casing Installed to 32 feet bgs.
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	0					0-28	0-0.25	ASPHALT: MW-28A, located ~6' east, was cored continuously from ground surface to 28' and accordingly, MW-28C was not cored through this interval. The MW-28A lithology is presented for informational purposes; refer to the MW-28A log for soil descriptions.
							0.25-0.8	FILL
	5						0.8-20	SILTY CLAY
	10							
	15							
	20						20-20.5	SAND
	25							

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MW-28C DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-28C Date Drilled 04/12/01

Project Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 88' Boring Diam. 8.25"

N. Coord. 729461.28' E. Coord. 3167919.72' Surface Elevation 44.3' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Schedule 40 PVC Diam. 2" Length 75' Sump Length 2.5'

Top of Casing Elevation 43.96' Stickup 0'

Depth to Water: 1. Ft. ( ) 2. Ft. ( )

Drilling Company Best Drilling Services, Inc. Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By Shannon Greenan

SKETCH MAP

NOTES
10" Inner Diameter New Carbon Steel Surface Casing Installed to 32 feet bgs.
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	25						25.5-28	CLAY
							28-35	NOT SAMPLED
	30							At 32.0' bottom of 10-inch diameter new carbon steel surface casing
	35				3.9	35-40	35-40	CLAY: Yellowish orange-red 5YR 5/8 mottled with trace gray 2.5Y 6/1; damp; plastic; layers of small mm diameter orangish nodules. At 35.0' very stiff PP=4.0 tsf At 36.0' hard PP=4.5 tsf
					2.7			At 39.0' possible parting in matrix.
	40				0.0	40-45	40-53.8	CLAY: Red 2.5YR 5/8 with trace gray 5Y 6/3 mottles; damp; plastic; hard PP=4.5 tsf; possible soil partings visible. At 40.0' trace white, crumbly, irregular nodules.
					1.2			
	45					45-50		At 45.0' red (5YR 5/8) is present also
					1.5			
	50						91	At 49.4' pockets of silty clay is dry and crumbles

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MW-28C DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-28C Date Drilled 04/12/01

Project Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 88 ' Boring Diam. 8.25 "

N. Coord. 729461.28' E. Coord. 3167919.72' Surface Elevation 44.3' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 75 ' Sump Length 2.5 '

Top of Casing Elevation 43.96' Stickup 0 '

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services, Inc. Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By Shannon Greenan

SKETCH MAP

NOTES
10" Inner Diameter New Carbon Steel Surface Casing Installed to 32 feet bgs.
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	50				0.3	50-55		At 50.0' gray 5Y 6/3 mottling becoming silty clay; dry to damp; whitish irregular mm diameter nodular layering that is dry and crumbles
					0.3		53.8-60	SILTY SANDY CLAY: Red 2.5YR 5/8 with trace gray 5Y 6/3; damp to wet; plastic.
	55					55-60		At 54.0' stiff PP=3.0 tsf At 55.0' stiff PP=2.0 tsf At 55.5' reds 2.5YR 4/8 and 5YR 5/8 in matrix; very moist; sandy unit; soft PP=1.0 tsf
					0.0			At 56.0' clay unit of (7 inches thick); hard PP=4.5 tsf At 57.0' silty unit; stiff PP=1.5 tsf At 58.0' clay unit (4 inches thick); hard PP=4.5 tsf At 59.0' silty unit; soft PP=0.5 tsf
	60					60-65	60-70	CLAYEY SAND: Fine; orange-red 5YR 5/8; wet; plastic; very soft PP=0.25 tsf
					0.3			At 62.5' 2-inch thick sandy and silty clay pocket; very moist; stiff PP=1.5 tsf
	65					65-70		At 65.0' very soft PP=0.0 tsf
					0.0			At 66.5' 3-inch pocket of sandy clay; wet; soft PP=0.5 tsf At 67.0' very soft PP=0.5 tsf
	70					70-75	70-85	NO RECOVERY
	75							

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MW-28C
DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-28C Date Drilled 04/12/01

Project Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 88 ' Boring Diam. 8.25 "

N. Coord. 729461.28' E. Coord. 3167919.72' Surface Elevation 44.3' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 75 ' Sump Length 2.5 '

Top of Casing Elevation 43.96' Stickup 0 '

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services, Inc. Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By Shannon Greenan

SKETCH MAP

NOTES
10" Inner Diameter New Carbon Steel Surface Casing Installed to 32 feet bgs.
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	75					75-80		
	80					80-85		
	85				0.0	85-87	85-85.3 85.3-87	CLAYEY SAND: Red 2.5YR 4/8; wet; plastic; stiff PP=1.0 tsf CLAY: Red 2.5YR 4/8 and trace gray 5Y 6/3 mottling; damp; hard PP=4.5 tsf T.D. = 88 '
	90							
	95							
	100						93	

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Plugged 12/2004

MW-29A
DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-29A Date Drilled 04/19/01

Project Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 23 ' Boring Diam. 8.25 "

N. Coord. 727310.34 ' E. Coord. 3164239.02 ' Surface Elevation 46.71 ' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 9 ' Sump Length 2.75 '

Top of Casing Elevation 46.59' Stickup 0 '

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services, Inc. Driller Jose Herrera

Drilling Method Hollow Stem Auger Log By Shannon Greenan

SKETCH MAP

NOTES

No Surface Casing Installed
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
46.91	0				0	0-5	0-12.5	SILTY CLAY: Dark brown 2.5Y 2.5/1 mottled with trace reddish brown 7.5YR 5/8; damp to moist with depth; plastic.
45					0			At 2.0' stiff PP=1.0 tsf
	5				0	5-10		At 3.5' stiff PP=1.25 tsf At 4.5' stiff PP=2.0 tsf
40					0			At 6.25' whitish calcareous-like nodules with a diameter of centimeters to inches
	10				0	10-15		At 8.0' blackish cm sized nodules in dark brown 2.5YR 2.5/1, orange-brown 10YR 6/8, tan 5Y 6/2, beige 2.5Y 5/2, and black mixed matrix; stiff PP=1.5 tsf At 8.5' dark brown 2.5YR 2.5/1 disappears from matrix; stiff PP=2.25 tsf At 10.0' grades to calcareous-like cm sized whitish nodules; dry
35					0		12.5-15	SANDY CLAY: Dark pinkish gray 5YR 4/1 matrix; very moist; plastic; soft PP=0.5 tsf; trace orange-brown 10YR 6/8 and gray-brown 5Y 7/1 silty clay mottling; stiff PP=1.5 tsf
	15				0	15-20	15-19	At 13.0' orange-brown 10YR 6/8 and gray-brown 5Y 7/1 sandy clay only; stiff PP=1.5 tsf At 13.5' very stiff PP=2.5 tsf At 14.0' stiff PP=2.0 tsf
30					0			CLAYEY SAND: Equally clayey and silty sand; light gray 2.5Y 7/2, orange-brown 10YR 6/8, and pinkish tan 3.5Y 6/4 mottled matrix; wet; malleable; slightly plastic; soft PP=0.5 tsf.
	20				0	20-23	19-23	SANDY CLAY: Medium grayish tan 5Y 6/2 matrix with trace orange-brown mottling 10YR 6/8 and trace dark brown 10R 2.5/1 pigment; damp; plastic; hard PP=4.5 tsf. At 20.0' trace reddish 5YR 5/8 cm and mm diameter nodules
25					0			T.D. = 23 '
	25							

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Plugged 11/2011

MW-29B
DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-29B Date Drilled 04/12/01

Project Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 57' Boring Diam. 8.25"

N. Coord. 727302.91' E. Coord. 3164238.97' Surface Elevation 46.73' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Schedule 40 PVC Diam. 2" Length 44' Sump Length 2.5'

Top of Casing Elevation 46.26' Stickup 0'

Depth to Water: 1. Ft. ( ) 2. Ft. ( )

Drilling Company Best Drilling Services, Inc. Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By Shannon Greenan

SKETCH MAP

NOTES

10" Inner Diameter New Carbon Steel Surface Casing Installed to 23 feet bgs.
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	0					0-23	0-12.5	SILTY CLAY: MW-29A, located ~6' north, was cored continuously from ground surface to 23' and accordingly, MW-29B was not cored through this interval. The MW-29A lithology is presented for informational purposes; refer to the MW-29A log for soil descriptions.
	5							
	10						12.5-15	SANDY CLAY
	15						15-19	CLAYEY SAND
							19-23	SANDY CLAY
	20							At 23.0' bottom of 10-inch diameter new carbon steel surface casing
	25				0.0	23-25	95	SILTY CLAY: Fine; orangish yellow-brown 5YR 5/6 and light yellowish gray 5Y 6/2 mottled; dry to damp; plastic; very hard PP>4.5 tsf; trace whitish mm diameter nodules.

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MW-29B
DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-29B Date Drilled 04/12/01

Project Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 57' Boring Diam. 8.25"

N. Coord. 727302.91' E. Coord. 3164238.97' Surface Elevation 46.73' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Schedule 40 PVC Diam. 2" Length 44' Sump Length 2.5'

Top of Casing Elevation 46.26' Stickup 0'

Depth to Water: 1. Ft. ( ) 2. Ft. ( )

Drilling Company Best Drilling Services, Inc. Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By Shannon Greenan

SKETCH MAP

NOTES

10" Inner Diameter New Carbon Steel Surface Casing Installed to 23 feet bgs.
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	25					25-30		At 25.0' light yellowish gray 5Y 6/2 diminishes to ~40 % of the matrix; damp; very stiff PP=3.5 tsf
					1.4			
	30					30-35	30.75-45	CLAY: Red 2.5YR 4/6 mottled with gray 5Y 6/3; damp; plastic; very hard PP>4.5 tsf
					0.0			
	35					35-40		
					0.0			
					0.0			
	40					40-45		
					0.2			
					0.0			
	45					45-50	45-46	CLAYEY SILTY SAND: Yellow orange-red 2.5YR 5/8; wet; soft PP=0.5 tsf
					0.0		46-50	SILTY CLAY: Yellow orange-red 2.5YR 5/8 with trace gray 5Y 6/2; damp; very stiff PP=3.5 to 4.0 tsf.
					0.0			
	50						96	

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MW-29B
DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-29B Date Drilled 04/12/01

roject Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 57 ' Boring Diam. 8.25 "

N. Coord. 727302.91' E. Coord. 3164238.97' Surface Elevation 46.73' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Schedule 40 PVC Diam. 2 " Length 44 ' Sump Length 2.5 '

Top of Casing Elevation 46.26' Stickup 0 '

Depth to Water: 1. Ft. ( ) 2. Ft. ( )

Drilling Company Best Drilling Services, Inc. Driller Sonny Tobola

Drilling Method Hollow Stem Auger Log By Shannon Greenan

SKETCH MAP

NOTES

10" Inner Diameter New Carbon Steel Surface Casing Installed to 23 feet bgs.
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	50				0.0	50-55	50-53.5	CLAYEY SAND: Reddish orange 2.5YR 5/8; wet; soft PP=0.5 tsf.
					0.0		53.5-57	CLAY: Red 2.5YR 4/6 mottled with gray 5Y 6/3; damp; plastic; hard PP=4.5 tsf.
	55				0.0	55-57		At 55.0' Reddish orange 2.5YR 5/8 clay with trace gray-tan mottling; very hard PP>4.5 tsf
								T.D. = 57 '
	60							
	65							
	70							
	75							

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Plugged 10/2011

MW-29C
DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-29C Date Drilled 04/27/01

Project Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 75' Boring Diam. 6.0"

N. Coord. 727292.82' E. Coord. 3164239.67' Surface Elevation 46.79' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Schedule 40 PVC Diam. 2" Length 62.5' Sump Length 2.5'

Top of Casing Elevation 46.46' Stickup 0'

Depth to Water: 1. Ft. ( ) 2. Ft. ( )

Drilling Company Best Drilling Services, Inc. Driller Alfredo Palacios

Drilling Method Mud Rotary Log By Shannon Greenan

SKETCH MAP

NOTES
12" Inner Diameter New Carbon Steel Surface Casing Installed to 23 feet bgs.
8 1/4" Inner Diameter New Carbon Steel Surface Casing Installed to 55 bgs.
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	0					0-23	0-12.5	SILTY CLAY: MW-29A, located ~12' north, was cored continuously from ground surface to 23' and accordingly, MW-29C was not cored through this interval. The MW-29A lithology is presented for informational purposes; refer to the MW-29A log for soil descriptions.
	5							
	10						12.5-15	SANDY CLAY
	15						15-19	CLAYEY SAND
							19-23	SANDY CLAY
	20							At 23.0' bottom of 12-inch diameter new carbon steel surface casing
						23-55	23-30.75	SILTY CLAY: MW-29B, located ~6' north, was cored continuously from ground surface to 55' and accordingly, MW-29 C was not cored through this interval. The MW-29B lithology is presented for informational purposes; refer to MW-29B log for descriptions.
	25							

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MW-29C DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-29C Date Drilled 04/27/01

Project Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 75' Boring Diam. 6.0"

N. Coord. 727292.82' E. Coord. 3164239.67' Surface Elevation 46.79' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Schedule 40 PVC Diam. 2" Length 62.5' Sump Length 2.5'

Top of Casing Elevation 46.46' Stickup 0'

Depth to Water: 1. Ft. _____ (_____) 2. Ft. _____ (_____)

Drilling Company Best Drilling Services, Inc. Driller Alfredo Palacios

Drilling Method Mud Rotary Log By Shannon Greenan

SKETCH MAP

NOTES
12" Inner Diameter New Carbon Steel Surface Casing Installed to 23 feet bgs.
8 1/4" Inner Diameter New Carbon Steel Surface Casing Installed to 55 bgs.
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	25							
	30						30.75-45	CLAY
	35							
	40							
	45						45-46	CLAYEY SILTY SAND
							46-50	SILTY CLAY
	50						50-53.5	CLAYEY SAND

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MW-29C DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-29C Date Drilled 04/27/01

Project Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 75' Boring Diam. 6.0"

N. Coord. 727292.82' E. Coord. 3164239.67' Surface Elevation 46.79' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Schedule 40 PVC Diam. 2" Length 62.5' Sump Length 2.5'

Top of Casing Elevation 46.46' Stickup 0'

Depth to Water: 1. Ft. ( ) 2. Ft. ( )

Drilling Company Best Drilling Services, Inc. Driller Alfredo Palacios

Drilling Method Mud Rotary Log By Shannon Greenan

SKETCH MAP

NOTES
12" Inner Diameter New Carbon Steel Surface Casing Installed to 23 feet bgs.
8 1/4" Inner Diameter New Carbon Steel Surface Casing Installed to 55 bgs.
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	50						53.5-55	CLAY
	55				0.0	55-60	55-60	At 55.0' bottom of 8 1/4-inch diameter new carbon steel surface casing SILTY CLAY: Red 5YR 4/6 mottled with trace gray, 5Y 6/2; damp; plastic; very stiff PP=3.5 tsf.
	60					60-65	55-60	NO RECOVERY: Driller reports drills like sand.
	65					65-66.8		
					0.0	66.8-69	66.8-67	SAND: Red 7.5YR 5/6; saturated; loose.
							67-67.3	SILTY SAND: Fine; red 7.5YR 5/6; wet; soft PP=0.5 tsf.
							67.3-68.25	SANDY CLAY: Red 5YR 5/6; very moist to wet; very soft PP=0.25 tsf.
							68.25-69	SILTY SAND: Fine; red 7.5YR 5/6; wet; soft PP=0.5 tsf.
						69-70	69-70	NO RECOVERY
	70					70-75	70-71	CLAYEY SILTY SAND: Red 5YR 5/6; wet; plastic; soft PP=0.5 tsf; trace reddish tan 7.5YR 5/6 sand.
					0.0		71-71.75	SILTY CLAY: Red 5YR 5/6 and reddish tan 7.5YR 5/6; damp; plastic; stiff PP=1.0 tsf.
							71.75-72.5	CLAYEY SILTY SAND: Red 5YR 5/6; wet; plastic; soft PP=0.5 tsf; trace reddish tan 7.5YR 5/6 sand.
					0.0			
	75						100	

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MW-29C
DRILLING LOG

W.O. NO. 422-009 Boring/Well ID MW-29C Date Drilled 04/27/01

Project Phase 2C RFI Owner Union Pacific Railroad Company

Location Houston Wood Preserving Works Boring T.D. 75' Boring Diam. 6.0"

N. Coord. 727292.82' E. Coord. 3164239.67' Surface Elevation 46.79' MSL Datum

Screen: Type Schedule 40 PVC Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Schedule 40 PVC Diam. 2" Length 62.5' Sump Length 2.5'

Top of Casing Elevation 46.46' Stickup 0'

Depth to Water: 1. Ft. ( ) 2. Ft. ( )

Drilling Company Best Drilling Services, Inc. Driller Alfredo Palacios

Drilling Method Mud Rotary Log By Shannon Greenan

SKETCH MAP

NOTES
12" Inner Diameter New Carbon Steel Surface Casing Installed to 23 feet bgs.
8 1/4" Inner Diameter New Carbon Steel Surface Casing Installed to 55 bgs.
PP = Pocket Penetrometer
tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (PPM)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	75						72.5-75	SILTY CLAY: Red 5YR 5/6 and reddish tan 7.5YR 5/6; damp; plastic; very stiff PP=3.5 tsf. T.D. = 75'
	80							
	85							
	90							
	95							
	100							

101

ERM.

MW-30A DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-30A Date Drilled 12/8/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 33 ' Boring Diam. 8.25 "

N. Coord. 728759.0600 ' E. Coord. 3167517.0680 'Surface Elevation 47.7' Ft. MSL Datum

Screen: Type Stainless steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless steel Diam. 2 " Length 20 ' Sump Length 2.5 '

Top of Casing Elevation 50.45 ' Stickup 3 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
47.7	0					0-1	0-4	FILL: Dark yellowish brown (10YR 3/4) from 0'-3.5', very dark brown (7YR 2.5/2) from 3.5'-4', cobbles and silty sand, fine-grained, sorted, subrounded, some black staining and wood fragments from 1'-3.5', moist, 82% recovery.
50					0.0	1-3.5		
					1.2	3.5-8.5		
					0.6		4-12	SANDY CLAY: Dark gray (10YR 4/1) from 4'-7', gray (10YR 6/1) from 7'-8.5', mottled, some iron nodules, some black nodules, sand decreasing with depth, very stiff (pp = 3.0 tsf). At 8.5' sand increasing with depth, moist, 100% recovery.
45	5							
					0.6	8.5-13.5		
40	10							
					0.0		12-23.5	CLAYEY SAND: Gray (10YR 6/1) from 12'-13.5', light gray (10YR 7/1) from 13.5'-23.5',very fine-grained, sorted, subrounded to subangular w depth, some black staining, some iron staining, product observed from 13.5'-23.5', slight odor, moist from 12'-13.5', saturated from 13.5'-23.5', 50% recovery.
					0.3	13.5-18.5		
	15						22	

ERM.

MW-30A
DRILLING LOG

J.O. NO. 422-102 Boring/Well ID MW-30A Date Drilled 12/8/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 33 ' Boring Diam. 8.25 "

N. Coord. 728759.0600 ' E. Coord. 3167517.0680 'Surface Elevation 47.7' Ft. MSL Datum

Screen: Type Stainless steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless steel Diam. 2 " Length 20 ' Sump Length 2.5 '

Top of Casing Elevation 50.45 ' Stickup 3 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
35	15							
					4.7	18.5-23.5		
30	20							
					1.9	23.5-28.5	23.5-28.5	NO RECOVERY
25	25							
					NA	28.5-29.5	28.5-29.5	CLAYEY SAND: Light reddish brown (5YR 6/4), clay increasing with depth, some gravel, odor, saturated to moist with depth, 100 % recovery.
	30				9.8	29.5-33	29.5-33	SILTY CLAY: Reddish brown (5YR 5/4), mottled, plastic, hard (pp = >4.5 tsf), fractured, black staining in fractures, some sand decreasing with depth, moist, 100% recovery.

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ERM.

MW-30A
DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-30A Date Drilled 12/8/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 33 ' Boring Diam. 8.25 "

N. Coord. 728759.0600 ' E. Coord. 3167517.0680 'Surface Elevation 47.7' Ft. MSL Datum

Screen: Type Stainless steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless steel Diam. 2 " Length 20 ' Sump Length 2.5 '

Top of Casing Elevation 50.45 ' Stickup 3 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
20	30				70.5			T.D. = 33 '
15	35							
10	40							
	45						24	

ERM.

MW-31A DRILLING LOG

P.O. NO.	422-102	Boring/Well ID	MW-31A	Date Drilled	12/8/2003
Project	Houston Wood Preserving works	Owner	Union Pacific Railroad Company		
Location	Houston, Texas	Boring T.D.	34'	Boring Diam.	8.25"
N. Coord.	728647.8540'	E. Coord.	3167476.9270'	Surface Elevation	49.4' Ft. MSL Datum
Screen: Type	Stainless steel	Diam.	2"	Length	10' Slot Size 0.1"
Casing: Type	Stainless steel	Diam.	2"	Length	21.5' Sump Length 2.5'
Top of Casing Elevation	52.08'			Stickup	3'
Depth to Water:	1. Ft. 15.19	(12/9/03)	2. Ft. 0	( )	
Drilling Company	Fugro Geosciences, Inc.	Driller	Steve Bender		
Drilling Method	Hollow stem auger	Log By	Marcel St. Marie		

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
52.08	0					0-5	0-3	CLAYEY SAND: Brown (5YR 6/3) from 0'-0.2', black (5YR 2.5/1), from 0.2'-3', fine-grained, sorted, subrounded, gravelly, wood from 2.9'-3', 100 % recovery, strong odor, moist, 100% recovery.
50					9.9		3-6	SANDY CLAY: Black (5YR 2.5/1), plastic, firm (pp = 1.0 tsf), trace rootlets, trace gravels, sand decreasing with depth, oily, strong odor, moist, 100% recovery.
	5				51.3	5-10		
45					58.3		6-18.4	SILTY CLAY: Dark reddish gray (2.5YR 3/1) from 6'-12.6', greenish gray (2.5YR 5/10) from 12.6'-17', dark geenish gray (2.5YR 4/10) from 17'-18.4', mottled, plastic, firm (pp = 1.25 tsf), trace rootlets, trace silt lenses, some iron nodules, some black staining, sand increasing with depth, strong odor, moist, 100% recovery.
	10				6.6	10-15		
40								
	15						25	

ERM.

MW-31A DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-31A Date Drilled 12/8/2003

Project Houston Wood Preserving works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 34' Boring Diam. 8.25 "

N. Coord. 728647.8540 ' E. Coord. 3167476.9270 'Surface Elevation 49.4' Ft. MSL Datum

Screen: Type Stainless steel Diam. 2 " Length 10 ' Slot Size 0.1 "

Casing: Type Stainless steel Diam. 2 " Length 21.5 ' Sump Length 2.5 '

Top of Casing Elevation 52.08' Stickup 3 '

Depth to Water: 1. Ft. 15.19 (12/9/03) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Hollow stem auger Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	15				8.9	15-20		
35					15.2			
							18.4-25	CLAYEY SAND: Dark greenish gray (2.5YR 4/10) from 18.4'-21.8', dark reddish brown (5YR 2.5/2) from 21.8'-25', some pinkish coloring, fine-grained, sorted, subangular, stiff (pp=1.5 tsf) at 16', soft (pp=0.5 tsf) at 18.5', clay is decreasing, wet from 18.4'-21.8', saturated from 21.8'-25', product is observed, strong odor, 100 % recovery.
	20				24.8	20-25		
30					13.9			
	25				113.8	25-30	25-30	NO RECOVERY
25								
	30							

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ERM.

MW-31A
DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-31A Date Drilled 12/8/2003

Project Houston Wood Preserving works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 34' Boring Diam. 8.25 "

N. Coord. 728647.8540 ' E. Coord. 3167476.9270 'Surface Elevation 49.4' Ft. MSL Datum

Screen: Type Stainless steel Diam. 2 " Length 10 ' Slot Size 0.1 "

Casing: Type Stainless steel Diam. 2 " Length 21.5 ' Sump Length 2.5 '

Top of Casing Elevation 52.08' Stickup 3 '

Depth to Water: 1. Ft. 15.19 (12/9/03) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Hollow stem auger Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
20	30				NR	30-33	30-33	SILTY CLAY: Gray (7.5YR 6/1), mottled, plastic, hard (pp=>4.5 tsf), fractured, some pea size black nodules, some gravel from 32.3'-32.5', trace rootlets, moist, 100% recovery.
					54.0			
					24.3			T.D. = 34 '
15	35							
10	40							
	45						27	

ERM.

MW-32A DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-32A Date Drilled 12/29/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 33 ' Boring Diam. 7.88 "

N. Coord. 728913.7360 ' E. Coord. 3167400.8980 ' Surface Elevation 44.54 ' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 20.5 ' Sump Length 2.5 '

Top of Casing Elevation 43.77 ' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

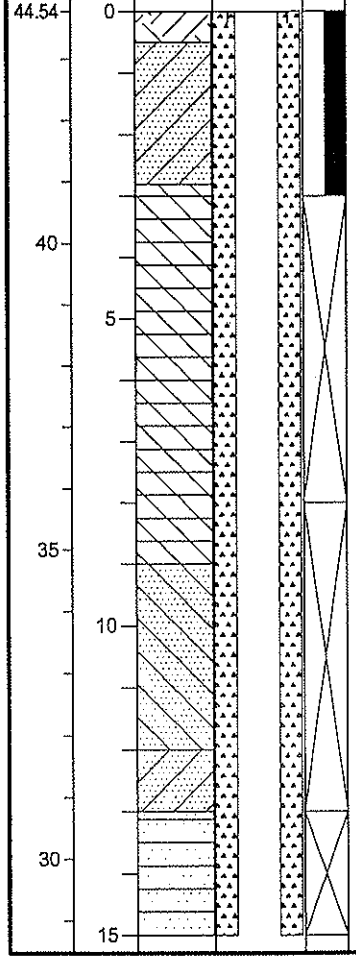
Drilling Method Mud rotary Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot



Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0-3	0-0.5	FILL: Asphalt
	0.5-2.8	CLAYEY SAND: Yellowish brown (10YR 5/4), fine-grained, sorted, subangular, moist, some gravels, some wood fragments, strong odor, 100% recovery.
3-8	2.8-9	SILTY CLAY: Yellowish red (5YR 5/6), mottled, moist, plastic, very soft (pp=0.25 tsf), some gravels, 100% recovery. At 3'-8' pinkish gray (7.5YR 6/2) mottling, very stiff (pp=2.25 tsf), some sand, some iron staining, some black nodules, some silt lenses. Sand layer from 4.2'-4.4'. Sand is very fine-grained, sorted, subangular, yellowish red (5YR 5/6). At 7'-8' some rootlets and trace sand. From 7.7'-8' greenish gray (6/10Y-GLEY). At 8'-9' sand increases.
8-13	9-12	SANDY CLAY: Greenish gray (6/10Y-GLEY), moist, very stiff (pp=2.25 tsf), trace iron staining, sand increasing, 100% recovery.
	12-13	CLAYEY SAND: Greenish gray (6/10Y-GLEY), fine-grained, sorted, subangular, saturated, some black staining, 100% recovery.
13-18	13-18	SILTY SAND: Greenish gray (6/10Y-GLEY), fine-grained, sorted, subangular, saturated, trace clay, 20% recovery.

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ERM.

MW-32A
DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-32A Date Drilled 12/29/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 33 ' Boring Diam. 7.88 "

N. Coord. 728913.7360 ' E. Coord. 3167400.8980 ' Surface Elevation 44.54 ' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 20.5 ' Sump Length 2.5 '

Top of Casing Elevation 43.77 ' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
25	15				18-23	18-30	NO RECOVERY: At 23'-30" odor noted from cuttings.
20	20				23-28		
15	25				28-30		
	30					29	

ERM.

MW-32A
DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-32A Date Drilled 12/29/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 33 ' Boring Diam. 7.88 "

N. Coord. 728913.7360 ' E. Coord. 3167400.8980 'Surface Elevation 44.54 ' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 20.5 ' Sump Length 2.5 '

Top of Casing Elevation 43.77 ' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
10	30				30-33	30-30.2 30.2-33	SANDY CLAY: Greenish gray (6/10Y-GLEY), moist, plastic, very stiff (pp=2.75 tsf), product observed, odor, 100 % recovery. CLAY: Yellowish red (5YR 4/6), mottled, moist, plastic, pp=3.0 tsf, highly fractured, product present in fractures, trace silt lenses, strong odor, 100 % recovery. T.D. = 33 '
5	35						
0	40						
	45					30	

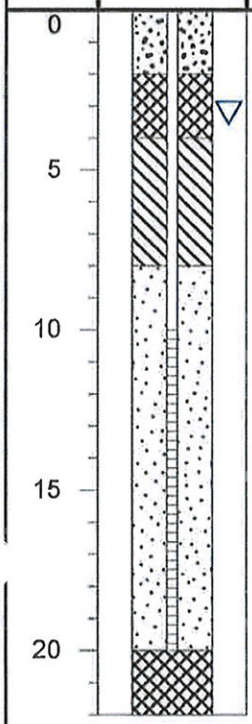
Union Pacific Railroad

Log of Boring: MW-32AR

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	12/15/2011	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	5
Driller:	Tim Beach	Total Depth (ft):	22
Driller's License:	58141	Northing:	728925.14
Field Supervisor:	Tim Jennings	Easting:	3167400.14
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	44.74



Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			DO	PAV.	(0 - 0.2) Asphalt Pavement
					(0.2 - 0.7) Gravel Base Material
				FILL	(0.7 - 5) FILL, gravelly clay, caliche-like
5			1.5/5	CL	(5 - 9.5) SANDY GRAVELLY CLAY, CL, light brown and light gray, moist, ~20-40% fine gravel, and fine to coarse carbonate sand, grade to silty sand
10			12/12	SM	(9.5 - 11.7) SILTY SAND, SM, gray, wet, ~30-40% fines in very fine to fine sand, slight odor
				SP	(11.7 - 18) POORLY GRADED SAND, SP, brown to gray, wet, very fine to fine sand, slight odor
15					
				SM/SC	(18 - 19.7) SILTY CLAYEY SAND, SM/SC, gray, wet, ~40-50% medium plasticity fines in very fine to fine sand, firm
20				CH	(19.7 - 22) SANDY CLAY, CH, light gray, moist, ~20-30% fine sand in high plasticity clay, soft to firm, slight odor

PBW
Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Top 5 feet drilled out (DO) with a hydrovac to clear for utilities.

Initial Fluid Level (01/27/12)
Depth to water: 3.22 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 4.0) Portland/Bentonite Grout
(4.0 - 8.0) Bentonite Pellets
(8.0 - 20.0) 20/40 Silica Sand
(20.0-22.0) Caved Formation

Well Materials
(0 - 10.0) Casing, 2" FJT Sch 40 PVC
(10.0 - 20.0) Screen, 2" FJT Sch 40 PVC, 0.01 slot

TOC Elevation (ft AMSL)
44.56

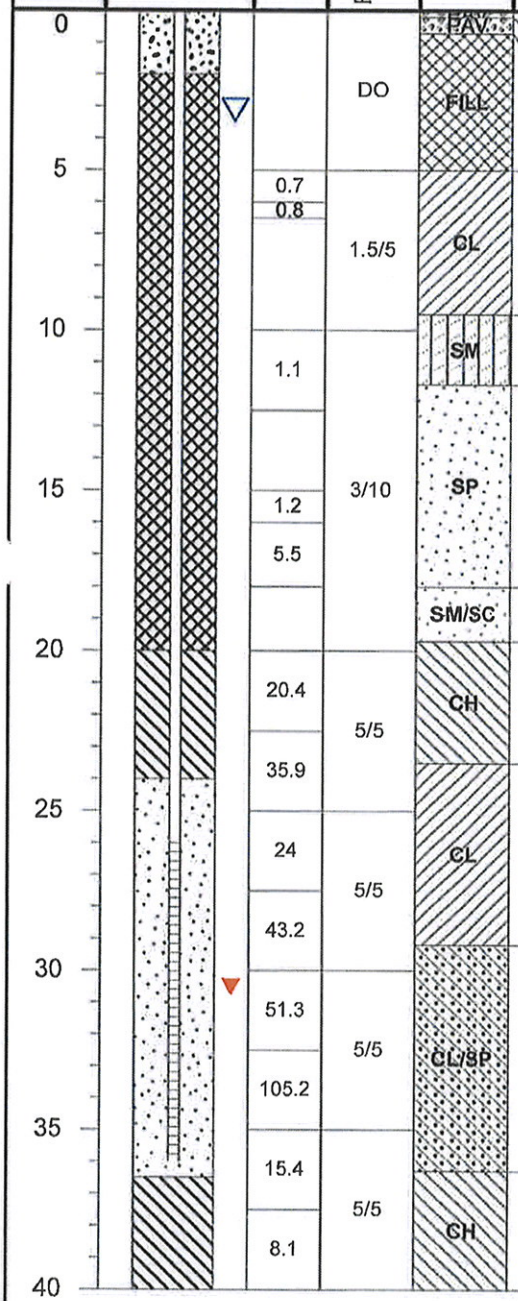
Union Pacific Railroad

Log of Boring: MW-32B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	12/15/2011	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	5
Driller:	Tim Beach	Total Depth (ft):	40
Driller's License:	58141	Northing:	728918.2
Field Supervisor:	Tim Jennings	Easting:	3167400.46
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	44.73



USCS	Lithologic Description
PAV	(0 - 0.2) Asphalt Pavement
	(0.2 - 0.7) Gravel Base Material
FILL	(0.7 - 5) FILL, gravelly clay, caliche-like
CL	(5 - 9.5) SANDY GRAVELLY CLAY, CL, light brown and light gray, moist, ~20-40% fine gravel, and fine to coarse carbonate sand, grade to silty sand
SM	(9.5 - 11.7) SILTY SAND, SM, gray, wet, ~30-40% fines in very fine to fine sand, slight odor
SP	(11.7 - 18) POORLY GRADED SAND, SP, brown to gray, wet, very fine to fine sand, slight odor
SM/SC	(18 - 19.7) SILTY CLAYEY SAND, SM/SC, gray, wet, ~40-50% medium plasticity fines in very fine to fine sand, firm
CH	(19.7 - 23.5) SANDY CLAY, CH, light gray, moist, ~20-30% fine sand in high plasticity clay, soft to firm, slight odor
CL	(23.5 - 29.2) SANDY GRAVELLY CLAY, CL, orange and reddish brown with gray mottling, moist, ~5-10% fine sand (increases to ~30% sand 25 to 28.5 feet) , <5% fine to coarse gravel, purple and black staining around gravel, thin gravel seams (interbeds) at 26.6, and 29-29.2 feet, small amount of NAPL in gravel bed at 29-29.2 feet (NAPL seeps out of core after laying out for 10-15 minutes), strong odor
CL/SP	(29.2 - 36.3) SANDY CLAY, CL/SP, reddish brown with gray mottling moist to dry, ~5-20% very fine sand mostly as fracture lining and fill, low to medium plasticity clay is very fractured and very friable, small amount of NAPL seeping out of sand-lined fractures 34-34.8 feet, strong odor
CH	(36.3 - 40) CLAY, CH, reddish brown and gray along fractures, very stiff, high plasticity clay, locally fractured with slickensides, fractures at 25 to 45 degree angle from vertical, slight odor

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Top 5 feet drilled out (DO) with a hydrovac to clear for utilities.
8-inch sonic isolation casing advanced to 23' then removed during grouting.

Initial Fluid Level (01/27/12)
Depth to water: 3.11 ft BTOC
Depth to NAPL: 30.52 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 20.0) Portland/Bentonite Grout
(20.0 - 24.0) Bentonite Pellets
(24.0 - 36.5) 20/40 Silica Sand
36.5 - 40.0) Bentonite Pellets

Well Materials
(0 - 26.0) Casing, 2" FJT Stainless Steel
(26.0 - 36.0) Screen, 2" FJT Stainless Steel, 0.01 slot

TOC Elevation (ft AMSL)
44.41

ERM.

MW-33A DRILLING LOG

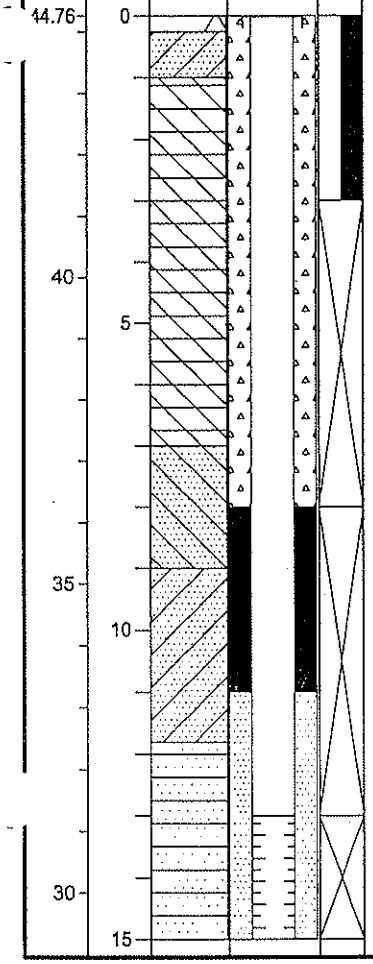
J.O. NO.	422-102	Boring/Well ID	MW-33A	Date Drilled	12/30/2003
Project	Houston Wood Preserving Works	Owner	Union Pacific Railroad Company		
Location	Houston, Texas	Boring T.D.	25.5'	Boring Diam.	7.88"
N. Coord.	728988.5670'	E. Coord.	3167667.8710'	Surface Elevation	44.76' Ft. MSL Datum
Screen: Type	Stainless Steel	Diam.	2"	Length	10' Slot Size 0.01"
Casing: Type	Stainless Steel	Diam.	2"	Length	13' Sump Length 2.5'
Top of Casing Elevation	44.25'			Stickup	0'
Depth to Water:	1. Ft. 0 ( )	2. Ft. 0 ( )			
Drilling Company	Fugro Geosciences, Inc.	Driller	Steve Bender		
Drilling Method	Mud rotary	Log By	Marcel St. Marie		

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot



Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
						0-3	0-0.25	OTHER: Asphalt, removed by driller.
							0.25-1	CLAYEY SAND: Dark grayish brown (10YR 4/2), clay increasing with depth, some gravels, moist, 100% recovery.
							1-7	SILTY CLAY: Dark grayish brown (10YR 4/2), mottled, plastic, very stiff (pp=2.5 tsf), some sand increasing with depth, trace iron nodules, some iron staining, rootlets, moist, 100% recovery. At 3' becomes light gray (2.5Y 7/2), some sand lenses (up to 1" diameter), grayish brown (2.5Y 5/2), very fine-grained, sorted, subangular.
					0.0	3-8		
					1.4			
					1.4	8-13	7-9	SANDY CLAY: Light gray (2.5Y 7/2), mottled, very stiff (pp=2.25 tsf), rootlets, some black staining, moist, 100% recovery.
					1.4		9-11.8	CLAYEY SAND: Greenish gray (GLEY 6/5GY), fine-grained, sorted, subangular, soft (pp=0.5 tsf), wet, 100% recovery.
					1.4	13-18	11.8-23	SILTY SAND: Greenish gray (GLEY 6/5GY), fine-grained, sorted, subangular, soft (pp=0.5 tsf), trace of clay, wet, saturated at 14', 50 % recovery. At 18' becomes light yellowish brown (2.5Y 6/2).

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ERM.

MW-33A DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-33A Date Drilled 12/30/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 25.5' Boring Diam. 7.88"

N. Coord. 728988.5670' E. Coord. 3167667.8710' Surface Elevation 44.76' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Stainless Steel Diam. 2" Length 13' Sump Length 2.5'

Top of Casing Elevation 44.25' Stickup 0'

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	15				1.4			
					2.1	18-23		
25					2.4			
	20							
						23-25.5	23-25.5	SILTY CLAY: Light gray (2.5Y 7/1), mottled, plastic, hard (pp=4.25 tsf), trace fractures, trace silt lenses, trace white nodules, rootlets, moist, 100 % recovery.
20								
	25				7.7			T.D. = 25.5'
15								
	30						32	

Union Pacific Railroad

Log of Boring: MW-33B

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	2/23/07	Drilling Method:	HSA
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	7.5
Driller:	Sonny Tobola	Total Depth (ft):	75
Driller's License:	3026	Northing:	3167660.91
Field Supervisor:	James Whittington, P.G.	Easting:	729149.63
Sampling Method:	2" x 3' Split Spoon	Casing Elevation (ft):	44.35

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
0			0	Fill	(0.0 to 0.25) Asphalt. (0.25 to 1.0) Gravelly clay FILL, red.
		0.2	75	CL	(1.0 to 3.0) Silty CLAY, very dark gray, gradational basal contact.
		0.1	100	CL/SC	(3.0 to 6.0) Silty CLAY and SAND, mottled gray and reddish-brown, increasing sand content with depth, gradational basal contact.
5		0	100		
		0	100	SP	(6.0 to 12.0) SAND, gray, fine-grained, ~25% clay, decreasing clay content with depth, gradational basal contact.
			0		
10		0.1	75		
		0	75	SP	(12.0 to 21.0) SAND, gray, sand is fine-grained quartz, < 10% clay, Base of Oxidzided Zone at 14.0, gradational basal contact.
			0		
15		0.1	75		
		0.3	50		
			0		
20		0.1	50		
		0	25	SP	(21.0 to 27.0) SAND, brown, medium- to fine-grained, ~80% sand, 10% silt, 10% clay, sharp basal contact.
			0		
25		0.1	100		
		8.5	90	CL	(27.0 to 30.0) CLAY, mottled reddish-brown and gray, ~5% small carbonaceous clasts, ~10% sand, creosote odor at ~29.0.
30					(30.0 to 40.0) silty CLAY, mottled reddish-brown and gray, firm, moist;

STATE OF TEXAS
JAMES R. WHITTINGTON
GEOLOGY
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LICENSED
PROFESSIONAL GEOSCIENTIST

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. 10" PVC surface casing set from 0 to 28.5 feet bgs.
2. Borehole grouted from 48 to 75 feet bgs, bentonite plug from 42 to 48 feet bgs

Annular Materials
(0 to 29.0) Bentonite-Cement Grout
(29.0 - 31.0) Bentonite Pellets
(31.0 - 42.0) 16-30 Silica Sand

Well Materials
(0 to 32.0) Casing, 2" Stainless Steel
(32.0 to 42.0) Screen 2" Wire Wrapped Stainless Steel 0.010 slot

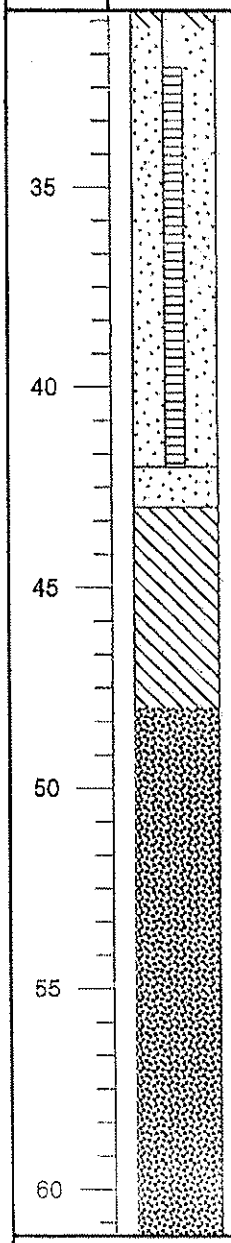
Union Pacific Railroad

Log of Boring: MW-33B

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	2/23/07	Drilling Method:	HSA
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	7.5
Driller:	Sonny Tobola	Total Depth (ft):	75
Driller's License:	3026	Northing:	3167660.91
Field Supervisor:	James Whittington, P.G.	Easting:	729149.63
Sampling Method:	2" x 3' Split Spoon	Casing Elevation (ft):	44.35



Depth (ft)	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
35	132		CL	carbonaceous nodules at 33.0, 35.0, 40.0; strong odor, product visible within matrix of freshly broken surfaces, gradational basal contact.
	38			
	141			
	145			
40	21			
	10			(40.0 to 62.0) CLAY, reddish-brown, moist, silty intervals < 0.5' thick at 48.0 and 56.0, weaker odor than at 30.0 to 40.0, sharp basal contact.
	6			
45	4.5			
	3.0			
	8.0			
50	1.5		CL	
	1			
	2			
55	1.0			
	1.0			
60	0.3			

PBW

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Notes:
1. 10" PVC surface casing set from 0 to 28.5 feet bgs.
2. Borehole grouted from 48 to 75 feet bgs, bentonite plug from 42 to 48 feet bgs

Annular Materials

(0 to 29.0) Bentonite-Cement Grout
(29.0 - 31.0) Bentonite Pellets
(31.0 - 42.0) 16-30 Silica Sand

Well Materials

(0 to 32.0) Casing, 2" Stainless Steel
(32.0 to 42.0) Screen 2" Wire Wrapped Stainless Steel 0.010 slot

Union Pacific Railroad

Log of Boring: MW-33B

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	2/23/07	Drilling Method:	HSA
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	7.5
Driller:	Sonny Tobola	Total Depth (ft):	75
Driller's License:	3026	Northing:	3167660.91
Field Supervisor:	James Whittington, P.G.	Easting:	729149.63
Sampling Method:	2" x 3' Split Spoon	Casing Elevation (ft):	44.35

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
65		0.5		SC	(62.0 to 75.0) Silty, clayey SAND; reddish-brown to medium brown, moderate creosote odor, saturated, sand increases with depth.
		41			
70		38			
75					

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Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. 10" PVC surface casing set from 0 to 28.5 feet bgs.
2. Borehole grouted from 48 to 75 feet bgs, bentonite plug from 42 to 48 feet bgs

Annular Materials
(0 to 29.0) Bentonite-Cement Grout
(29.0 - 31.0) Bentonite Pellets
(31.0 - 42.0) 16-30 Silica Sand

Well Materials
(0 to 32.0) Casing, 2" Stainless Steel
(32.0 to 42.0) Screen 2" Wire Wrapped Stainless Steel 0.010 slot

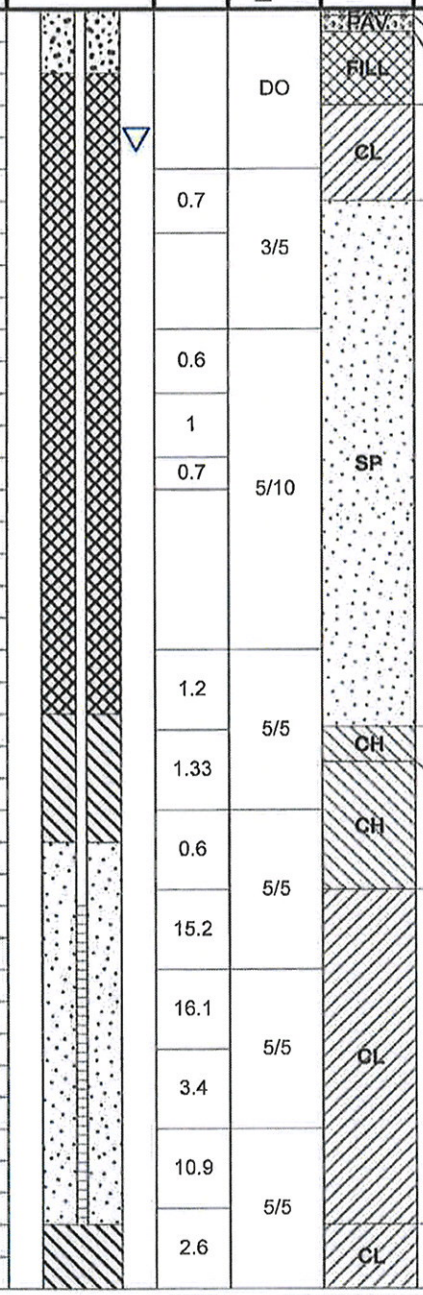
Union Pacific Railroad

Log of Boring: MW-33BR

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	12/19/2011	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	5
Driller:	Tim Beach	Total Depth (ft):	40
Driller's License:	58141	Northing:	729142.16
Field Supervisor:	Tim Jennings	Easting:	3167661.63
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	44.86



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Notes:
Top 5 feet drilled out (DO) with a hydrovac to clear for utilities.
8-inch sonic isolation casing advanced to 25' then removed during grouting.

Initial Fluid Level (01/27/12)
Depth to water: 4.07 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 22.0) Portland/Bentonite Grout
(22.0 - 26.0) Bentonite Pellets
(26.0 - 38.0) 20/40 Silica Sand
38.0 - 40.0) Bentonite Pellets

Well Materials
(0 - 28.0) Casing, 2" FJT Stainless Steel
(28.0 - 38.0) Screen, 2" FJT Stainless Steel, 0.01 slot

TOC Elevation (ft AMSL)
44.46

ERM.

MW-34C DRILLING LOG

J.O. NO.	422-102	Boring/Well ID	MW-34C	Date Drilled	1/13/2004
Project	Houston Wood Preserving Works	Owner	Union Pacific Railroad Company		
Location	Houston, Texas	Boring T.D.	72.5'	Boring Diam.	7.88"
N. Coord.	728933.9030'	E. Coord.	3168159.5200'	Surface Elevation	45.63' Ft. MSL Datum
Screen: Type	Stainless Steel	Diam.	2"	Length	10' Slot Size 0.01"
Casing: Type	Stainless Steel	Diam.	2"	Length	60' Sump Length 2.5'
Top of Casing Elevation	45.31'			Stickup	0'
Depth to Water:	1. Ft. 0 ( )	2.. Ft. 0 ( )			
Drilling Company	Fugro Geosciences, Inc.	Driller	Steve Bender		
Drilling Method	Mud Rotary	Log By	Vivian Rohrback		

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
45.31	0					0-0.58	0-0.58	CONCRETE: Road material.
45					NM	0.58-2	0.58-2	CLAY: Dark gray (7.5YR 4/1), plastic, some gravel up to 1/2" diameter, moist, 100% recovery.
					0.0	2-4	2-3	SILTY CLAY: Dark greenish gray (GLEY 3/10Y), soft (pp=0.5 tsf), some gravel up to 1/2" diameter, moist, 100 % recovery.
							3-6	SANDY CLAY: Greenish gray (GLEY 6/10Y), fine-grained, subangular, stiff (pp=1.25 tsf), cobbles up to 1" in diameter, moist. At 5' has olive yellow mottling (2.5Y 6/8), stiff (pp=2.0 tsf), iron nodules, and gravel up to 1/2" diameter, 75% recovery.
					0.0	4-6		
40	5				0.0	6-8	6-8	SANDY SILTY CLAY: Greenish gray (GLEY 5/10Y), orange red mottling, very stiff (pp=2.5), gravels up to 1/2" diameter, moist, 100 % recovery.
					0.0	8-10	8-9	NO RECOVERY
							9-10	SANDY CLAY: Greenish gray (GLEY 6/5GY), brownish yellow (10YR 7/8) mottling, stiff (pp=1.5 tsf), fine-grained, subrounded, gravel up to 3/4" diameter, some iron nodules, moist, 100 % recovery.
35	10				0.0	10-12	10-12	SILTY SANDY CLAY: Greenish gray (GLEY 6/10Y), brownish yellow mottling, fine-grained, subangular, black staining, moist, 100 % recovery.
					0.0	12-14	12-14	SANDY CLAY: Greenish gray (GLEY 6/5GY), yellowish brown (10YR 5/6) at 13.5', mottling at 13.5', pinkish tinge, very stiff (pp= 3 tsf at 12' and 2.5 tsf at 13'), fine-grained, subrounded, gravel up to 3/4" diameter, some iron nodules, some white calcareous nodules, moist, 100 % recovery.
					0.0	14-16	14-15.5	SILTY SANDY CLAY: Greenish gray (GLEY 6/5BG) with light greenish gray (GLEY 4/5BG) and olive yellow (2.5Y 6/8) mottling, fine grained, subangular, gravels up to 1/2" diameter, moist, 100 % recovery.
	15						33	

ERM.

MW-34C DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-34C Date Drilled 1/13/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 72.5' Boring Diam. 7.88"

N. Coord. 728933.9030' E. Coord. 3168159.5200' Surface Elevation 45.63' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Stainless Steel Diam. 2" Length 60' Sump Length 2.5'

Top of Casing Elevation 45.31' Stickup 0'

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud Rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
30	15				0.0	16-18	15.5-18	CLAYEY SAND: Dark greenish gray (GLEY 4/10Y), yellowish red (5YR 5/8) at 16.5', fine-grained, subangular, moist, 75 % recovery.
					0.0	18-20	18-18.5	SANDY CLAY: Greenish gray (GLEY 6/10Y), fine-grained, subangular, moist to saturated, 100% recovery.
							18.5-19.5	CLAYEY SAND: Yellowish brown (10YR 5/6), fine-grained, subangular, moist, 100% recovery.
							19.5-21	NO RECOVERY
25	20				0.0	20-22		
					0.0	22-24	21-26	CLAYEY SAND: Bluish gray (GLEY 6/5BG), grades to a pinkish gray, fine-grained, subangular, some iron flecks, some clay lenses, some gravels up to 1/2" diameter, moist to saturated, 75 % recovery. At 22' becomes greenish gray (GLEY 6/10Y), caliche zone at 22.8', wet, 1" of brownish yellow (10YR 6/8) clayey sand at 25.5', odor.
					0.8	24-26		
20	25				4.7	26-28	26-28	CLAY: Yellowish red (5YR 4/6), pale yellow (2.5Y 7/3) mottling, stiff (pp=2.0 tsf), laminated, fractured, fractures filled with black staining, moist, 100% recovery.
					0.0	28-30	28-32	SILTY CLAY: Yellowish red (5YR 5/6) with light greenish gray (GLEY 7/10BG) mottling, very stiff (pp=3.5 tsf), silt lenses, fractured, iron staining, mild odor, moist, 100 % recovery. At 30' becomes dark yellowish brown (10YR 4/6), very stiff (pp=3.5 tsf), manganese oxide nodules at 31.5', odor.
	30							

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ERM.

MW-34C DRILLING LOG

J.O. NO. 422-102 Boring/Well ID MW-34C Date Drilled 1/13/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 72.5' Boring Diam. 7.88"

N. Coord. 728933.9030' E. Coord. 3168159.5200' Surface Elevation 45.63' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Stainless Steel Diam. 2" Length 60' Sump Length 2.5'

Top of Casing Elevation 45.31' Stickup 0'

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud Rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
15	30				0.0	30-32		
					0.0	32-34	32-32.5	NO RECOVERY
							32.5-34	CLAYEY SILT: Light greenish gray (GLEY 7/10BG), pp=3.5 tsf moist, iron nodules, black staining at 32.5', silt lenses.
					71.9	34-36	34-34.5	NO RECOVERY
10	35						34.5-36	SILTY CLAY: Light greenish gray (GLEY 7/10BG) with brownish yellow (10YR 6/8) mottling, hard (pp=>4.5 tsf), fractured, manganese oxide staining, few iron nodules, odor, moist, 100 % recovery.
					1.1	36-38	36-36.5	NO RECOVERY
							36.5-38	CLAYEY SILT: Light greenish gray (GLEY 7/5GY) with yellowish red (5YR 5/6) mottling, stiff (pp=2.0), fractured, sheen, odor, moist, 100 % recovery.
					82.0	38-40	38-48	SILTY CLAY: Reddish yellow (5YR 6/6) with light olive gray (5Y 6/2) mottling, hard (pp=>4.5 tsf), fractured, manganese oxide staining, few iron nodules, sheen, odor, moist, 75% recovery. Silt increases from 40.8'-44.6', hard (pp=>4.5 tsf). At 44' becomes yellowish red (5YR 5/6) with light greenish gray (GLEY 7/10BG), very stiff (pp=4.0 tsf), fractured, bioturbation. Clay lenses at 47.5', plastic, hard (pp=>4.5 tsf) at 46', stiff (pp=2.25 tsf) at 48', odor.
5	40				8.5	40-42		
					4.8	42-44		
					2.8	44-46		
	45							

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ERM.

MW-34C DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-34C Date Drilled 1/13/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 72.5 ' Boring Diam. 7.88"

N. Coord. 728933.9030 ' E. Coord. 3168159.5200 'Surface Elevation 45.63' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2" Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2" Length 60 ' Sump Length 2.5 '

Top of Casing Elevation 45.31' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud Rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	45				1.8	46-48		
					11.8	48-50	48-50	NO RECOVERY
-5	50				NM	50-52	50-54	SILTY CLAY: Yellowish red (5YR 5/6) with light greenish gray (GLEY 7/10BG), very stiff (pp=4.0 tsf) at 50' and hard (pp=>4.5 tsf) at 52', manganese oxide staining, limestone gravel at 50'-50.2', odor, moist, 75 % recovery. Silt lenses, very stiff (pp=3.0 tsf), bioturbation, slight odor at 53'.
					3.8	52-54		
-10	55				0.8	54-56	54-58	SILTY CLAY: Slightly silty clay, yellowish red (5YR 5/6) with light greenish gray (GLEY 7/10BG), very stiff (pp=3.5 tsf at 55' and pp=4.0 tsf at 56', pp=2.25 tsf at 57'), fractured, silt lenses, manganese oxide staining, odor, moist, 100% recovery. At 57.5' becomes clayey sand, fine-grained, subrounded, clay partings, slight odor.
					0.8	56-58		
					0.5	58-60	58-59.5	SILTY SANDY CLAY: Yellowish red (5YR 5/6), plastic, very fine-grained, well sorted, moist, odor, 100% recovery.
	60						59.5-60	SILTY CLAY: Yellowish red (5YR 4/6) with light greenish gray (GLEY 7/10BG) mottling, hard (pp=>4.5 tsf), fractured, laminated, odor, moist, 100% recovery.

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ERM.

MW-34C DRILLING LOG

V.O. NO. 422-102 Boring/Well ID MW-34C Date Drilled 1/13/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 72.5' Boring Diam. 7.88"

N. Coord. 728933.9030' E. Coord. 3168159.5200' Surface Elevation 45.63' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Stainless Steel Diam. 2" Length 60' Sump Length 2.5'

Top of Casing Elevation 45.31' Stickup 0'

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud Rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-15	60				0.0	60-62	60-61	SILTY SAND: Yellowish red (5YR 5/6), fine-grained, subrounded, wet, 75% recovery.
							61-62	SILTY SANDY CLAY: Yellowish red (5YR 5/6), fine-grained, slight odor, moist, 100% recovery.
					0.1	62-64	62-64	SANDY CLAY: Yellowish red (5YR 5/6), fine-grained, clay partings, moist, 100% recovery.
-20	65				0.0	64-66	64-68	SILTY SAND: Yellowish red (5YR 5/6), fine-grained, subrounded, clay partings, sheen from 64.5'-64.7' and 67'-68', odor, wet to moist with depth, 63% recovery. Sampler hammered in approximately 81 blows for 64'-66' interval and approximately 87 blows for 66'-68' interval.
					0.0	66-68		
					0.5	68-70	68-70	SILTY SANDY CLAY: Yellowish red (5YR 5/6), fine-grained, subrounded, silt and clay lenses, manganese oxide staining, black staining, odor, moist, 75% recovery.
-25	70				0.0	70-72	70-72	CLAY: Yellowish red (5YR 5/6), fractured, laminated, very stiff (pp=2.75 tsf at 71' and pp=3.25 tsf at 72'), some iron nodules, manganese oxide staining, slight odor, moist, 100% recovery.
					0.0			T.D. = 72.5'
	75							

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Union Pacific Railroad

Log of Boring: MW-34CR

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	5/9/2014	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	10
Driller:	Tim Beach	Total Depth (ft):	70
Driller's License:	58141	Northing:	728982.3594
Field Supervisor:	Patrick Ferrell	Easting:	3168226.8542
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	46.9

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0					
5			0.0/0.0	NR	(0 - 10) No Recovery, NR, concrete cored and soils removed to 10' by hydrovac to clear for utilities.
10		3.1			
		3.3	10.0/10.0	CL	(10 - 19.9) SILTY CLAY, CL, grey with dark brown and orange mottling between 10.0' to 12.4', orange mottling continues to 16.3', be comes red-brown and grey at 18.0' with few black streaks, carbonate nodules present at 12.5', 16.5', and 19.8', dry, firm to hard with low plasticity, no odors.
15		3			
		4.2			
20		7.8			
		15.4	10.0/10.0	SP	(19.9 - 27.7) SAND, SP, grey and tan becomes brown below 25.6', medium to fine grained, saturated at 20.0', no visible staining, mild creosote odor between 23.0' to 27.7'.
25		21.1			
		20.4			(27.7 - 56.8) SILTY CLAY, CL, red-brown with few black streaks, fractured seams at 29.4' and 29.9', no odor, dry and hard. Fractures seen in dark brown clay at 30.1' with black/dark staining and mild odor, clay becomes grey at 32.8' with orange mottling beginning at 33.7' and increasing with depth to 37.4' where it becomes primarily orange. Some carbonate nodules with black staining at 36.5' to 37.2' and large carbonate nodule clast at 39.2' (8 cm diameter). Orange-red clay with some black streaks continues with mild odor to 46.0' with a visible sheen on carbonate nodules at 43.0'. Slickenslide fractures at 41.9', and 46.4', clay is grey along the fractures, but red-orange above and below fractures, dry, very hard with no plasticity. Carbonate nodule lenses noted at 53.3' to 53.4', 55.4' to 55.5', no staining or odors.
30		14.1			
		16.1	10.0/10.0		
35		15.7			
		15.4			
40		16.4			
		13.2	10.0/10.0	CL	
45		12.4			
		9.1			
50		7.1			
		3.1	10.0/10.0		
55		3.2			
		2.3		CH	(56.8 - 59.4) SANDY CLAY, CH, red-brown and orange, fine grained with no odors or staining, moist, soft with low to medium plasticity.
60		17.4		CL	(59.4 - 60.5) SILTY CLAY, CL, red-brown and orange with few black streaks, no odors, dry, very hard with no plasticity.
		19.3	10.0/10.0		(60.5 - 64.2) SANDY CLAY, CH, red-brown, trace carbonate nodules at 63.2', sheen visible at 62.4' to 62.7', and 63.7' to 64.0', heavy odor, some thin clay lenses at 63.2' and 63.3', moist and soft with low plasticity.
65		20.1		SM	(64.2 - 68.4) SILTY SAND, SM, fine grained, orange-brown with slight creosote odor, but no visible staining, few clasts (2-4 cm diameter at 68.4'), moist.
		14.7		CL	(68.4 - 70) SILTY CLAY, CL, orange-brown, some fine grained sand present, no staining, clay lenses present at 69.1' to 69.6', moist, firm with low plasticity.
70					

PBW

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Notes:
Top 10 feet drilled out (DO) with a hydrovac to clear for utilities.
8-inch sonic isolation casing advanced to 30' then removed during grouting.
6-inch sonic casing advanced to 70', then removed during grouting.

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 54.0) Portland/Bentonite Grout
(54.0 - 57.0) Bentonite Pellets
(57.0 - 70.0) 20/40 Silica Sand

Well Materials
(0 - 60.0) Casing, 4" FJT Stainless Steel
(60.0 - 70.0) Screen, 4" FJT Stainless Steel,
0.01 slot

TOC Elevation (ft AMSL)
46.47

Union Pacific Railroad

Log of Boring: MW-35A

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	2/21/07	Drilling Method:	HSA
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	8.5
Driller:	Sonny Tobola	Total Depth (ft):	30
Driller's License:	3026	Northing:	3167045.40
Field Supervisor:	James Whittington, P.G.	Easting:	728984.92
Sampling Method:	4" x 5' Split Barrel	Casing Elevation (ft):	44.75

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
0					(0.0 to 0.5) Asphalt.
				FILL	(0.5 to 1.0) Gravelly clay FILL, red.
				FILL	(1.0 to 1.5) Clay FILL, red.
		0.4	80	CL	(1.5 to 6.0) Silty CLAY, dark gray, lighter color with increasing depth.
		0.2			
5		0.6			
		0.6	100	CL	(6.0 to 10.0) Sandy CLAY, mottled gray and tan, ~30% sand, increasing sand with depth.
		0.3			
10		0.3		CL/SC	(10.0 to 14.0) CLAY and SAND, tan and gray, ~50% clay, ~50% sand, increasing moisture with depth.
		0.3	70		
		0.2			
15		0.2		SP	(14.0 to 24.0) SAND, gray, fine-grained, < 20% silt and clay, saturated, coarsens downward.
		0.5	80		
20		0.5			
		0.3	80		
		0.8			
25		0.8		SP	(24.0 to 27.0) SAND, tan, medium-grained, ~10 % clay.
			60	CL	(27.0 to 30.0) Sandy CLAY, reddish-brown, dense, calcareous nodules, ~10% sand, less moist than above.
30					

STATE OF TEXAS
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Notes:

Annular Materials
(0 to 10.0) Bentonite-Cement Grout
(10.0 - 12.0) Bentonite Pellets
(12.0 - 28.0) 16-30 Silica Sand

Well Materials
(0 to 13.0) Casing, 2" Sch 40 FJT PVC
(13.0 to 23.0) Screen 2" Sch 40 FJT PVC
0.010 slot

Union Pacific Railroad

Log of Boring: MW-35B

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	2/26/07	Drilling Method:	HSA
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	8.5
Driller:	Sonny Tobola	Total Depth (ft):	43
Driller's License:	3026	Northing:	3167045.19
Field Supervisor:	James Whittington, P.G.	Easting:	728988.18
Sampling Method:	4" x 5' Split Barrel	Casing Elevation (ft):	44.83

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
0				FILL	(0.0 to 0.5) Asphalt.
				FILL	(0.5 to 1.0) Gravelly clay FILL, red.
				FILL	(1.0 to 1.5) Clay FILL, red.
		0.4	80	CL	(1.5 to 6.0) Silty CLAY, dark gray, lighter color with increasing depth.
		0.2			
5		0.6			
		0.6	100	CL	(6.0 to 10.0) Sandy CLAY, mottled gray and tan, ~30% sand, increasing sand with depth.
		0.3			
10		0.3		CL/SC	(10.0 to 14.0) CLAY and SAND, tan and gray, ~50% clay, ~50% sand, increasing moisture with depth.
		0.3	70		
		0.2			
15		0.2		SP	(14.0 to 24.0) SAND, gray, fine-grained, < 20% silt and clay, saturated, coarsens downward.
		0.5	80		
20		0.5			
		0.3	80		
		0.8			
25		0.8		SP	(24.0 to 27.0) SAND, tan, medium-grained, ~10 % clay.
			60	CL	(27.0 to 30.0) Sandy CLAY, reddish-brown, dense, calcareous nodules, ~10% sand, less moist than above.
30					(30.0 to 43.0) Silty CLAY, mottled reddish-brown, gray, and tan.

PBW

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Notes:
1. 10" PVC surface casing set from 0 to 30.0 feet bgs.

Annular Materials
(0 to 29.0) Bentonite-Cement Grout
(29.0 - 31.0) Bentonite Pellets
(31.0 - 42.0) 16-30 Silica Sand

Well Materials
(0 to 32.0) Casing, 2" Sch 40 FJT PVC
(32.0 to 42.0) Screen 2" Sch 40 FJT PVC
0.010 slot

Union Pacific Railroad

Log of Boring: MW-35B

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	2/26/07	Drilling Method:	HSA
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	8.5
Driller:	Sonny Tobola	Total Depth (ft):	43
Driller's License:	3026	Northing:	3167045.19
Field Supervisor:	James Whittington, P.G.	Easting:	728988.18
Sampling Method:	4" x 5' Split Barrel	Casing Elevation (ft):	44.83

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
		9		CL	
35		211		CL	(33.0 to 36.0) Gravelly, silty CLAY, carbonate seams, very strong hydrocarbon odor, visible product at 36.0, saturated at 36.0.
		50			(36.0 to 43.0) CLAY, mottled reddish-brown and gray, firm, moist, sporadic carbonate nodules < 5 mm in diameter.
		8			
40		2		CL	
		3			

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Notes:
1. 10" PVC surface casing set from 0 to 30.0 feet bgs.

Annular Materials
(0 to 29.0) Bentonite-Cement Grout
(29.0 - 31.0) Bentonite Pellets
(31.0 - 42.0) 16-30 Silica Sand

Well Materials
(0 to 32.0) Casing, 2" Sch 40 FJT PVC
(32.0 to 42.0) Screen 2" Sch 40 FJT PVC
0.010 slot

Union Pacific Railroad

Log of Boring: MW-36A

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	2/22/07	Drilling Method:	HSA
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	8.5
Driller:	Sonny Tobola	Total Depth (ft):	30
Driller's License:	3026	Northing:	3168167.43
Field Supervisor:	James Whittington, P.G.	Easting:	729148.20
Sampling Method:	4" x 5' Split Barrel	Casing Elevation (ft):	44.53

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
0				Fill	(0.0 to 0.3) Asphalt.
				Fill	(0.3 to 0.8) Gravel base.
		0.2		CL	(0.8 to 1.5) Gravelly, clay FILL, red.
					(1.5 to 3.5) CLAY, dark gray, dense, < 2% clasts, gradational basal contact.
		0.2			(3.5 to 14.0) Silty CLAY, mottled gray and tan, sporadic carbonaceous clasts, coarsening downward into lighter colored gray and tan mottled sandy clay.
5		0.1			
		0.1		CL	
10		0.1			
		0.1			
		0.6			
15		0	NA	CL	(14.0 to 19.0) CLAY, mottled red and gray to black, chemically weathered carbonaceous gravel.
		0.1			
					(19.0 to 27.0) SAND, light brown, medium-grained, quartz sand, < 5% clay, < 5% silt, ~5% dark minerals, no apparent bedding, sharp contact.
20		0.2		SP	
		0.2			
25					
		0.2		CL	(27.0 to 30.0) CLAY, mottled red and gray, < 10% sand and fine gravel.
30					

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Notes:
1. Borehole plugged with bentonite chips 28.0 to 30.0 feet bgs.

Annular Materials
(0 to 15.0) Bentonite-Cement Grout
(15.0 - 17.0) Bentonite Pellets
(17.0 - 28.0) 16-30 Silica Sand

Well Materials
(0 to 18.0) Casing, 2" Sch 40 FJT PVC
(18.0 to 28.0) Screen 2" Sch 40 FJT PVC
0.010 slot

Union Pacific Railroad

Log of Boring: MW-36B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	6/24/10	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	6
Driller:	William Bludworth	Total Depth (ft):	43
Driller's License:	4885	Northing:	729161.08
Field Supervisor:	Chris Moore	Easting:	3168172.38
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	44.58

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			DO	PAV	Asphalt Pavement
					Gravel Base Material
					CLAY, CH, light gray, moist, firm to hard.
5		-		CH	CLAY, CH, dark gray, moist, firm, some banded orange staining, 8.2-13: silty/sandy.
		0			
10		0	9.0/10.0		
		0			
15		0		SP	SAND, SP, yellowish brown, wet, soft, very fine grained, trace clayey lenses.
		0			
20		0	10.0/10.0		
		0			
25		0			
		0		CH	CLAY, CH, reddish brown, moist, firm to hard, some gray mottling,
30		0	10.0/10.0		
		0			
35		0			CLAY, CH, light brown, moist, firm to hard, some sand to gravel size calcaroues nodules, 39.5-39.8: wet sand lens.
		0			
40		0	8.0/8.0		
		0			CLAY, CH, mottled reddish brown and gray, moist, hard.

STATE OF TEXAS
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1/6/2011

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Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.

Initial Fluid Level (7/12/10)
▼ Depth to water: 1.32 ft BTOC

Annular Materials
(0.0 - 1.0) Concrete
(1.0 - 34.0) Portland/Bentonite Grout
(34.0 - 36.0) Bentonite Chips
(36.0 - 43.0) 16/30 Silica Sand

Well Materials
(0 - 38.0) Casing, 2" Sch 40 FJT PVC
(38.0 - 43.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
44.07

Union Pacific Railroad

Log of Boring: MW-36D

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	6/22/10	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	6
Driller:	William Bludworth	Total Depth (ft):	110
Driller's License:	4885	Northing:	729161.54
Field Supervisor:	Chris Moore	Easting:	3168179.5
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	44.53

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			DO	PAV	Asphalt Pavement Gravel Base Material CLAY, CH, light gray, moist, firm to hard.
5		–		CH	CLAY, CH, dark gray, moist, firm, some banded orange staining, 8.5-13: silty/sandy.
10		0	10.0/10.0		
		0			
		0			
15		0		SP	SAND, SP, yellowish brown, wet, soft, very fine grained, trace clayey lenses.
		0			
20		0	9.5/10.0		
		0			
		0			
25		0		CH	CLAY, CH, reddish brown, moist, firm to hard, some gray mottling,
		0			
30		0	10.0/10.0		
		0			
		0			CLAY, CH, light brown, moist, firm to hard, some sand to gravel size calcaroues nodules, 39.5-39.6 and 39.8-39.9: wet sand lens.
35		0			
		0			
40		0	10.0/10.0		CLAY, CH, mottled reddish brown and gray, moist, hard, some slickensided fractures, reddish brown below 47.
		0			
		0			
45		0			
		0			
50			10.0/10.0		

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1/11/2011

Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.
Sonic isolation casing advanced to 75' then removed during grouting.

Initial Fluid Level (7/12/10)
▼ Depth to water: 85.39 ft BTOC

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Annular Materials
(0.0 - 1.0) Concrete
(1.0 - 96.0) Portland/Bentonite Grout
(96.0 - 98.0) Bentonite Chips
(98.0 - 110.0) 16/30 Silica Sand

Well Materials
(0 - 100.0) Casing, 2" Sch 40 FJT PVC
(100.0 - 110.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
44.33

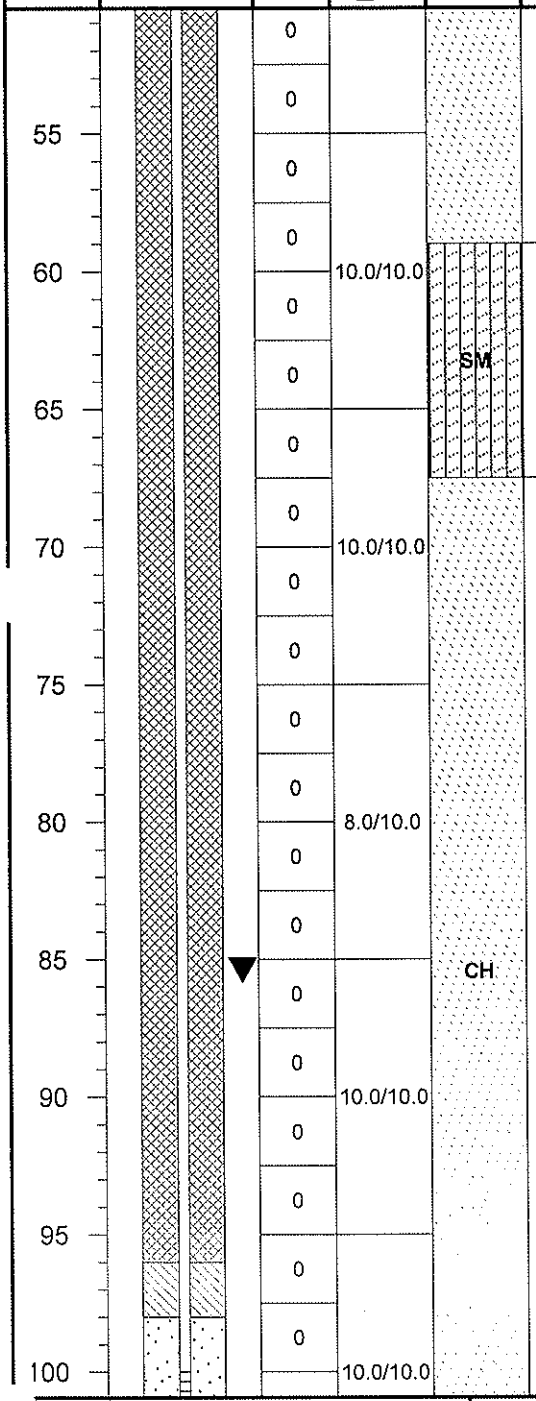
Union Pacific Railroad

Log of Boring: MW-36D

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	6/22/10	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	6
Driller:	William Bludworth	Total Depth (ft):	110
Driller's License:	4885	Northing:	729161.54
Field Supervisor:	Chris Moore	Easting:	3168179.5
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	44.53



Lithologic Description

SILTY SAND, SM, reddish brown, wet, soft, very fine grained, some clayey lenses.

CLAY, CH, reddish brown, moist, firm to hard, trace gray silty lenses, 78-79: sand size calcareous nodules, 80-83: gray.

Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.
Sonic isolation casing advanced to 75' then removed during grouting.

Initial Fluid Level (7/12/10)
▼ Depth to water: 85.39 ft BTOC

Annular Materials
(0.0 - 1.0) Concrete
(1.0 - 96.0) Portland/Bentonite Grout
(96.0 - 98.0) Bentonite Chips
(98.0 - 110.0) 16/30 Silica Sand

Well Materials
(0 - 100.0) Casing, 2" Sch 40 FJT PVC
(100.0 - 110.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
44.33

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Union Pacific Railroad

Log of Boring: MW-36D

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	6/22/10	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	6
Driller:	William Bludworth	Total Depth (ft):	110
Driller's License:	4885	Northing:	729161.54
Field Supervisor:	Chris Moore	Easting:	3168179.5
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	44.53

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
		0			
		0		SP/SM	SAND/SILTY SAND, SP/SM, reddish brown, wet, soft, very fine grained.
105		0	5.0/5.0	CH	CLAY, CH, reddish brown, moist, firm to hard, trace gray silty lenses, 78-79: sand size calcareous nodules, 80-83: gray.
		0		CL	SILTY CLAY, CL, light gray, moist, firm, with sand.
110					

PBW

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Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.
Sonic isolation casing advanced to 75' then removed during grouting.

Initial Fluid Level (7/12/10)
▼ Depth to water: 85.39 ft BTOC

Annular Materials
(0.0 - 1.0) Concrete
(1.0 - 96.0) Portland/Bentonite Grout
(96.0 - 98.0) Bentonite Chips
(98.0 - 110.0) 16/30 Silica Sand

Well Materials
(0 - 100.0) Casing, 2" Sch 40 FJT PVC
(100.0 - 110.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
44.33

Union Pacific Railroad

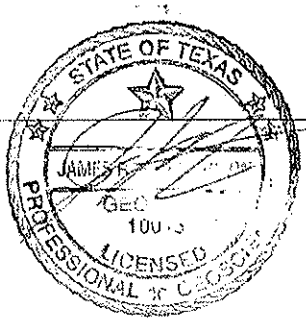
Log of Boring: MW-38A

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	2/21/07	Drilling Method:	HSA
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	8.5
Driller:	Sonny Tobola	Total Depth (ft):	25
Driller's License:	3026	Northing:	3165934.27
Field Supervisor:	James Whittington, P.G.	Easting:	728402.21
Sampling Method:	4" x 5' Split Barrel	Casing Elevation (ft):	46.39

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
0				Fill	(0.0 to 0.4) Asphalt. (0.4 to 2.0) Gravel base.
		0.7	50	CL	(2.0 to 7.0) Silty CLAY, dark gray, fine laminations, no odor.
5			20		(7.0 to 15.0) Sandy CLAY, tan to gray, lighter color and more sand with depth.
		1			
10		0.7	60	CL	
		0.5			
15					(15.0 to 21.0) SAND, light gray, saturated, > 20% silt and clay, no odor.
		0.5	80	SP	
		1			
20		0.5			(21.0 to 25.0) CLAY, mottled light gray and tan.
		0.7	100	CL	
25		1.2			



PBW

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Notes:
1. Borehole plugged with bentonite chips 23.0 to 25.0 feet bgs.

Annular Materials
(0 to 9.0) Bentonite-Cement Grout
(9.0 - 11.0) Bentonite Pellets
(11.0 - 23.0) 16-30 Silica Sand

Well Materials
(0 to 12.0) Casing, 2" Sch 40 FJT PVC
(12.0 to 22.0) Screen 2" Sch 40 FJT PVC
0.010 slot

ERM.

MW-38B
DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-38B Date Drilled 12/31/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 38 ' Boring Diam. 7.88 "

N. Coord. 728319.1500 ' E. Coord. 3165944.7150 'Surface Elevation 45.92 ' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 25.5 ' Sump Length 2.5 '

Top of Casing Elevation 45.51' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
45.51	0					0-6	0-6	CLAYEY SAND: Reddish brown (5YR 4/3), rootlets.
45								
	5				NM	6-8	6-13.9	SANDY CLAY: Light brownish gray (2.5Y 6/2), mottled, plastic, very stiff (pp=2.5 tsf), trace fractures, trace white silt lenses, trace white nodules up to 10 mm, moist, 100% recovery. At 8' stiff (pp=1.5 tsf), sand decreasing with depth, some iron nodules. At 10' stiff (pp=2.0 tsf), sand increases, some black staining.
40					0.0	8-10		
	10				0.0	10-12		
35								
					8.7	12-14		CLAYEY SAND: Light brownish gray (2.5Y 6/2), firm (pp=0.75 tsf), fine-grained, sorted, subangular, some iron staining, moist, 50 % recovery.
					6.2	14-16	13.9-14 14-18.5	CLAYEY SILTY SAND: Light brownish gray (2.5Y 6/2), very fine-grained, sorted, subangular, clay decreasing with depth, moist, saturated at 15.9', 100% recovery.
	15						38	

ERM.

MW-38B
DRILLING LOG

I.O. NO. 422-102 Boring/Well ID MW-38B Date Drilled 12/31/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 38' Boring Diam. 7.88"

N. Coord. 728319.1500' E. Coord. 3165944.7150' Surface Elevation 45.92' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Stainless Steel Diam. 2" Length 25.5' Sump Length 2.5'

Top of Casing Elevation 45.51' Stickup 0'

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
30	15				4.8	16-18		
					9.0	18-20	18.5-22	SANDY CLAY: Light brownish gray (2.5Y 6/2), plastic, fractured, very stiff (pp=2.25 tsf) at 20'-22', sand decreasing with depth, trace white silt lenses, some iron staining, saturated from 18'-18.5', moist from 18.5'-22', 100% recovery.
25	20				6.2	20-22		
					6.1	22-24	22-28	SILTY CLAY: Light gray (5Y 7/2), plastic, hard (pp=4.25 tsf, pp=4.5 tsf) at 22'-24' and 24'-28', some fractures, trace white silt lenses, some iron staining, moist, 100% recovery. At 24' sand decreasing, black staining, iron staining. At 26' sand content increasing with depth.
					38.9	24-26		
20	25				57.3	26-28		
					9.0	28-30	28-30	CLAYEY SAND: Yellowish red (5YR 4/6), very fine-grained, sorted, subangular, clay content decreasing, moist, 100 % recovery.
	30							

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ERM.

MW-38B DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-38B Date Drilled 12/31/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 38 ' Boring Diam. 7.88 "

N. Coord. 728319.1500 ' E. Coord. 3165944.7150 'Surface Elevation 45.92 ' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 25.5 ' Sump Length 2.5 '

Top of Casing Elevation 45.51' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
15	30				11.1	30-32	30-32	SILTY SAND: Yellowish red (5YR 4/6), very soft (pp=0.0 tsf), very fine-grained, sorted, subangular, some clay content decreasing, saturated, 50% recovery.
					12.5	32-34	32-34	NO RECOVERY
	35				NM	34-36	34-36.1	SILTY SAND: Yellowish red (5YR 4/6), very soft (pp=0.0 tsf), very fine-grained, sorted, subangular, some clay content decreasing, saturated, 50% recovery.
10					18.8	36-38	36.1-38	SILTY CLAY: Yellowish red (5YR 4/6), plastic, hard (pp=>4.5 tsf), highly fractured, trace sand lenses, medium-grained, sorted, subrounded, black staining in fractures, moist, 100% recovery.
					12.8			T.D. = 38 '
5	40						40	
	45							

ERM.

MW-39B DRILLING LOG

'.O. NO. 422-102 Boring/Well ID MW-39B Date Drilled 12/16/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 40' Boring Diam. 7.88"

N. Coord. 728423.6760' E. Coord. 3166019.0000' Surface Elevation 47.20' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Stainless Steel Diam. 2" Length 27.5' Sump Length 2.5'

Top of Casing Elevation 49.58' Stickup 3'

Depth to Water: 1. Ft. 6.23 (12/29/03) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
47.20	0					0-4	0-0.2	OTHER: Shells and asphalt.
							0.2-1.5	CLAYEY SAND: Dark yellowish brown (10YR 4/4), very fine-grained, sorted, subrounded, moist, 100% recovery.
							1.5-2.5	SANDY CLAY: Black (5YR 2.5/1), moist, plastic, soft, pp=0.25 tsf, trace gravels, 100% recovery.
					0.1		2.5-12	SILTY CLAY: Black (5YR 2.5/1), moist, pp=0.5 tsf, some sand decreasing with depth. At 4'-6' becomes gray (10YR 5/1), mottled, very stiff (pp=2.25 tsf), trace sand, trace gravel, some concretions, some iron staining, 100% recovery. At 6'-8' very stiff (pp=2.75 tsf) and some black nodules. At 8'-10' very stiff (pp=2.25 tsf). At 10'-12' becomes light gray (2.5Y 7/1), mottled, soft (pp=0.5 tsf), trace sand, increasing with depth.
					0.0	4-6		
45	5							
					0.0	6-8		
					0.0	8-10		
40	10				0.0	10-12		
					0.0	12-14	12-15.9	SANDY CLAY: Black (5YR 2.5/1), fine-grained, sorted, subangular, moist, plastic, some iron staining, 75% recovery.
					0.0	14-16		
35	15							

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ERM.

MW-39B DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-39B Date Drilled 12/16/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 40' Boring Diam. 7.88"

N. Coord. 728423.6760' E. Coord. 3166019.0000' Surface Elevation 47.20' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Stainless Steel Diam. 2" Length 27.5' Sump Length 2.5'

Top of Casing Elevation 49.58' Stickup 3'

Depth to Water: 1. Ft. 6.23 (12/29/03) 2. Ft. 0 (_____)

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

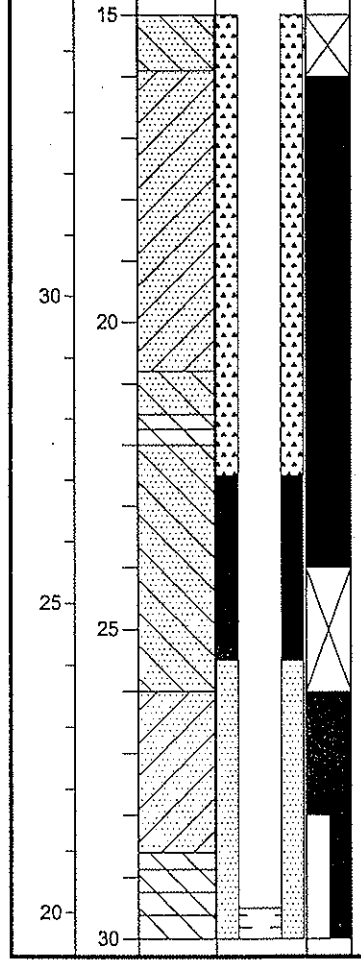
Drilling Method Mud rotary Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot



Elevation (Feet)	Depth (Feet)	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
		0.0	16-18	15.9-20.8	CLAYEY SAND: Light olive gray (5Y 6/2), moist, very stiff (pp=3.0 tsf), 100% recovery. At 16' becomes gray (5Y 5/1), soft (pp=0.25 tsf), clay decreases with depth. At 18'-20.8' becomes saturated.
		0.7	18-20		
		0.0	20-22		
				20.8-21.5	SANDY CLAY: Light gray (2.5Y 7/2), moist, plastic, stiff (pp=1.25 tsf).
				21.5-22	SILTY CLAY: Gray (5Y 5/1), moist, plastic, very stiff (pp=3.0 tsf), trace sand, iron staining from 21.8'-22', 100% recovery.
		0.0	22-24	22-26	SANDY CLAY: Light gray (10YR 7/2), mottled, moist, plastic, very stiff (pp=2.25 tsf), some iron staining, 100% recovery. At 24'-26' very stiff (pp=2.75 tsf), sand decreasing with depth, trace rootlets.
		0.0	24-26		
		0.0	26-28	26-28.6	CLAYEY SAND: Yellowish red (5YR 5/6), fine-grained, sorted, subangular, very soft (pp=0.0 tsf), moist, 100% recovery.
		NM	28-30		
				28.6-30.4	SILTY CLAY: Light olive gray (5Y 6/2), mottled, plastic, stiff (pp=2.0 tsf), some sand, trace gravels, moist, 100% recovery. At 28'-30' some horizontal fractures, very stiff (pp=4.0 tsf), trace silt lenses, sand increasing with depth. At 30'-30.4' very soft (pp=0.5 tsf).

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ERM.

MW-39B DRILLING LOG

J.O. NO. 422-102 Boring/Well ID MW-39B Date Drilled 12/16/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 40 ' Boring Diam. 7.88 "

N. Coord. 728423.6760 ' E. Coord. 3166019.0000 'Surface Elevation 47.20 ' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 27.5 ' Sump Length 2.5 '

Top of Casing Elevation 49.58' Stickup 3'

Depth to Water: 1. Ft. 6.23 (12/29/03) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	30				0.0	30-32	30.4-38.6	CLAYEY SAND: Yellowish red (5YR 5/6), fine-grained, sorted, subangular, very soft (pp=0.0 tsf), moist, 100 % recovery. At 31'-32' becomes silty sand with some clay. At 32'-34' becomes strong brown (7.5YR 5/8), saturated, very soft (pp=0.0 tsf), trace clay. At 34'-36' yellowish red (5YR 4/6), saturated, very soft (pp=0.0 tsf), clay increasing. At 36'-38' becomes strong brown (7.5YR 5/8), saturated. At 38'-38.6' clay increases and trace gravels are present.
					0.0	32-34		
15	35				0.0	34-36		
					0.0	36-38		
					0.0	38-40		
10	40				0.0		38.6-40	SILTY CLAY: Light gray (5Y 7/2), mottled, moist, plastic, very stiff (pp=3.75 tsf), trace fractures, trace of sand decreasing with depth, trace black staining, 100% recovery.
								T.D. = 40 '
5	45							

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ERM.

MW-40B DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-40B Date Drilled 12/15/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 42 ' Boring Diam. 7.88 "

N. Coord. 728340.8690 ' E. Coord. 3166121.9310 'Surface Elevation 47.18 ' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01"

Casing: Type Stainless Steel Diam. 2 " Length 29.5' Sump Length 2.5 '

Top of Casing Elevation 49.59' Stickup 3.0'

Depth to Water: 1. Ft. 5.81 (12/29/2003) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
47.18	0					0-4	0-0.3	FILL: Asphalt, 100% recovery.
							0.3-0.9	FILL: Base for asphalt, 100% recovery.
							0.9-1.9	SILTY SAND: Dark reddish brown (5YR 3/3), fine-grained, sorted, subrounded, moist, 100% recovery.
					1.8		1.9-6	SILTY CLAY: Black (5YR 2.5/1) from 1.9'-4', dark gray (7.5YR 4/1) from 4'-6', mottled, plastic, soft (pp= 0.5 tsf) at 3', stiff (pp= 1.5 tsf) at 5', some sand decreasing with depth, trace gravel, trace wood fragments, trace fractures, moist, 75% recovery.
					1.8	4-6		
45	5							
					1.8	6-8	6-8	GRAVELLY CLAY: Light yellow brown (2.5Y 6/2), plastic, soft (pp= 0.5 tsf), gravels (up to 5mm in diameter), moist, 100 % recovery.
					0.7	8-10	8-12	SILTY CLAY: Light olive gray (5Y 6/2), mottled, plastic, stiff (pp= 1.75 tsf) at 9', very stiff (pp= 3.0 tsf) at 11', some iron staining, trace black nodules, trace sand from 9.2'-10', moist, 100 % recovery.
40	10				0.0	10-12		
					1.4	12-14	12-16	SANDY CLAY: Light olive gray (5Y 6/2), plastic, pp= 3.25 tsf, iron staining, moist, 100% recovery.
					1.8	14-16		
35	15						44	

ERM.

MW-40B
DRILLING LOG

'.O. NO. 422-102 Boring/Well ID MW-40B Date Drilled 12/15/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 42 ' Boring Diam. 7.88 "

N. Coord. 728340.8690 ' E. Coord. 3166121.9310 'Surface Elevation 47.18 ' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01"

Casing: Type Stainless Steel Diam. 2 " Length 29.5' Sump Length 2.5 '

Top of Casing Elevation 49.59' Stickup 3.0'

Depth to Water: 1. Ft. 5.81 (12/29/2003) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	15				1.1	16-18	16-20	CLAYEY SAND: Gray (5Y 6/1), very fine-grained, sorted, subangular, wet, 100% recovery.
					2.1	18-20		
30	20				5.0	20-22	20-22	NO RECOVERY
					NA	22-24	22-22.4	SANDY CLAY: Gray (5Y 6/1), plastic, pp= 0.5 tsf, trace gravels, moist, 100% recovery.
					0.0		22.4-28	SILTY CLAY: Gray (5Y 6/1), plastic, hard (pp= 4.25 tsf) at 23', stiff (pp=3.0 tsf) at 27', some iron staining, moist, 100 % recovery.
25					0.0	24-26		
	25				0.0	26-28		
					0.0	28-30	28-32.4	SANDY CLAY: Gray (5Y 6/1), plastic, very hard (pp= >4.5 tsf), silt lenses, moist, 100% recovery.
20	30							

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ERM.

MW-40B DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-40B Date Drilled 12/15/2003

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 42 ' Boring Diam. 7.88 "

N. Coord. 728340.8690 ' E. Coord. 3166121.9310 'Surface Elevation 47.18 ' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01"

Casing: Type Stainless Steel Diam. 2 " Length 29.5' Sump Length 2.5 '

Top of Casing Elevation 49.59' Stickup 3.0'

Depth to Water: 1. Ft. 5.81 (12/29/2003) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Marcel St. Marie

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	30				0.0	30-32		
					0.0	32-34	32.4-38	CLAYEY SAND: Gray (5Y 6/1), very fine-grained, sorted, subrounded, some sandy clay intervals at 34.3' and 35.1', moist from 32.4'-35.4', wet from 35.4'-38', 100% recovery.
15					0.0	34-36		
	35				0.0	36-38		
					0.0	38-40	38-40	SILTY SAND: Yellowish red (5YR 5/6), fine-grained, subrounded, some clay, saturatrd, 75% recovery.
10	40				0.0	40-42		T.D. = 42 '
					0.0			
5	45						46	

ERM.

MW-41B
DRILLING LOG

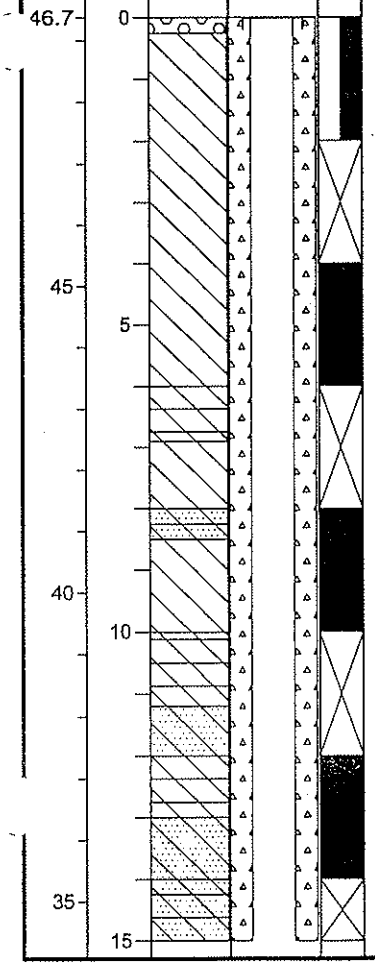
J.O. NO.	422-102	Boring/Well ID	MW-41B	Date Drilled	1/7/2004
Project	Houston Wood Preserving Works	Owner	Union Pacific Railroad Company		
Location	Houston, Texas	Boring T.D.	42'	Boring Diam.	7.88"
N. Coord.	728176.0110'	E. Coord.	3166002.9040'	Surface Elevation	46.7' Ft. MSL Datum
Screen: Type	Stainless Steel	Diam.	2"	Length	10' Slot Size 0.01"
Casing: Type	Stainless Steel	Diam.	2"	Length	29.5' Sump Length 2.5'
Top of Casing Elevation	49.37'			Stickup	0'
Depth to Water:	1. Ft. 4.47	(01/19/04)	2. Ft. 0	( )	
Drilling Company	Fugro Geosciences, Inc.	Driller	Steve Bender		
Drilling Method	Mud rotary	Log By	Vivian Rohrback		

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot



Description/Soil Classification (Color, Texture, Structure)
GRAVEL: Fill material. Gravels up to 1.5" diameter.
CLAY: Reddish black (2.5YR 2.5/1), plastic, gravels up to 0.5' diameter, some wood fragments, some fine-grained sand, subrounded, moist, 100 % recovery. At 2'-4' greenish black (GLEY 3/10Y), grades to black (7.5YR 2.5/1) at 3', plastic, pp=0.5 tsf at 2', pp=1 tsf at 4', some fine-grained sand, rounded, few iron nodules. At 4' plastic, pp=0.5 tsf, some gravel up to 1/4" diameter, some iron nodules, becoming more sandy. At 5.2' becomes light bluish gray (GLEY 7/5B) with brownish yellow (10YR 6/8) mottling. pp=1 tsf at 6'.
SILTY CLAY: Greenish gray (GLEY 5/10GY), gravels up to 1/2" diameter, moist, 100% recovery.
CLAY: Greenish gray (GLEY 5/10GY) with brownish yellow mottling, plastic, stiff (pp=1 tsf) at 6.5', 1" lenses of white nodules at 7.9', moist, 100% recovery.
SANDY SILTY CLAY: Dark greenish gray (GLEY 4/10Y), gravels up to 1/2" diameter, moist, 100% recovery.
CLAY: Light greenish gray (GLEY 7/5G) with brownish yellow (10YR 6/8) mottling, plastic, very stiff (pp=2.5 tsf), iron nodules, moist, 100 % recovery.
SILTY CLAY: Greenish gray (GLEY 6/5G) with orange brown mottling, plastic, soft (pp=<0.5 tsf), black staining, moist, 100 % recovery.
SANDY CLAY: Greenish gray with some pink (GLEY 6/5G) with orange brown mottling, fine-grained, subrounded, moist, 100 % recovery.
SILTY CLAY: Greenish gray (GLEY 6/10GY) with orange brown mottling, gravels up to 1/2" diameter, moist, 100 % recovery.
SANDY CLAY: Greenish gray with pinkish tinge (GLEY 6/5GY) with orange brown and greenish gray (GLEY 6/5G) mottling, firm (pp=1 tsf) at 12' and very stiff (pp=3.5 tsf) at 13.5', fine-grained, rounded, moist, 100 % recovery.
SILTY SANDY CLAY: Pale olive (5Y 6/3) with pink tint and orange brown mottling, fine-grained, moist, 100% recovery.

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ERM.

MW-41B DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-41B Date Drilled 1/7/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 42' Boring Diam. 7.88"

N. Coord. 728176.0110' E. Coord. 3166002.9040' Surface Elevation 46.7' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Stainless Steel Diam. 2" Length 29.5' Sump Length 2.5'

Top of Casing Elevation 49.37' Stickup 0'

Depth to Water: 1. Ft. 4.47 (01/19/04) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	15				0.0	16-18	15-18	SANDY CLAY: Greenish gray (GLEY 7/5GY) with pink tinge, fine-grained, rounded, moist, 100% recovery. At 16' orange brown mottling, gravels up to 1/2" diameter. At 16.8' becomes light greenish gray (GLEY 7/5GY), moist to saturated with depth.
					0.0	18-20	18-19	NO RECOVERY
30	20				0.0	20-22	19-19.5 19.5-24	SILTY CLAY: Dark greenish gray (GLEY 4/10Y) with reddish yellow and blue gray mottling, soft (pp=0.5 tsf), small gravel, saturated, 100 % recovery. SANDY CLAY: Light greenish gray (GLEY 7/10Y), fine-grained, subrounded, saturated to moist with depth, 100 % recovery. At 20' reddish yellow (7.5YR 1/6) mottling, fractured, hard (pp=>4.5 tsf), gravels up to 1/2" diameter. At 22' light greenish gray (GLEY 7/10GY) with yellowish brown (10YR 5/8) mottling, very stiff (pp=3.5 tsf), few iron nodules.
					0.0	22-24		
25					0.0	24-26	24-24.5 24.5-26	SILTY SANDY CLAY: Very pale brown (10YR 7/4) with light greenish gray mottling, fine-grained, subangular, moist, 100 % recovery. SANDY CLAY: Light greenish gray (GLEY 7/10GY) with yellowish brown (10YR 5/8) mottling, fractured, very stiff (pp=2.5 tsf), fine-grained, subangular, moist, 100 % recovery.
	25				0.0	26-28	26-27	SILTY SANDY CLAY: Light greenish gray (GLEY 7/5BG) with reddish yellow mottling, fine grained, subrounded, gravels up to 1/2" diameter, sheen, odor, moist, 100% recovery.
					0.1	28-30	27-30	SANDY CLAY: light greenish gray (GLEY 7/10GY) with yellowish brow (5YR 5/8) mottling, very stiff (pp=2.5 tsf), fine-grained, subangular, moi 100% recovery. At 28' has light greenish gray (GLEY 7/5GY) mottling, stiff (pp=2.0 tsf), some white nodules, some black staining, odor.
20	30							

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ERM.

MW-41B
DRILLING LOG

I.O. NO. 422-102 Boring/Well ID MW-41B Date Drilled 1/7/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 42' Boring Diam. 7.88"

N. Coord. 728176.0110' E. Coord. 3166002.9040' Surface Elevation 46.7' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Stainless Steel Diam. 2" Length 29.5' Sump Length 2.5'

Top of Casing Elevation 49.37' Stickup 0'

Depth to Water: 1. Ft. 4.47 (01/19/04) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	30				0.1	30-32	30-31	NO RECOVERY
							31-38	CLAYEY SAND: Light greenish gray (GLEY 6/10Y) grading to yellowish red (5YR 5/6), fine grained, subrounded, sheen, odor, saturated, 63 % recovery. At 33'-34' some gravel up to 1/2" diameter. At 36' becomes subangular, light greenish gray (GLEY 7/5GY), mottled, very stiff (pp=3.0 tsf), moist. At 36.4' black staining, sheen, odor.
					0.0	32-34		
15					0.0	34-36		
	35							
					0.0	36-38		
					0.0	38-40	38-40	SANDY CLAY: Yellowish red (5YR 5/8) with light greenish gray (GLEY 7/5BG) mottling, stiff (pp=2.0 tsf), fine-grained, subangular, moist, 25 % recovery.
10								
	40				0.0	40-42	40-42	CLAY: Yellowish red (5YR 5/8), hard (pp=4.5 tsf) at 41.5', small thin layer of olive (2.5Y 6/8) with black staining, some calcareous nodules, sheen, odor, moist, 75% recovery.
					NA			T.D. = 42'
5								
	45						49	

ERM Environmental Resources Management

MW-42B DRILLING LOG

Proj. No. 0014419 Boring/Well ID MW-42B Date Drilled 8/24/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 42 ' Boring Diam. 14 "

N. Coord. 728256.42 ' E. Coord. 3166322.89 ' Surface Elevation 0 ' Ft. MSL Datum

Screen: Type stainless steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type stainless steel Diam. 2 " Length 30 ' Sump Length 2 '

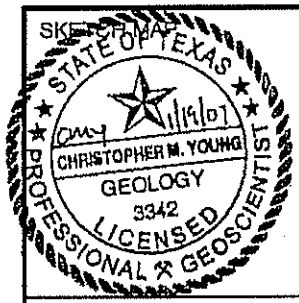
Top of Casing Elevation 0 ' Stickup 3 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe/Mud Rotary Log By Emmanuel Mkandawire

SKETCH MAP



NOTES

pp = pocket penetrometer.
tsf = tons per square foot.
Isolation casing set at 23.5' and monitoring well installed using mud rotary.
0'-41' log from geoprobe boring.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0					0-42	0-2	FILL: concrete and fill material approximately 2 ft thick, moist, gravel pieces 2mm-10mm diameter, angular
							2-3	SILTY CLAY: silty clay, very dark gray (5YR 3/1), moist, pp=1, very plastic, traces of brown concretions, less than 1mm
							3-5	NO RECOVERY
-5	5						5-7	SILTY CLAY: silty clay, gray (5 YR 5/1), moist, pp=2.0tsf, very plastic, few strong brown mottling (1.5 YR 5/6)
							7-10	CLAY: clay, gray (5 YR 5/1), moist, pp=3.5tsf, very plastic, few strong brown mottling (1.5 YR 5/6), calcarious nodules white (<2mm diameter), increasing content with depth
-10	10						10-11.5	CLAY: clay, gray (5 YR 5/1), moist, white calcarious nodules increasing with depth <2mm diameter, black specks and stains
							11.5-13.6	CLAYEY SILTY SAND: clayey silty sand, poorly sorted, very fine to medium-grained, gray (5 YR 6/1), moist, pp=2.0tsf, slight plastic
-15	15						13.6-15	NO RECOVERY

ERM Environmental Resources Management

MW-42B DRILLING LOG

Proj. No. 0014419 Boring/Well ID MW-42B Date Drilled 8/24/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 42 ' Boring Diam. 14 "

N. Coord. 728258.42 ' E. Coord. 3166322.89 ' Surface Elevation 0 ' Ft. MSL Datum

Screen: Type stainless steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type stainless steel Diam. 2 " Length 30 ' Sump Length 2 '

Top of Casing Elevation 0 ' Stickup 3 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe/Mud Rotary Log By Emmanuel Mkandawire

SKETCH MAP

NOTES
pp = pocket penetrometer.
tsf = tons per square foot.
Isolation casing set at 23.5' and monitoring well installed using mud rotary.
0'-41' log from geoprobe boring.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-15	15						15-20	SILTY SAND: silty sand, gray (5 YR 6/2), saturated, poorly sorted, medium to fine-grained, subangular
-20	20						20-20.6	SILTY SAND: silty sand, gray (5 YR 6/2), saturated, poorly sorted, medium to fine-grained, subangular
							20.6-24	CLAY: clay, gray (5 YR 6/1) with few strong brown mottled (7.5 YR 5/8), moist, pp=3.0tsf, very plastic
							24-25	NO RECOVERY: NOTE: stopped on 8/24/2006, continued on 8/25/2006
-25	25						25-27	CLAY: clay, gray (7.5 YR 5/1), strong brown (7.5 YR 5/6) mottling, moist, pp=>4.5tsf, plastic, traces of slicken sides
							27-29	CLAY: clay, gray (7.5 YR 5/1), strong brown (7.5 YR 5/6) mottling, moist, pp=>4.5tsf, plastic, traces of slicken sides
-30	30						29-30	CLAY: clay light gray (2.5 Y 7/1) mottled with strong brown (7.5 YR 5/6), moist, pp=2.5tsf, very plastic

ERM Environmental Resources Management

MW-42B DRILLING LOG

Proj. No. 0014419 Boring/Well ID MW-42B Date Drilled 8/24/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 42' Boring Diam. 14"

N. Coord. 728258.42' E. Coord. 3166322.89' Surface Elevation 0' Ft. MSL Datum

Screen: Type stainless steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type stainless steel Diam. 2" Length 30' Sump Length 2'

Top of Casing Elevation 0' Stickup 3'

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe/Mud Rotary Log By Emmanuel Mkandawire

SKETCH MAP

NOTES
pp = pocket penetrometer.
tsf = tons per square foot.
Isolation casing set at 23.5' and monitoring well installed using mud rotary.
0'-41' log from geoprobe boring.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-30	30						30-31	SILTY CLAY: silty clay, strong brown (7.5 YR 5/6), moist, pp=>4.5tsf, crumbly, black stain, traces of white calcareous nodules (1mm diameter)
							31-32	SILTY CLAY: silty clay, strong brown (7.5 YR 5/6), moist, pp=>4.5tsf, crumbly, black stain, white calcareous nodules (30mm diameter)
							32-33	NO RECOVERY
							33-34.3	SILTY CLAY: silty clay, strong brown (7.5 YR 5/6), moist, pp=>4.5tsf, crumbly, black stain, @33.4ft, white calcareous zone 1-inch thick
							34.3-35	NO RECOVERY
-35	35						35-35.8	SANDY SILT: sandy silt, strong brown (7.5 YR 5/6), with few light gray (7.5 YR 7/1) mottling, moist, pp=2.0tsf, crumbly, traces of white calcareous nodules, <2mm diameter, fine-grained
							35.8-37	NO RECOVERY
							37-38.6	SILTY SAND: silty sand, strong brown (7.5 YR 5/6), wet to saturated, very fine to fine sand, poorly sorted, crumbly, traces of greenish gray (1 Gley 5/10GY)
							38.6-39	NO RECOVERY
							39-41	CLAY: clay, strong brown (7.5 YR 5/6), very few light gray (7.5 YR 7/1) mottles, moist, pp=4.0tsf, white calcareous nodules, 5mm diameter
-40	40				0			
					2		41-42	NOT SAMPLED
					NM			T.D. = 42'
-45	45							

Union Pacific Railroad

Log of Boring: MW-44A

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	2/22/07	Drilling Method:	HSA
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	8.5
Driller:	Sonny Tobola	Total Depth (ft):	32
Driller's License:	3026	Northing:	3168348.72
Field Supervisor:	James Whittington, P.G.	Easting:	729020.79
Sampling Method:	4" x 5' Split Barrel	Casing Elevation (ft):	45.11

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
0				Topsoil	(0.0 to 1.0) Topsoil.
		0		CL	(1.0 to 2.5) Silty CLAY, dark gray, undecayed plant material.
		0.2		CL	(2.5 to 7.0) Silty CLAY, gray, moist, < 5% carb nodules.
5		0			
				CL	(7.0 to 17.0) Silty CLAY, mottled tan and gray, more gray with depth, more sand with depth.
10		0			
		0			
15		0.1	NA		
				CL	(17.0 to 18.0) Sandy CLAY, gray, carb nodules.
				SP	(18.0 to 24.0) SAND, brown, medium-grained, 90% sand, 5% silt, and 5% clay.
20		0.3			
		0			
25				SP/ML	(24.0 to 30.0) SAND, brown, medium grained, sandy SILT, gray, fine-grained, < 10% clay interbedded, ~5 - 10 cm, silt layers, dilatent.
		0.2			
30		11.2		CL	(30.0 to 32.0) CLAY, mottled red and gray, moist, stiff, top of sand lense at 32.0, creosote odor.

STATE OF TEXAS JAMES WHITTINGTON GEOLOGY 10016 LICENSED PROFESSIONAL GEOSCIENTIST

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. Borehole plugged with bentonite chips 28.0 to 32.0 feet bgs.

Annular Materials
(0 to 15.0) Bentonite-Cement Grout
(15.0 - 17.0) Bentonite Pellets
(17.0 - 28.0) 16-30 Silica Sand

Well Materials
(0 to 18.0) Casing, 2" Sch 40 FJT PVC
(18.0 to 28.0) Screen 2" Sch 40 FJT PVC
0.010 slot

Union Pacific Railroad

Log of Boring: MW-44A

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	2/22/07	Drilling Method:	HSA
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	8.5
Driller:	Sonny Tobola	Total Depth (ft):	32
Driller's License:	3026	Northing:	3168348.72
Field Supervisor:	James Whittington, P.G.	Easting:	729020.79
Sampling Method:	4" x 5' Split Barrel	Casing Elevation (ft):	45.11

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
0				Topsoil	(0.0 to 1.0) Topsoil.
		0		CL	(1.0 to 2.5) Silty CLAY, dark gray, undecayed plant material.
		0.2		CL	(2.5 to 7.0) Silty CLAY, gray, moist, < 5% carb nodules.
5		0			
				CL	(7.0 to 17.0) Silty CLAY, mottled tan and gray, more gray with depth, more sand with depth.
10		0			
		0			
15		0.1	NA		
				CL	(17.0 to 18.0) Sandy CLAY, gray, carb nodules.
				SP	(18.0 to 24.0) SAND, brown, medium-grained, 90% sand, 5% silt, and 5% clay.
20					
		0.3			
		0			
25				SP/ML	(24.0 to 30.0) SAND, brown, medium grained, sandy SILT, gray, fine-grained, < 10% clay interbedded, ~5 - 10 cm, silt layers, dilatent.
		0.2			
30		11.2		CL	(30.0 to 32.0) CLAY, mottled red and gray, moist, stiff, top of sand lense at 32.0, creosote odor.

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. Borehole plugged with bentonite chips 28.0 to 32.0 feet bgs.

Annular Materials
(0 to 15.0) Bentonite-Cement Grout
(15.0 - 17.0) Bentonite Pellets
(17.0 - 28.0) 16-30 Silica Sand

Well Materials
(0 to 18.0) Casing, 2" Sch 40 FJT PVC
(18.0 to 28.0) Screen 2" Sch 40 FJT PVC
0.010 slot

ERM.

MW-44C DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-44C Date Drilled 1/16/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 70 ' Boring Diam. 7.88 "

N. Coord. 729020.8930 ' E. Coord. 3168348.8380 'Surface Elevation 45.2' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 57.5 ' Sump Length 2.5 '

Top of Casing Elevation 45.03' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
45.2	0					0-2	0-4.5	CLAY: Light olive brown (2.5Y 5/3), mottled, stiff (pp=1.5 tsf), some gravel, moist, 50% recovery. At 2' black nodules. At 2.7' becomes sandy, fine-grained, angular, some gravel. At 4' becomes dark yellowish brown (10YR 3/6), plastic, stiff (pp=1.5 tsf).
					0.0	2-4		
					0.0	4-6		
40	5						4.5-5	SILTY CLAY: Bluish black (GLEY 4/10B), gravels up to 1/4" diameter from 4.5'-5', moist, 75% recovery.
							5-8	CLAY: Light olive brown (2.5Y 5/3), mottled. At 6' becomes (GLEY 6/5PB) with orange and dark brown mottling, stiff (pp=1.5 tsf), sand lenses, fine grained, angular, moist, 50 % recovery.
					0.0	6-8		
					0.0	8-10	8-10	SILTY CLAY: Brown (10YR 5/3) with orange mottling, plastic, soft (pp=0.5 tsf) at 8'-9' and stiff (pp=1.25 tsf) at 9'-10', gravels up to 1/2" diameter, iron nodules up to 1/2" diameter from 9'-10', moist, 100 % recovery. At 9.5' becomes strong brown (7.5YR 5/6) with less gravel.
35	10				0.0	10-12	10-12	CLAY: Brownish yellow (10YR 6/8) with light bluish gray (GLEY 7/10B) mottling, stiff (pp=1.5 tsf), iron nodules up to 1/2" diameter, sand lenses, fine-grained, subangular, moist, 100 % recovery.
					0.0	12-14	12-12.5	SILTY CLAY: Brownish yellow (10YR 6/6), soft (pp=0.5 tsf), moist.
							12.5-14	SANDY CLAY: Very pale brown (10YR 7/3) with pink tinge, fine-graine subangular, plastic, stiff (pp=2.0 tsf), iron nodules up to 1/2" diameter, moist, 100% recovery.
					0.0	14-16	14-16.3	SANDY SILTY CLAY: light brown (7.5YR 6/3) with orange mottling, fine-grained, subangular, very soft (pp=0.0 tsf), gravels up to 1/2" diameter, moist, 100% recovery.
	15						50	

ERM.

MW-44C DRILLING LOG

J.O. NO.	422-102	Boring/Well ID	MW-44C	Date Drilled	1/16/2004
Project	Houston Wood Preserving Works	Owner	Union Pacific Railroad Company		
Location	Houston, Texas	Boring T.D.	70 '	Boring Diam.	7.88 "
N. Coord.	729020.8930 '	E. Coord.	3168348.8380 '	Surface Elevation	45.2' Ft. MSL Datum
Screen: Type	Stainless Steel	Diam.	2 "	Length	10 ' Slot Size 0.01 "
Casing: Type	Stainless Steel	Diam.	2 "	Length	57.5 ' Sump Length 2.5 '
Top of Casing Elevation	45.03'			Stickup	0 '
Depth to Water:	1. Ft. 0 ( )	2. Ft. 0 ( )			
Drilling Company	Fugro Geosciences, Inc.	Driller	Steve Bender		
Drilling Method	Mud rotary	Log By	Vivian Rohrback		

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
30	15				0.0	16-18	16.3-20.3	SANDY CLAY: Greenish gray (GLEY 6/10GY) with dark brown mottling, stiff (pp=1.5 tsf), fine-grained, subangular, moist, 100 % recovery. At 18' becomes brown (7.5YR 5/4) with greenish gray (GLEY 6/10GY) mottling, gravels up to 1/2" diameter at 19', increasing sand.
					0.0	18-20		
25	20				0.0	20-22	20.3-24	SAND: Light yellowish brown (10YR 6/4), very fine-grained, subangular, moist, 50% recovery. At 22' few gravel pieces up to 3/4" diameter, some iron nodules.
					0.0	22-24		
20	25				0.0	24-26	24-26	NO RECOVERY
					0.0	26-28	26-28	SAND: Light yellowish brown (10YR 6/4), very fine-grained, subangular, moist, 25% recovery.
	30				0.0	28-30	28-30	CLAY: Strong brown (7.5YR 5/6) with bluish gray (GLEY 6/10B) mottling, plastic, soft (pp=0.25 tsf) at 28'-28.4' and very stiff (pp=3.0 tsf) at 28.4'-30', moist, 100% recovery. At 28.4'-30' becomes brownish yellow (10YR 6/6) with bluish gray (GLEY 6/10B) mottling, sand lenses, fine-grained, subangular, black staining at 28.5'.

51

ERM.

MW-44C DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-44C Date Drilled 1/16/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 70 ' Boring Diam. 7.88 "

N. Coord. 729020.8930 ' E. Coord. 3168348.8380 'Surface Elevation 45.2' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 57.5 ' Sump Length 2.5 '

Top of Casing Elevation 45.03' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
15	30				0.0	30-32	30-38	CLAY: Olive yellow (2.5Y 6/6) with light bluish gray mottling, black nodules, black staining, stiff (pp=2.0 tsf), moist, 75 % recovery. At 32' grades to light yellowish brown (2.5Y 6/4) with bluish gray (GLEY 6/5B) mottling, some calcareous nodules, soft (pp=0.5 tsf) at 32' and stiff (pp=2.0 tsf) at 34'. At 34' becomes reddish yellow (7.5YR 6/6) with light greenish gray (GLEY 7/5GY) mottling, calcareous nodules up to 1/4" diameter, very stiff (pp=3.25 tsf). At 36' some black staining, few fractures, very stiff (pp=2.5 tsf).
					0.0	32-34		
					0.0	34-36		
10	35				1.7	36-38		
					1.4	38-40	38-39.2	SILTY SANDY CLAY: Reddish yellow (7.5YR 6/6) with light greenish gray (GLEY 8/10Y) mottling, fine-grained, subangular, gravels up to 1/4" diameter, moist, 100% recovery.
							39.2-42	CLAY: Yellowish red (5YR 5/6) with light greenish gray (GLEY 7/5GY) mottling, fractured, some calcareous nodules, some black staining, hard (pp=>4.5 tsf) moist. At 40'-42' odor.
5	40				0.0	40-42		
					0.0	42-44	42-43	SILTY SANDY CLAY: Reddish yellow (7.5YR 6/6) with light greenish gray (GLEY 8/10Y) mottling, fine-grained, subangular, gravels up to 1/4" diameter, moist, 100% recovery.
							43-46	CLAY: Yellowish red (5YR 5/6) with light greenish gray (GLEY 7/5GY) mottling, fractured, hard (pp=4.5 tsf), some calcareous nodules, some black staining, moist, odor, 100% recovery.
					0.0	44-46		
	45						52	

ERM.

MW-44C DRILLING LOG

J.O. NO. 422-102 Boring/Well ID MW-44C Date Drilled 1/16/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 70 ' Boring Diam. 7.88 "

N. Coord. 729020.8930 ' E. Coord. 3168348.8380 'Surface Elevation 45.2' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 57.5 ' Sump Length 2.5 '

Top of Casing Elevation 45.03' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	45							
					0.0	46-48	46-47	SILTY CLAY: Yellowish red (5YR 3/8) with light greenish gray (GLEY 7/5GY) mottling, odor, moist, 100 % recovery.
							47-50	CLAY: Yellowish red (5YR 5/6) with light greenish gray (GLEY 8/5GY) mottling, fractured, very stiff (pp=4.0 tsf), odor, moist, 100 % recovery. At 48' becomes hard (pp=4.5 tsf).
					0.0	48-50		
-5	50				0.0	50-52	50-51	SILTY CLAY: Yellowish red (5YR 5/8) with light greenish gray (GLEY 7/5GY) mottling, some gravels up to 1/2" diameter, odor, moist, 100 % recovery.
							51-54	CLAY: Red (2.5YR 4/6) with light greenish gray (GLEY 7/5GY) mottling, fractured, hard (pp=4.5 tsf), odor, moist, 100 % recovery.
					0.0	52-54		
					0.5	54-56	54-55	SILTY CLAY: Yellowish red (5YR 5/8) with light greenish gray (GLEY 7/5GY) mottling, some gravels up to 1/2" diameter, odor, moist, 100 % recovery.
-10	55						55-57	CLAY: Red (2.5YR 4/6) with light greenish gray (GLEY 7/5GY) mottling, fractured, hard (pp=>4.5 tsf) at 55' and very stiff (pp=3.75 tsf) at 56', odor, moist, 100% recovery.
					1.7	56-58		
							57-58	SILTY CLAY: Yellowish red (5YR 5/6), firm (pp=1.0 tsf), slight odor, moist, 100% recovery.
					0.2	58-60	58-59	NO RECOVERY
							59-60	CLAY: With silt partings, yellowish red (5YR 5/8), laminated, fractured, hard (pp=>4.5 tsf), moist, 100% recovery.
	60						53	

ERM.

MW-44C DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-44C Date Drilled 1/16/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 70 ' Boring Diam. 7.88 "

N. Coord. 729020.8930 ' E. Coord. 3168348.8380 'Surface Elevation 45.2' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 57.5 ' Sump Length 2.5 '

Top of Casing Elevation 45.03' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-15	60				1.4	60-62	60-65.8	SILTY CLAY: Yellowish red (5YR 5/6), fractured, carbonate cemented sand zone at 62.5', odor, moist, 100 % recovery. At 62' some small gravel, 63', and 63.5', sheen, wet to moist with depth. At 64' becomes wet.
					0.0	62-64		
					0.0	64-66		
-20	65				0.2	66-68	65.8-66 66-68	SANDY SILT: Yellowish red (5YR 5/6), very fine-grained, rounded, odor, wet, 100% recovery. NO RECOVERY: Hammered sampler ~109 blows. Driller stated it drilled like sandstone.
					NR	68-70	68-70	CLAY: Yellowish red (5YR 5/6), fractured, manganese oxide in fractures, stiff (pp=1.0 tsf) at 68' and very stiff (pp=3.0 tsf) at 70', odor, moist, 100 % recovery.
-25	70				0.0			T.D. = 70 '
	75							

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ERM.

MW-45C DRILLING LOG

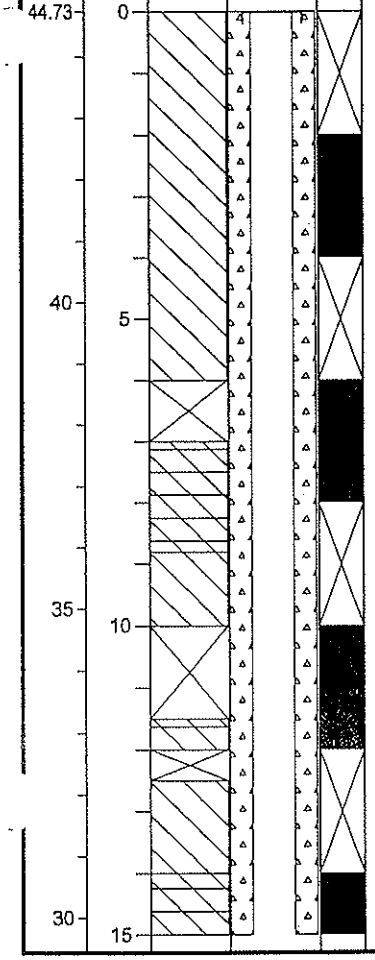
J.O. NO.	422-102	Boring/Well ID	MW-45C	Date Drilled	1/20/2004
Project	Houston Wood Preserving Works	Owner	Union Pacific Railroad Company		
Location	Houston, Texas	Boring T.D.	70.5'	Boring Diam.	7.88"
N. Coord.	729155.2550'	E. Coord.	3168511.7350'	Surface Elevation	44.9' Ft. MSL Datum
Screen: Type	Stainless Steel	Diam.	2"	Length	10' Slot Size 0.01"
Casing: Type	Stainless Steel	Diam.	2"	Length	58' Sump Length 2.5'
Top of Casing Elevation	44.73'			Stickup	0'
Depth to Water:	1. Ft. 0 ( )	2. Ft. 0 ( )			
Drilling Company	Fugro Geosciences, Inc.	Driller	Steve Bender		
Drilling Method	Mud rotary	Log By	Vivian Rohrback		

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot



Elevation (Feet)	Depth (Feet)	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
44.73	0		0-2	0-6	CLAY: Dark olive brown (2.5Y 3/2), soft (pp=0.5 tsf), some gravels up to 1/2" diameter, rootlets, some glass and rusty screws, moist, 50 % recovery. At 3' becomes brownish yellow (10YR 6/1), plastic, stiff (pp=1.5 tsf), trace rootlets, iron nodules, calcareous nodules, moist, 50 % recovery. At 4' becomes olive yellow (5Y 6/1) with brownish yellow (10YR 6/8) mottling, stiff (pp=1.5 tsf), some gravel up to 1/4" in diameter, caliche lenses at 4.4' and 5', moist, 75% recovery.
		0.0	2-4		
		0.0	4-6		
40	5	0.0	6-8	6-7	NO RECOVERY
				7-8.8	SILTY CLAY: Dark grayish brown (2.5Y 4/2), caliche nodules up to 1/4" diameter, some iron nodules, wet, 100 % recovery.
		0.0	8-10		
				8.8-10	CLAY: Olive yellow (2.5Y 6/8) and greenish gray (GLEY 5/10Y) mottling, plastic, soft (pp=0.5 tsf), iron nodules, moist, 100 % recovery.
35	10	0.0	10-12	10-11.5	NO RECOVERY
				11.5-12	SILTY CLAY: Light gray (2.5Y 7/2), mottled, soft (pp=0.5 tsf), 100 % recovery.
		0.0	12-14	12-12.5	NO RECOVERY
				12.5-14	CLAY: Light greenish gray (GLEY 7/10Y) with brownish yellow (10YR 6/8) mottling, plastic, very stiff (pp=4.0 tsf), iron nodules, black oxide staining, moist, 100% recovery.
		0.0	14-16	14-16	SILTY CLAY: Light gray (2.5Y 7/2) with brownish yellow (10YR 6/8) mottling, very stiff (pp=3.0 tsf), black oxide zone at 15'-16', moist, 100 % recovery.
30	15			55	

ERM.

MW-45C DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-45C Date Drilled 1/20/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 70.5' Boring Diam. 7.88"

N. Coord. 729155.2550' E. Coord. 3168511.7350' Surface Elevation 44.9' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Stainless Steel Diam. 2" Length 58' Sump Length 2.5'

Top of Casing Elevation 44.73' Stickup 0'

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	15				0.0	16-18	16-16.5	NO RECOVERY
							16.5-18	CLAY: Light gray (2.5Y 7/2) with brownish yellow (10YR 6/8) mottling, iron staining, some gravel, gravel at beginning of interval ~2.5" diameter, moist, 100% recovery.
					0.0	18-20	18-19	NO RECOVERY
							19-20	CLAYEY SILT: Pale yellow (2.5Y 7/2), pink tinge, some black nodules, moist, 100% recovery.
25	20				0.0	20-22	20-22	CLAYEY SILTY SAND: Brownish gray (2.5Y 6/2) grading to yellowish brown (10YR 5/6), very fine-grained, rounded, light, moist, 100 % recovery.
					0.0	22-24	22-22.5	NO RECOVERY
							22.5-26	CLAYEY SAND: Yellowish brown (10YR 5/6), fine-grained, subrounded, some light brownish gray (2.5Y 6/2) clay stringers, saturated to wet with depth, 100% recovery.
					0.0	24-26		
20	25				0.0	26-28	26-28	CLAY: Strong brown (7.5YR 5/6), fat, fractured, laminated, very stiff (pp=3.5 tsf), light greenish gray (GLEY 8/10Y) clay fill in fractures, black oxide staining, odor, moist, 100% recovery.
					0.0		28-32	SILTY CLAY: Strong brown (7.5YR 5/6) with light greenish gray (GLEY 8/10GY) mottling, fractured, stiff (pp=2.0 tsf), manganese oxide staining, large limestone gravel up to 2" diameter at 29', odor, moist, 100 % recovery. At 30'-32' very stiff (pp=2.75 tsf), some calcareous nodules, some iron nodules, slight odor, moist, 100 % recovery, .
15	30						56	

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MW-45C DRILLING LOG

.O. NO. 422-102 Boring/Well ID MW-45C Date Drilled 1/20/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 70.5 ' Boring Diam. 7.88 "

N. Coord. 729155.2550 ' E. Coord. 3168511.7350 'Surface Elevation 44.9' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 58 ' Sump Length 2.5 '

Top of Casing Elevation 44.73' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	30				0.3			
					0.0		32-34	CLAYEY SILT: Light greenish gray (GLEY 7/5GY), mottled, very stiff (pp=3.25 tsf), rootlets, iron staining, moist, 50 % recovery.
					0.0		34-36	SILTY CLAY: Light greenish gray (GLEY 7/5GY), mottled, very stiff (pp=3.25 tsf), rootlets, iron staining, moist, 100 % recovery.
10	35				0.0		36-42	CLAYEY SILT: Light greenish gray (GLEY 7/5GY) with yellowish brown (10YR 5/8) mottling, very stiff (pp=4.0 tsf at 36'-38', pp=3.0 at 38.5'-40'), hard (pp=>4.5 tsf) at 40.5'-42', odor, moist, 58 % recovery. At 37.5'-38' iron nodules. At 40.5' becomes yellowish red (5YR 5/6) with light greenish gray (GLEY 7/5GY) mottling, fractured, maganese nodules and staining, sheen.
					2.5			
5	40				0.6			
					5.0		42-60	SILTY CLAY: Light greenish gray (GLEY 7/5GY) with yellowish brown (10YR 5/8) mottling, hard (pp=>4.5 tsf), manganese oxide staining, odor, moist, 72% recovery. At 45' becomes yellowish red (5YR 5/6) with light greenish gray (GLEY 7/10BG) mottling, cohesive, fractured, hard (pp=>4.5 tsf), bioturbation. At 46'-48' hard (pp=>4.5 tsf), manganese oxide staining. At 49'-50' fractured, hard (pp=>4.5 tsf), silt lenses, manganese oxide staining, slight odor. At 51'-54' more fractures, hard (pp=4.0 tsf), manganese oxide staining, slight odor. At 54'-56' very stiff (pp=3.0 tsf), silt lenses. At 56.5'-58' very stiff (pp=3.5 tsf), homogenous, bioturbation, carbonate concretions. At 58'-60' plastic with clay and silt lenses.
					48.9			
0	45						57	

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MW-45C DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-45C Date Drilled 1/20/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 70.5 ' Boring Diam. 7.88 "

N. Coord. 729155.2550 ' E. Coord. 3168511.7350 'Surface Elevation 44.9' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 58 ' Sump Length 2.5 '

Top of Casing Elevation 44.73' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-5	45				2.2			
	50				0.6			
					0.0			
					0.0			
-10					0.0			
	55				0.0			
					0.0			
-15	60						58	

ERM.

MW-45C DRILLING LOG

J.O. NO. 422-102 Boring/Well ID MW-45C Date Drilled 1/20/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 70.5 ' Boring Diam. 7.88 "

N. Coord. 729155.2550 ' E. Coord. 3168511.7350 'Surface Elevation 44.9' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 58 ' Sump Length 2.5 '

Top of Casing Elevation 44.73' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	60				0.0		60-62	NO RECOVERY
					NR		62-64	SILTY CLAY: Yellowish red (5YR 5/6), moist to wet with depth, laminated, fractured, very stiff (pp=3.0 tsf), burrows, clay lenses, sheen, odor, moist to wet with depth, 100% recovery.
-20	65				5.9		64-68	SILTY CLAYEY SAND: Yellowish red (5YR 5/6), very fine-grained, well-sorted, sheen, odor, wet, 40% recovery. At 67.5'-68' moderately sorted, slight odor. At 64'-66' hammered in ~82 blows. At 66'-68' hammered in ~57 blows.
					11.9			
					1.2		68-70	CLAY: Yellowish red (5YR 5/6), plastic, very stiff (pp=3.0 tsf), laminated, fractured, manganese oxide and iron staining, slight odor, moist, 100 % recovery.
-25	70				0.0			T.D. = 70.5 '
							59	
-30	75							

ERM.

MW-46C DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-46C Date Drilled 1/9/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 72.5' Boring Diam. 7.88"

N. Coord. 729120.9350' E. Coord. 3168576.2680' Surface Elevation 45.0' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Stainless Steel Diam. 2" Length 60' Sump Length 2.5'

Top of Casing Elevation 44.94' Stickup 0'

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud Rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
44.94	0					0-2	0-2	SANDY CLAY: Black (5YR 2.5/1) grading to weak red (2.5YR 4/2), fine-grained, subrounded, gravel up to 3/4" diameter, some iron nodules, wood fragments, rootlets, moist, 50% recovery.
					0.0	2-4	2-4	CLAY: Weak red (2.5YR 4/2), some gravel, some white nodules, sand lense at 2.3', fine-grained, subangular, some rootlets, iron staining, moist, 75% recovery.
					0.0	4-6	4-4.5	SILTY SANDY CLAY: Greenish gray (GLEY 6/10Y), fine-grained, subangular, gravels up to 1/2" diameter, moist, 100 % recovery.
40	5						4.5-6	SANDY CLAY: Greenish gray (GLEY 6/10Y) with reddish yellow (7.5YR 6/8) mottling, stiff (pp=1.5 tsf), fine-grained, subangular, some white nodules, moist, 100% recovery.
					0.0	6-8	6-6.8	SANDY SILTY CLAY: Greenish gray (GLEY 5/8GY), fine-grained, subangular, gravels up to 1/2" diameter, moist, 100 % recovery.
							6.8-8	SANDY CLAY: Light greenish gray (GLEY 7/10Y) with orange yellow mottling, stiff (pp=1.5 tsf), fractured, fine-grained, subangular, some iron nodules, black staining, moist, 100 % recovery.
					0.0	8-10	8-8.9	SANDY SILTY CLAY: Greenish gray (GLEY 5/8GY), fine-grained, subangualr, gravels up to 1/2" diameter, moist, 100 % recovery.
							8.9-10	SANDY CLAY: Light greenish gray (GLEY 7/10Y) with orange yellow mottling, firm (pp=1.0 tsf), gravel ~1.5" diameter from 8'-8.2', moist, 100 % recovery.
35	10				0.0	10-12	10-10.8	SILTY SANDY CLAY: Light greenish gray (GLEY 7/10Y) with yellow brown mottling, very fine-grained, rounded, gravels up to 1/2" diameter, moist, 100% recovery.
							10.8-12	CLAY: Light greenish gray (GLEY 7/10Y), firm (pp=0.5 tsf), very fine-grained, rounded, some iron nodules, some sand lenses, moist, 100 % recovery.
					0.0	12-14	12-12.5	SANDY SILTY CLAY: Greenish gray (GLEY 5/8GY), fine-grained, subangualr, gravels up to 1/2" diameter, moist, 100 % recovery.
							12.5-16	SANDY CLAY: Light greenish gray (GLEY 7/10GY) with reddish yellow (7.5YR 6/8) mottling, fine-grained, subangular, very stiff (pp=2.25 tsf) at 12.5'-14' and (pp=2.5tsf) at 14'-16', iron nodules, some shell fragments, moist, 100% recovery.
					0.0	14-16		
30	15						60	

ERM.

MW-46C DRILLING LOG

V.O. NO. 422-102 Boring/Well ID MW-46C Date Drilled 1/9/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 72.5 ' Boring Diam. 7.88 "

N. Coord. 729120.9350 ' E. Coord. 3168576.2680 'Surface Elevation 45.0' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 60 ' Sump Length 2.5 '

Top of Casing Elevation 44.94' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud Rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	15				0.0	16-18	16-16.8	SANDY SILTY CLAY: Light greenish gray (GLEY 7/10Y) with orange red mottling, fine-grained, subangular, black nodules up to 1/2" diameter, moist, 100% recovery.
							16.8-20	SANDY CLAY: Light greenish gray (GLEY 5/10Y), fine-grained, subangular, very stiff (pp=2.5 tsf), white nodules, moist, 100 % recovery. At 18' orange red mottling, stiff (pp=1.5 tsf), sand lenses at 19.7'.
					0.0	18-20		
25	20				0.0	20-22	20-28	SAND: Light greenish gray (GLEY 7/10GY) grading to brown (7.5YR 5/4), very fine-grained, subrounded, saturated to moist to saturated, 70 % recovery. At 22.5'-24' some gravels up to 1/2" diameter. At 24'-26' light greenish gray (GLEY 7/5BG) mottling, firm (pp=1.0 tsf), clay lenses from 24.3'-24.5', odor.
					0.0	22-24		
					0.0	24-26		
20	25							
					0.0	26-28		
					0.0	28-30	28-30	CLAY: Strong brown (7.5YR 5/6) with light greenish gray (GLEY 6/10Y) mottling, very stiff (pp=4.0 tsf), some black staining, moist, 100 % recovery. At 28-28.2' sandy silt clay, fine-grained, subangular, gravel up to 1/2" diameter. At 29.6' sand lenses, very fine grained, rounded. Sampler had sheen on it when pulled from hole.
15	30						61	

ERM.

MW-46C DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-46C Date Drilled 1/9/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 72.5 ' Boring Diam. 7.88 "

N. Coord. 729120.9350 ' E. Coord. 3168576.2680 'Surface Elevation 45.0' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 60 ' Sump Length 2.5 '

Top of Casing Elevation 44.94' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud Rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	30				0.0	30-32	30-34	SILTY CLAY: Reddish yellow (5YR 6/6) grading to yellowish red (5YR 5/6) with light greenish gray (GLEY 8/5GY) mottling, some iron nodules, moist, 100% recovery, odor. At 32.5 becomes light greenish gray (GLEY 8/10Y) and olive yellow (2.5Y 6/8), slight odor.
					0.0	32-34		
					0.0	34-36	34-36	CLAYEY SILT: Pale yellow (2.5Y 7/3) with yellow (2.5Y 7/8) mottling, very stiff (pp=3.25 tsf), caliche nodules, moist, 50 % recovery.
10	35				0.0	36-38	36-42	SILTY CLAY: Reddish yellow (7.5YR 6/8) with light greenish gray (GLEY 8/5GY) mottling, plastic, massive, very stiff (pp=3.25 tsf at 36'-38' and pp=3.5 tsf at 39'-40'), trace gravels, moist, 63 % recovery. At 39' black nodules. At 40' becomes strong brown (7.5YR 5/6) with light greenish gray (GLEY 7/10Y) mottling, fractured, laminated, very stiff (pp=3.75 tsf), caliche lenses, manganese oxide staining.
						38-40		
5	40				0.0	40-42		
					0.0	42-44	42-44	CLAYEY SILT: Strong brown (7.5YR 5/8) with light greenish gray (GLEY 7/10Y) mottling, very stiff (pp=4.0 tsf), manganese oxide staining, odor, moist.
					17.9	44-46	44-46	CLAY: Strong brown (7.5YR 5/8) with light greenish gray (GLEY 7/5GY) mottling, hard (pp=>4.5 tsf), calcareous nodules up to 1/4" diameter, manganese oxide staining, odor, moist, 75 % recovery.
0	45							

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ERM.

MW-46C
DRILLING LOG

.O. NO. 422-102 Boring/Well ID , MW-46C Date Drilled 1/9/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 72.5 ' Boring Diam. 7.88 "

N. Coord. 729120.9350 ' E. Coord. 3168576.2680 'Surface Elevation 45.0' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 60 ' Sump Length 2.5 '

Top of Casing Elevation 44.94' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud Rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	45				0.0	46-48	46-47	NO RECOVERY
							47-48	CLAYEY SILT: Yellowish red (5YR 5/6) with light greenish gray (GLEY 7/5GY) mottling, fractured, slicken sides, hard (pp=>4.5 tsf), manganese oxide staining, odor, moist, 50% recovery.
					0.7	48-50	48-54	SILTY CLAY: Yellowish red (5YR 5/6) with pale yellow (5Y 7/3) mottling, very stiff (pp=3.5 tsf), calcareous nodules, manganese oxide staining, moist, 100% recovery, odor. At 50' becomes strong brown (7.5YR 5/6) with light greenish gray (GLEY 7/5GY) mottling, fractured, slicken sides, very stiff (pp=3.0 tsf). At 52' hard (pp=>4.5 tsf), slight odor.
-5	50				0.1	50-52		
					0.0	52-54		
					0.0	54-56	54-56	CLAYEY SILT: Yellow red (5YR 5/6), plastic, stiff (pp=1.5 tsf), fractured, laminated, clay lenses, moist, 75% recovery.
-10	55				0.0	56-58	56-57	NO RECOVERY
							57-58	SILTY CLAY: Yellow red (5YR 5/6), plastic, stiff (pp=1.5 tsf), moist, 100 % recovery.
					0.0	58-60	58-60	CLAYEY SILT: Yellowish red (5YR 5/8), very stiff (pp=4.0 tsf), slight odor, moist, 75% recovery.
-15	60							

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ERM.

MW-46C DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-46C Date Drilled 1/9/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 72.5 ' Boring Diam. 7.88 "

N. Coord. 729120.9350 ' E. Coord. 3168576.2680 'Surface Elevation 45.0' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 60 ' Sump Length 2.5 '

Top of Casing Elevation 44.94' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud Rotary Log By Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	60				0.0	60-62	60-64	SANDY CLAY: Yellowish red (5YR 5/6), very fine-grained, very soft (pp=0.0 tsf), sheen, odor, moist, 75% recovery. At 62.9' some silt lenses, sheen, strong odor. At 62.7'-62.9' clayey silt, at 62.9' limestone lenses.
					1.0	62-64		
					10.9	64-66	64-68	SAND: Yellowish red (5YR 5/6), fine-grained, subrounded, carbonate cemented sand lenses at 65.1', sheen, strong odor, wet, 50 % recovery. At 66'-68' hammered sampler ~80 blows, driller indicated increased resistance.
-20	65				1.6	66-68		
					0.0	68-70	68-70	SILTY CLAY: Yellowish red (5YR 5/6), fractured, stiff (pp=1.5 tsf), fractured, manganese oxide staining, moist to wet with depth, odor, 75 % recovery. At 68.5'-69.4' becomes silty sand, fine grained, subrounded.
-25	70				0.0	70-72	70-72	CLAY: Yellowish red (5YR 5/6) with light greenish gray (GLEY 7/5GY) mottling, fractured, laminated, very stiff (pp=2.5 tsf), manganese oxide staining, moist, 100% recovery.
					0.0			T.D. = 72.5 '
-30	75						64	

Union Pacific Railroad

Log of Boring: MW-47C

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	2/24/07	Drilling Method:	HSA / Mud Rotory
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	6
Driller:	Sonny Tobola	Total Depth (ft):	72.5
Driller's License:	3026	Northing:	3168536.04
Field Supervisor:	James Whittington, P.G.	Easting:	728724.52
Sampling Method:	2" x 3' Split Spoon	Casing Elevation (ft):	45.61

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
0				Fill	(0.0 to 1.0) Topsoil and trash.
				Fill	(1.0 to 1.4) Asphalt.
				Fill	(1.4 to 2.5) Fill, gravelly clay.
		0	50	CL	(2.5 to 6.0) Silty CLAY, dark gray, gradational basal contact.
5		0	100		
		0.1	100	CL	(6.0 to 15.0) Silty CLAY with SAND, mottled gray and tan, more sand with depth, more gray with depth, gradational basal contact.
			0		
10		0.1	90		
		0	90		
			0		
15		0.2	100	SP	(15.0 to 23.0) SAND, gray, fine sand, trace tan iron mottles, saturated at ~17.0, gradational basal contact.
		0.1	75		
			0		
20		0.2	50		
		0.1	50		
			0	SP	(23.0 to 28.0) Interbedded gray fine SAND and medium-fine brown SAND
25		0.2	50		
		0.4	25		
			0	SC	(28.0 to 30.0) Interbedded brown SAND and reddish-brown CLAY, sharp basal contact.
30					(30.0 to 32.0) CLAY, mottled reddish-brown and gray, dense, firm, less

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
1. 10" PVC surface casing set from 0 to 30.0 feet bgs. 6" PVC casing set from 30.0 to 55.0 feet

Annular Materials
(0 to 55.0) Bentonite-Cement Grout
(55.0 - 57.0) Bentonite Pellets
(57.0 - 74.0) 16-30 Silica Sand

Well Materials
(0 to 61.0) Casing, 2" Stainless Steel
(61.0 to 71.0) Screen 2" Wire Wrapped Stainless Steel 0.010 slot

Union Pacific Railroad

Log of Boring: MW-47C

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	2/24/07	Drilling Method:	HSA / Mud Rotory
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	6
Driller:	Sonny Tobola	Total Depth (ft):	72.5
Driller's License:	3026	Northing:	3168535.04
Field Supervisor:	James Whittington, P.G.	Easting:	728724.52
Sampling Method:	2" x 3' Split Spoon	Casing Elevation (ft):	45.61

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
		0.3	100	CL	moist.
		0	80	CL	(32.0 to 40.0) CLAY with SILT, mottled yellowish-brown and gray, carb clasts, firm, moist, transition with Fe.
35					
		0			
		0	100		
40		0			(40.0 to 50.0) CLAY, reddish-brown with 10% gray mottling, moist, very firm, no odor until 49.0.
		0			
		0	100	CL	
45		0			
		3			
		69	100		
50		4.5		CL	(50.0 to 51.0) Silty CLAY, reddish-brown, saturated, sheen visible on broken surface, very strong odor.
		1		CL	(51.0 to 55.0) CLAY, dark red, very firm, moist, fat, no odor, less moist with depth.
			100		
55			0	NR	(55.0 to 57.0) Drilled out, no recovery.
		0	100	CL	(57.0 to 58.5) CLAY, dark red, very firm, moist, fat, no odor, less moist with depth.
				SM	(58.5 to 63.5) Very silty SAND, red (2.5YR 4/6), reddish-brown to orange fine sand, no odor, some silty clayey lenses; hard, blocky, cemented lens at 59.3 to 59.5.
60		1.5			

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Well Materials
(0 to 61.0) Casing, 2" Stainless Steel
(61.0 to 71.0) Screen 2" Wire Wrapped Stainless Steel 0.010 slot

Union Pacific Railroad

Log of Boring: MW-47C

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	2/24/07	Drilling Method:	HSA / Mud Rotory
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	6
Driller:	Sonny Tobola	Total Depth (ft):	72.5
Driller's License:	3026	Northing:	3168535.04
Field Supervisor:	James Whittington, P.G.	Easting:	728724.52
Sampling Method:	2" x 3' Split Spoon	Casing Elevation (ft):	45.61

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
			50		
		4.1	100	CL	(63.5 to 64.5) Clayey SILT and silty CLAY, red (2.5YR 5/6), stiff to firm, interbedded silt and clay, thin (0.2' each), moist, slight odor with depth.
65		1	20	SM	(64.5 to 68.0) Silty SAND, red (2.5YR 5/6); very fine, poorly sorted, quatz sand; wet, firm, odor present, cleaner sand with depth, less silt with depth no recovery from 65.5 to 67.5, very hard/stiff sand, drilled out to 68', drilling very easy, washing out as drill stem being lowered, indication of a decent sand.
		1.4	75	CL SM	(68.0 to 69.0) Silty CLAY, red (2.5 YR 4/6), hard, medium plasticity, homogenous, thin laminae of silt, dark color, <0.01' thick, sharp basal contact.
70			100	CL/CH	(69.0 to 70.0) Silty SAND, red (2.5YR 4/6), firm, wet, very fine-grained, powdery, friable, no odor. (70.0 to 72.5) Silty CLAY, light gray (10YR 7/1) to brownish-yellow (10YR 6/8), moist to slightly moist, firm, some very thin laminae of silt, core breaks along silt laminations, medium plasticity, sticky clay, no odor, color grades into a brown (10YR 5/3) with laminated silt at 71.6, little burros filled with silt, basal contact not encountered.

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Annular Materials
(0 to 55.0) Bentonite-Cement Grout
(55.0 - 57.0) Bentonite Pellets
(57.0 - 74.0) 16-30 Silica Sand

Well Materials
(0 to 61.0) Casing, 2" Stainless Steel
(61.0 to 71.0) Screen 2" Wire Wrapped Stainless Steel 0.010 slot

ERM.

MW-48C
DRILLING LOG

J.O. NO.	422-102	Boring/Well ID	MW-48C	Date Drilled	2/2/2004
Project	Houston Wood Preserving Works	Owner	Union Pacific Railroad Company		
Location	Houston, Texas	Boring T.D.	72.5'	Boring Diam.	7.88"
N. Coord.	728417.3900'	E. Coord.	3168240.9350'	Surface Elevation	44.69' Ft. MSL Datum
Screen: Type	Stainless Steel	Diam.	2"	Length	10' Slot Size 0.01"
Casing: Type	Stainless Steel	Diam.	2"	Length	60' Sump Length 2.5'
Top of Casing Elevation	44.68'			Stickup	0'
Depth to Water:	1. Ft. 0 ( )	2. Ft. 0 ( )			
Drilling Company	Fugro Geosciences, Inc.	Driller	Steve Bender		
Drilling Method	Mud rotary	Log By	Marcel St. Marie and Vivian Rohrback		

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
44.68	0					0-2	0-2	CLAY: Very dark gray (7.5YR 3/1), mottled, plastic, stiff (pp=2.0 tsf), some gravels, trace sand grains, glass fragments, rootlets, moist, 100 % recovery.
					0.0	2-4	2-10	SILTY CLAY: Very dark gray (7.5YR 3/1), mottled, plastic, very stiff (pp=2.25 tsf), some sand, rootlets, moist, 50 % recovery. At 4'-6' becomes gray (7.5YR 6/1), mottled, plastic, very stiff (pp=2.25 tsf), some iron staining, trace white nodules. At 8'-10' firm (pp=0.75 tsf).
40	5				0.0	4-6		
					0.0	6-8		
					0.0	8-10		
35	10				0.0	10-12	10-12	CLAYEY SAND: Gray (2.5Y 6/1), very fine-grained, sorted, subangular, some iron staining, moist, 25% recovery.
					0.0	12-14	12-16.8	SANDY CLAY: Greenish gray (GLEY 6/5GY), plastic, stiff (pp=1.5 tsf), very fine-grained, sorted, subangular, sand increasing with depth.
30	15				0.0	14-16		

65

ERM.

MW-48C DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-48C Date Drilled 2/2/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 72.5' Boring Diam. 7.88"

N. Coord. 728417.3900' E. Coord. 3168240.9350' Surface Elevation 44.69' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Stainless Steel Diam. 2" Length 60' Sump Length 2.5'

Top of Casing Elevation 44.68' Stickup 0'

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Marcel St. Marie and Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	15				0.0	16-18		
							16.8-18	CLAYEY SAND: Greenish gray GLEY 6/5GY), fine-grained, sorted, subangular, moist, 100 % recovery.
					0.0	18-20	18-24	SILTY SAND: Gray (2.5Y 6/1), fine-grained, sorted, subangular, trace clay, layers of greenish gray (GLEY 6/5GY), wet, 60 % recovery. At 20'-22' saturated. At 22'-24' very dark gray (7.5YR 3/1), product observed, strong odor, saturated, 58 % recovery.
25	20				0.0	20-22		
					NA	22-24		
					NA	24-26	24-26	CLAY: Light gray (2.5Y 6/1), plastic, very stiff (pp=4.0 tsf), moist, 100 % recovery.
20	25				NA	26-28	26-30	SILTY CLAY: Pale yellow (2.5Y 7/4) with light greenish gray (GLEY 7/10BG) mottling, very stiff (pp=3.0 tsf), some iron nodules, odor, moist, 90% recovery. At 28' becomes light yellowish brown (2.5Y 6/4) with light greenish gray (GLEY 7/10BG) mottling, grading to a strong brown (7.5YR 5/8) with the same color mottling, very stiff (pp=3.5 tsf) at 29' a hard (pp=4.25 tsf) at 30', fractured, some iron nodules, manganese oxide staining.
					0.8	28-30		
15	30						66	

ERM

MW-48C DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-48C Date Drilled 2/2/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 72.5 ' Boring Diam. 7.88 "

N. Coord. 728417.3900 ' E. Coord. 3168240.9350 ' Surface Elevation 44.69 ' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 60 ' Sump Length 2.5 '

Top of Casing Elevation 44.68' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Marcel St. Marie and Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	30				8.4	30-32	30-34	CLAY: Yellowish red (5YR 5/6) with light greenish gray (GLEY 7/5GY) mottling, very stiff (pp=4.0 tsf), 2" limestone at 30.3'-30.5', manganese oxide staining, reacts after acid applied to limestone fragments, odor, moist, 75% recovery. At 32'-34' very stiff (pp=4.0 tsf), silt lenses, slight odor.
					20.5	32-34		
10	35				0.4	34-36	34-36	SILTY CLAY: Yellowish red (5YR 5/6) with light greenish gray (GLEY 7/5GY) mottling, very stiff (pp=2.75 tsf), some small calcareous nodules, reacts after acid applied to limestone fragments at 34.2', 34.5', and 34.9', manganese oxide staining, odor, moist, 75 % recovery.
					3.1	36-38	36-42	CLAYEY SILT: Yellowish red (5YR 5/6) with light greenish gray (GLEY 7/5GY) mottling, very stiff (pp=4.0 tsf), some small calcareous nodules, manganese oxide staining, odor, moist, 90 % recovery. At 38'-40' very stiff (pp=3.75 tsf). At 40'-42' fractured, very stiff (pp=3.25 tsf).
					0.8	38-40		
5	40				0.8	40-42		
					0.0	42-44	42-44	SILTY CLAY: Yellowish red (5YR 5/6) with light greenish gray (GLEY 8/5GY) mottling, very stiff (pp=3.75 tsf), few calcareous nodules, some black manganese oxide staining, slight odor, moist, 100 % recovery.
							44-44.5	SILTY SAND: Yellowish red (5YR 5/6), very fine grained, moist, 100 % recovery.
0	45				0.4	44-46	44.5-48	SILTY CLAY: Yellowish red (5YR 5/6) with light greenish gray (GLEY 8/5GY) mottling, hard (pp=>4.5 tsf), sand lenses, slight odor, moist, 100% recovery. At 46'-48' stiff (pp=2.0 tsf) at 47' and very stiff (pp=3.5 tsf) at 48', sand lenses at 46.2', sheen, odor.

ERM.

MW-48C DRILLING LOG

W.O. NO. 422-102 Boring/Well ID MW-48C Date Drilled 2/2/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 72.5' Boring Diam. 7.88"

N. Coord. 728417.3900' E. Coord. 3168240.9350' Surface Elevation 44.69' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type Stainless Steel Diam. 2" Length 60' Sump Length 2.5'

Top of Casing Elevation 44.68' Stickup 0'

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Marcel St. Marie and Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	45				0.0	46-48		
					5.3	48-50	48-50	CLAYEY SILT: Yellowish red (5YR 5/6) with light greenish gray (GLEY 8/5GY) mottling, hard (pp=>4.5 tsf), bioturbation, sheen, odor, moist, 75 % recovery.
-5	50				0.8	50-52	50-52	SILTY CLAY: Yellowish red (5YR 5/6), mottled, hard (pp=4.25 tsf), some manganese oxide staining, odor, moist, 100 % recovery.
					0.0	52-54	52-54	CLAYEY SILT: Yellowish red (5YR 5/6) with light greenish gray (GLEY 8/5GY) mottling, very stiff (pp=3.75 tsf) at 54', hard (pp=>4.5 tsf) at 53', burrows, manganese oxide staining, odor, moist, 75 % recovery.
					0.0	54-56	54-56	SILTY CLAY: Yellowish red (5YR 5/6) with light greenish gray (GLEY 7/5GY) mottling, fractured, hard (pp=>4.5 tsf), some calcareous nodules, burrows, 100% recovery, slight odor, moist, 100 % recovery.
-10	55				0.8	56-58	56-60	CLAYEY SILT: Yellowish red (5YR 5/6) with light greenish gray (GLEY 7/5GY) mottling, hard (pp=>4.5 tsf) at 56'-58', very stiff (pp=2.5' tsf) at 58.5', firm (pp=1.0 tsf) at 60', fractured, silt lenses, some manganese oxide staining, bioturbation, slight odor, moist, 75 % recovery. At 59.7' very fine-grained, sandy silt lenses.
					0.4	58-60		
-15	60							

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ERM.

MW-48C
DRILLING LOG

J.O. NO. 422-102 Boring/Well ID MW-48C Date Drilled 2/2/2004

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, Texas Boring T.D. 72.5 ' Boring Diam. 7.88 "

N. Coord. 728417.3900 ' E. Coord. 3168240.9350 ' Surface Elevation 44.69 ' Ft. MSL Datum

Screen: Type Stainless Steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type Stainless Steel Diam. 2 " Length 60 ' Sump Length 2.5 '

Top of Casing Elevation 44.68' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Steve Bender

Drilling Method Mud rotary Log By Marcel St. Marie and Vivian Rohrback

SKETCH MAP

NOTES

PP = Pocket Penetrometer

tsf = Tons per square foot

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
	60				0.4	60-62	60-70	SILTY SAND: Yellowish red (5YR 5/6), soft (pp=0.5 tsf), fine-grained, medium-grained from 62.5-64', subrounded, moist, clay lenses, moist, 75 % recovery. hammered in ~35 blows. At 65'-66' clay lenses, hammered in ~108 blows, slight odor. At 67.5' clay, yellowish red (5YR 5/6), hammered in ~69 blows. At 69.2'-70' clay lenses, black staining between clay lenses and silty sand, slight odor.
					0.4	62-64		
-20					0.4	64-66		
	65				0.0	66-68		
					0.0	68-70		
-25	70				0.0		70-72	CLAY: Yellowish red (5YR 5/6) grading to brown (7.5YR 5/4), laminated, fractured, very stiff (pp=2.5 tsf), black staining, light greenish gray (GLEY 7/5GY) and yellow (2.5Y 7/8) in fractures with black staining, odor, moist, 100% recovery.
					0.0			T.D. = 72 '
-30	75						69	

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Union Pacific Railroad

Log of Boring: MW-49A

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	2/28/07	Drilling Method:	HSA
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	8.5
Driller:	Bruce Milton	Total Depth (ft):	30
Driller's License:	4926	Northing:	3168190.82
Field Supervisor:	Tim Jennings, P.G.	Easting:	728345.08
Sampling Method:	4" x 5' Split Barrel	Casing Elevation (ft):	46.18

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
0				Base	(0.0 to 0.5) Concrete base.
		0.7	80	CH	(0.5 to 3.5) Sandy CLAY, dark brown to black, moist, ~20 to 30% fine sand and silt, ~70 to 80% high plasticity clay, firm, bedded.
5		0.5		CH	(3.5 to 8.9) Sandy gravelly CLAY, grayish-brown with black mottling, moist, ~20 to 40% fine to course carbonate sand, ~10% carbonate grave and cobbles, ~70% high plasticity clay, firm.
		0.6	100		
10		0.8		CL	(8.9 to 13.0) Sandy CLAY, orange with gray mottling, moist, ~30 to 40% fine sand, ~60 to 70% high plasticity clay, soft.
		0.8	80		
15		1		SP	(13.0 to 16.6) Clayey SAND, grayish-brown, moist, ~40% medium to high plasticity clay interbedded with ~60% fine sand, soft.
		0.8	90	CL	(16.6 to 20.5) CLAY with SAND, gray, moist to wet below 20.0, ~30% fine sand interbeds, ~70% medium plasticity clay interbeds, very firm, slight chemical odor.
20		1.4		SP	(20.5 to 25.3) SAND, gray, poorly graded, wet, very fine to fine sand, trace small gray clay clasts or interbeds below 23.0, moderate chemical odor.
		2.7	70		
25				CL	(25.3 to 30.0) CLAY with SAND, orange with gray mottling, moist to locally wet, ~10% fine sand interbedded and in lenses, ~90% medium plasticity clay, abundant nodual below 29.5, moderate chemical odor.
		15.5	100		
30					

PBW

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Round Rock, TX 78664
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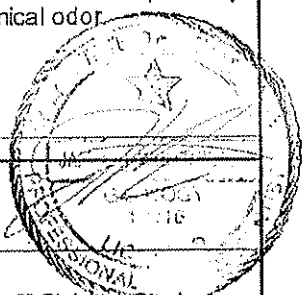
Notes:

Annular Materials
(0 to 16.0) Bentonite-Cement Grout
(16.0 - 18.0) Bentonite Pellets
(18.0 - 30.0) 20-40 Silica Sand

Well Materials
(0 to 20.0) Casing, 2" Stainless Steel
(20.0 to 30.0) Screen 2" Wire Wrapped Stainless Steel 0.010 slot



Union Pacific Railroad

Log of Boring: MW-49B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/24/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	6
Driller:	William Bludworth	Total Depth (ft):	35.0
Driller's License:	4885	Northing:	728374.64
Field Supervisor:	Chris Moore	Easting:	3168183.77
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	46.43

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				CON	(0 - 1.2) CONCRETE
		--	DO	GC	(1.2 - 8.5) CLAYEY GRAVEL, GC, very dark gray, with sand, moist, firm, no odor.
5					
10		4.5			(8.5 - 15.7) SANDY CLAY, CL, light gray, moist, firm to hard, some yellow/orange staining.
	▼	4.5	5.0/6.0	CL	
		4			
15		5.8			
		4.8		SM	(15.7 - 19.6) SILTY SAND, SM, light grayish brown, wet, soft, odor.
20		4.4	10.0/10.0		
		12.7		SP	(19.6 - 25.5) SAND, SP, light greenish gray, wet, soft, strong odor.
		10.2			
25		10.1			
		13.6	5.0/5.0		(25.5 - 31.6) CLAY, CH, light greenish gray, moist, hard, with sand, strong odor, oily sheen/NAPL in seams at 27.5, silt lens with NAPL at 30.6-31.0, carbonate gravel with NAPL at 32.3-32.4.
		78			
30		141		CH	
		13	5.0/5.0		(31.6 - 35.0) CLAY, CH, red, moist, firm, slight odor.
35		9.3			

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

1/6/2011

PBW
Pastor, Behling & Wheeler, LLC
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Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.
Sonic isolation casing advanced to 30' then removed during grouting.

Initial Fluid Level (2/04/09)
▼ Depth to water: 11.65 ft BTOC

Annular Materials
(0.0 - 27.0) Portland/Bentonite Grout
(27.0 - 29.0) Bentonite Chips
(29.0 - 35.0) 16/30 Silica Sand

Well Materials
(0 - 30.0) Casing, 2" Sch 40 FJT PVC
(30.0 - 35.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
44.18

Union Pacific Railroad

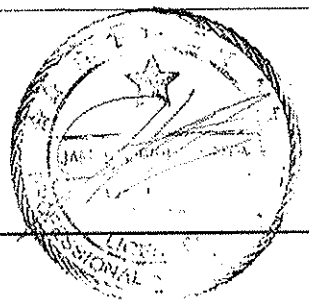
Log of Boring: MW-50A

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	3/1/07	Drilling Method:	HSA
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	8.5
Driller:	Bruce Milton	Total Depth (ft):	25
Driller's License:	4926	Northing:	3167958.38
Field Supervisor:	Tim Jennings, P.G.	Easting:	727501.00
Sampling Method:	4" x 5' Split Barrel	Casing Elevation (ft):	46.96

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
0		0		Base	(0.0 to 0.5) Concrete base.
				Fill	(0.5 to 1.5) Gel and FILL from previous sample.
		0	100	CH/SP	(1.5 to 5.0) Sandy CLAY and clayey SAND, dark brown, moist, ~30 to 60% fine sand, ~40 to 70% high plasticity clay, soft.
5		0			
		0	100	CL	(5.0 to 10.5) Sandy gravelly CLAY, light brownish-gray with orange mottling, moist, ~10% fine sand, ~5 to 10% fine to coarse carbonate gravel, ~80% to 85% medium plasticity clay, very firm, abundant root traces filled with carbonaceous material.
10		0			
		0	100	CL	(10.5 to 14.5) Sandy CLAY with SAND, orange with gray mottling, moist, ~10% fine sand in clay, ~20 to 30% sand interbeds and lenses increasing downward, ~70 to 80% high plasticity clay, firm, few carb nodules.
15		0		SC	(14.5 to 16.5) Clayey SAND, gray, wet, ~30% high plasticity clay, ~70% fine sand, very soft.
		0	60	SP	(16.5 to 21.6) SAND, gray, poorly graded, wet, very fine to fine sand, unconsolidated.
20		0			
		0	100	SP/CL	(21.6 to 23.5) Interbedded SAND and CLAY, orange and gray, moist to wet, ~50% poorly graded sand interbeds, ~50% medium plasticity clay interbeds, firm.
				CL	(23.5 to 25.0) CLAY, gray with orange mottling, moist, medium plasticity clay, stiff.
25					



PBW

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Notes:

Annular Materials
(0 to 10.0) Bentonite-Cement Grout
(10.0 - 12.0) Bentonite Pellets
(12.0 - 25.0) 20-40 Silica Sand

Well Materials
(0 to 14.0) Casing, 2" Sch 40 FJT PVC
(14.0 to 24.0) Screen 2" Sch 40 FJT PVC
0.010 slot

Union Pacific Railroad

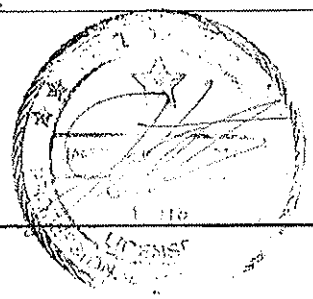
Log of Boring: MW-51A

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	2/28/07	Drilling Method:	HSA
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	8.5
Driller:	Bruce Milton	Total Depth (ft):	25
Driller's License:	4926	Northing:	3166884.68
Field Supervisor:	Tim Jennings, P.G.	Easting:	726925.05
Sampling Method:	4" x 5' Split Barrel	Casing Elevation (ft):	47.8

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
0		0	20	CL	(0.0 to 1.0) Sandy gravelly CLAY, dark brown, dry, ~20 to 30% fine sand, ~10 to 20% fine to course gravel, ~60 to 70% low plasticity clay, gravel blocked sampler.
				NR	(1.0 to 5.0) No Recvovery.
5		0	100	CH	(5.0 to 8.5) Sandy CLAY, gry with black mottling, moist, ~10 to 20% fine sand (few lenses), ~80 to 90% high plasticity clay, firm.
		0			
		0	100	SP/CL	(8.5 to 14.8) SAND and sandy CLAY, mottled orange and gray, ~20 to 40% fine sand including small sand lenses, ~60 to 80% high plasticity clay, firm, increasing sand below ~13.5, few carb nodules, abundant Fe staining, few root holes with black carbonaceous material.
10		0			
		0			
		0	100	CL	(14.8 to 18.4) CLAY with SAND, red with gray mottling, moist, ~10% fine sand as small lenses, ~90% medium plasticity clay, very firm.
15		0			
		0	100	CL	(18.4 to 23.2) Sandy CLAY with SAND, gray with orange mottling, wet to moist, ~30 to 40% fine sand including seams and lenses, soft to firm, decreasing sand below 21.5.
20		0			
		0			
		0	100	CL	(23.2 to 25.0) CLAY, reddish-brown with gray mottling, moist to wet, medium plasticity clay with ~5% carbonate sand and nodules, abundant carb nodules in zone at 24.6 to 24.8.
25					



PBW

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Notes:

Annular Materials

(0 to 11.0) Bentonite-Cement Grout
(11.0 - 13.0) Bentonite Pellets
(13.0 - 25.0) 20-40 Silica Sand

Well Materials

(0 to 15.0) Casing, 2" Sch 40 FJT PVC
(15.0 to 25.0) Screen 2" Sch 40 FJT PVC
0.010 slot

Union Pacific Railroad

Log of Boring: MW-51C

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	5/10/2014	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	10
Driller:	Tim Beach	Total Depth (ft):	80
Driller's License:	58141	Northing:	726934.5814
Field Supervisor:	Patrick Ferrell	Easting:	3166894.3552
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	47.7

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0					(0 - 10) No Recovery, NR, soils removed to 10' by hydrovac to clear for utilities.
5			0.0/0.0	NR	
10		3.1			(10 - 17.1) SILTY CLAY, CL, grey with trace orange mottling that increases with depth, trace black streaks (no odor), carbonate nodule seam at 14.8' to 15.1', 15.6' to 15.8', dry, firm with low plasticity.
		3	10.0/10.0	CL	
15		2.4			
		2.7		SM	(17.1 - 18.3) SILTY SAND, SM, grey with orange and few black streaks, very fine grained, no odor, dry.
20		1.9			(18.3 - 36.7) SILTY CLAY, CL, red-brown with grey mottling, carbonate nodules at 18.8'. Becomes grey with orange mottling at 19.3' to 25.9', with carbonate seams at 25.0' to 25.4', 26.1' to 28.0', carbonate gravel is black between 27.4' to 27.8' with no odor. Orange mottling incrases beyond 28.0' with trace small carbonate nodules below 30.0' (no lenses or seams), dry, very hard with no plasticity.
		1.9			
25		1.7	10.0/10.0		
		1.8			
30		2.1			
		1.8			
35		1.7	10.0/10.0	CL	
		2			(36.7 - 42.4) SILTY CLAY, CL, red-brown with some grey mottling and carbonate seams at 37.9', 38.5', 38.95' and 39.5', dry, very hard with no plasticity.
40		1.3			
		1.5			(42.4 - 45.8) SANDY SILTY CLAY, CL, red-brown, very fine grained, dry to moist, soft with no plasticity.
45		1.4	10.0/10.0		
		1.9			(45.8 - 54.2) SILTY CLAY, CL, red-brown with trace grey mottling, dry, very hard (driller noted that it required >1000 psi to remove sample from core barrel), no plasticity, staining or odors.
50		1.7			
		1.7			
55		1.7	10.0/10.0	SM	(54.2 - 57.9) SILTY SAND, SM, red-brown, fine grained, homogeneous with no odors or staining, wet, very soft, no plasticity.
		1.2		CL	(57.9 - 59.7) SILTY CLAY, CL, red-brown, moist, very hard with no to low plasticitiy, no staining or odors.
60		2.1			(59.7 - 63.7) CLAYEY SAND, SP, red-brown, very fine grained with some cohesives, moist to wet, very soft with low plasticity, no staining or odors.
		1.8			
65		1.6	10.0/10.0	SP	(63.7 - 72.2) SAND, SP, red-brown, medium grained, wet, very soft with no plasticity, thin clayey zones at 69.4' to 69.7', becomes red-brown and tan at 69.8'.
		1.7			
70		1.6			
		1.4			(72.2 - 80) SILTY CLAY, CL, red-brown, becomes red-brown and grey at 74.1', becomes grey with black streaks at 76.2' (no odor), and brown below 77.0', dry, firm to hard with no plasticity.
75		1.6	10.0/10.0	CL	
		1.7			
80					

PBW

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Notes:
Top 10 feet drilled out (DO) with a hydrovac to clear for utilities.
8-inch sonic isolation casing advanced to 20' then removed during grouting.
6-inch sonic casing advanced to 72', then removed during grouting.

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 57.0) Portland/Bentonite Grout
(57.0 - 60.0) Bentonite Pellets
(60.0 - 72.0) 20/40 Silica Sand
(72.0 - 80.0) Bentonite Pellets

Well Materials
(0 - 62.0) Casing, 2" FJT Sch 40 PVC
(62.0 - 72.0) Screen, 2" FJT Sch 40 PVC,
0.01 slot

TOC Elevation (ft AMSL)
47.48

Union Pacific Railroad

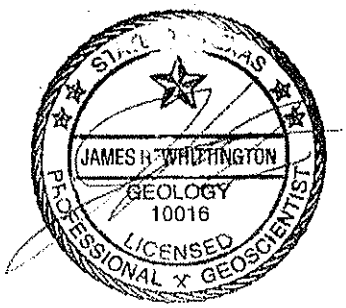
Log of Boring: MW-52A

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	2/27/07	Drilling Method:	HSA
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	8.5
Driller:	Bruce Milton	Total Depth (ft):	35
Driller's License:	4926	Northing:	3167814.27
Field Supervisor:	James Whittington, P.G.	Easting:	728698.97
Sampling Method:	2" x 3' Split Spoon	Casing Elevation (ft):	51.91

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
0				Fill	(0.0 to 1.5) FILL, gravel, oily .
		.	20	Fill	(1.5 to 4.0) FILL, clay with gravel, dark gray, oily.
		3			
5				CL	(4.0 to 14.5) Silty, sandy CLAY, dark gray, moist, firm, lighter gray with depth, ~1% carb clasts, slightly more sand with depth, dense layer of carb nodules with 50% CLAY matrix from 14-14.5.
		0.6	< 20		
		8			
10		0			
		0	60		
		0			
15				CL	(14.5 to 18.0) CLAY, mottled gray and brown, ~5% carb clasts.
		0			
			< 20		
				SP	(18.0 to 30.0) SAND and silty CLAY, gray, fine sand, becoming cleaner fine sand with depth, saturated with free product.
20		0.6			
			20		
		216			
25					
			75		
		32			
30		87			(30.0 to 35.0) Sandy CLAY, mottled gray and tan, strong odor.



PBW
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Notes:

Annular Materials
(0 to 16.0) Bentonite-Cement Grout
(16.0 - 18.0) Bentonite Pellets
(18.0 - 35.0) 20-40 Silica Sand

Well Materials
(0 to 20.0) Casing, 2" Stainless Steel
(20.0 to 30.0) Screen 2" Wire Wrapped Stainless Steel 0.010 slot

Union Pacific Railroad

Log of Boring: MW-52A

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	2/27/07	Drilling Method:	HSA
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	8.5
Driller:	Bruce Milton	Total Depth (ft):	35
Driller's License:	4926	Northing:	3167814.27
Field Supervisor:	James Whittington, P.G.	Easting:	728698.97
Sampling Method:	2" x 3' Split Spoon	Casing Elevation (ft):	51.91

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
35			100	CL	

PBW

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Round Rock, TX 78664
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Notes:

Annular Materials
(0 to 16.0) Bentonite-Cement Grout
(16.0 - 18.0) Bentonite Pellets
(18.0 - 35.0) 20-40 Silica Sand

Well Materials
(0 to 20.0) Casing, 2" Stainless Steel
(20.0 to 30.0) Screen 2" Wire Wrapped Stainless Steel 0.010 slot

ERM Environmental Resources Management

MW-53C (SB-69) DRILLING LOG

Proj. No. 0014419 Boring/Well ID MW-53C (SB-69) Date Drilled 8/15/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 72 ' Boring Diam. 14 "

N. Coord. 729610.93 ' E. Coord. 3168505.34 ' Surface Elevation 0 ' Ft. MSL Datum

Screen: Type stainless steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type stainless steel Diam. 2 " Length 60 ' Sump Length 2 '

Top of Casing Elevation 0 ' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe/Mud Rotary Log By J. Rose and M. St. Marie and E. Mkandawire

SKETCH MAP

STATE OF TEXAS
CHRISTOPHER M. YOUNG
GEOLOGY
3342
LICENSED
PROFESSIONAL GEOSCIENTIST
1/19/07

NOTES
pp = pocket penetrometer.
tsf = tons per square foot.
Isolation casing set at 38' and monitoring well installed using mud rotary.
0'-45' log from geoprobe boring, 55'-70' log from mud rotary boring.
Lithological description of 45'-55' taken from nearby well MW-45C.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
0	0				1.6 NM	0-72	0-0.5 0.5-1 1-5	CLAYEY SAND: brown (10 YR 5/3) clayey sand, moist, well sorted, fine-grained, loose, grass, roollets last inch, tar-like gravel FILL: pale brown (10 YR 6/3) shell/sand fill material, moist, poorly sorted, loose SANDY CLAY: dark gray (10 YR 4/1) mottled sandy clay, moist, roollets, iron staining, increasing sand at 2', (pp=1.0tsf) above 2' pp=2.25tsf, firm, plastic below 2'
-5	5				0.3		5-10	SANDY CLAY: light brownish gray (2.5 Y 6/2) sandy clay, moist, firm, plastic pp=7.0tsf at 1' pp=1.0tsf at 3', pp=2.0 at 5' carbonate layer at 2' and 4.5'
-10	10						10-15	SANDY CLAY: light greenish gray (Gley 1 7/1 10Y), moist, pp=1.25tsf at 1', pp=1.0tsf at 2.5', pp=2.0tsf at 5', mottled sandy clay, plastic
-15	15							

ERM Environmental Resources Management

MW-53C (SB-69) DRILLING LOG

Proj. No. 0014419 Boring/Well ID MW-53C (SB-69) Date Drilled 8/15/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 72' Boring Diam. 14"

N. Coord. 729610.93' E. Coord. 3168505.34' Surface Elevation 0' Ft. MSL Datum

Screen: Type stainless steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type stainless steel Diam. 2" Length 60' Sump Length 2'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe/Mud Rotary Log By J. Rose and M. St. Marie and E. Mkandawire

SKETCH MAP

NOTES
pp = pocket penetrometer.
tsf = tons per square foot.
Isolation casing set at 38' and monitoring well installed using mud rotary.
0'-45' log from geoprobe boring, 55'-70' log from mud rotary boring.
Lithological description of 45'-55' taken from nearby well MW-45C.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-15	15						15-20	SANDY CLAY: light greenish gray (Gley 1 7/1 10Y) mottled sandy clay, moist, plastic, carbonate lenses pp=1.25tsf at 1', pp=1.0 at 3', pp=0.75tsf at 4', black nodules, iron staining
-20	20						20-20.2	CLAYEY SAND: light olive gray (5 Y 6/2) clayey sand, moist, fine-grained, plastic pp=0.25tsf, mottled
							20.2-23.5	CLAYEY SAND: strong brown (7.5 YR 5/6) well sorted clayey sand, wet, soft, fine-grained sand, non plastic
							23.5-24	CLAYEY SAND: light olive gray (5 Y 6/2) clayey sand, moist, fine-grained, plastic pp=0.25tsf, mottled
							24-24.8	SILTY CLAY: yellowish brown (10 YR 5/6) silty sand, moist, very fine-grained, soft (pp=0.75tsf)
-25	25						24.8-25	SILTY SAND: yellowish brown (10 YR 5/6) silty sand, moist, very fine-grained, loose, non plastic, well sorted
							25-28	SILTY SAND: yellowish brown (10 YR 5/6) silty sand, moist, very fine-grained, loose, non plastic, well sorted
							28-30	CLAYEY SAND: light olive gray (5 Y 6/2), mottled clay, moist, cleavage, black staining
-30	30							

ERM Environmental Resources Management

MW-53C (SB-69) DRILLING LOG

Proj. No. 0014419 Boring/Well ID MW-53C (SB-69) Date Drilled 8/15/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 72' Boring Diam. 14"

N. Coord. 729610.93' E. Coord. 3168505.34' Surface Elevation 0' Ft. MSL Datum

Screen: Type stainless steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type stainless steel Diam. 2" Length 60' Sump Length 2'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe/Mud Rotary Log By J. Rose and M. St. Marie and E. Mkandawire

SKETCH MAP

NOTES
pp = pocket penetrometer.
tsf = tons per square foot.
Isolation casing set at 38' and monitoring well installed using mud rotary.
0'-45' log from geoprobe boring, 55'-70' log from mud rotary boring.
Lithological description of 45'-55' taken from nearby well MW-45C.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-30	30						30-33.5	CLAYEY SAND: strong brown (7.5 Y 4/6) mottled clay, moist, plastic pp=2.5tsf at 1', pp=3.0 at 2', pp=3.25 at 3.5'
							33.5-35	CLAYEY SAND: light yellowish brown (2.5 Y 6/4), mottled clay, moist, plastic pp=1.25 tsf, carbonate nodules, black staining
-35	35						35-40	CLAYEY SAND: light olive brown (2.5 Y 5/4) mottled clay, moist, plastic, pp=3.0tsf at 1', pp=3.25tsf at 2', pp=3.5tsf at 4', pp=3.5 at 5', carbonate nodules, black stained sand lense from 36.7-37.0
-40	40						40-45	CLAYEY SAND: greenish gray (Gley 1 6/1 5GY) mottled clay, moist, plastic, pp=3.75tsf at 1', pp=4.25tsf at 3', pp=3.25tsf at 5', carbonate nodules and black staining, BORING STOPPED ON 8/15/2006, CONTINUED ON 8/29/2006
-45	45							

ERM Environmental Resources Management

MW-53C (SB-69) DRILLING LOG

Proj. No. 0014419 Boring/Well ID MW-53C (SB-69) Date Drilled 8/15/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 72 ' Boring Diam. 14 "

N. Coord. 729610.93 ' E. Coord. 3168505.34 ' Surface Elevation 0 ' Ft. MSL Datum

Screen: Type stainless steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type stainless steel Diam. 2 " Length 60 ' Sump Length 2 '

Top of Casing Elevation 0 ' Stickup 0 '

Depth to Water: 1. Ft 0 ( ) 2. Ft 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe/Mud Rotary Log By J. Rose and M. St. Marie and E. Mkandawire

SKETCH MAP

NOTES
pp = pocket penetrometer.
tsf = tons per square foot.
Isolation casing set at 38' and monitoring well installed using mud rotary.
0'-45' log from geoprobe boring, 55'-70' log from mud rotary boring.
Lithological description of 45'-55' taken from nearby well MW-45C.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-45	45				0.0		45-55	SILTY CLAY: yellowish red (5YR 5/6) with light greenish gray (GLEY 7/10BG) mottling, cohesive, fractured, hard, pp=>4.5 tsf, bioturbation. At 46'-48' hard, pp=> 4.5 tsf, manganese oxide staining. At 49-50' fractured, hard pp=>4.5 tsf, silt lenses, manganese oxide staining, slight odor. At 51'-54' more fractures, hard, pp=4.0 tsf, manganese oxide staining, slight odor. At 54'-56' very stiff, pp=3.0 tsf, silt lenses.
-50	50							
-55	55				NM		55-57	CLAY: clay, red (2.5 YR 4/6) mottled with gray (7.5 YR 5/1) moist, pp=4.0tsf, plastic, slicken sides present
					0.2		57-60	NO RECOVERY
-60	60							

ERM Environmental Resources Management

MW-53C (SB-69) DRILLING LOG

Proj. No. 0014419 Boring/Well ID MW-53C (SB-69) Date Drilled 8/15/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 72 ' Boring Diam. 14 "

N. Coord. 729810.93 ' E. Coord. 3168505.34 ' Surface Elevation 0 ' Ft. MSL Datum

Screen: Type stainless steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type stainless steel Diam. 2 " Length 60 ' Sump Length 2 '

Top of Casing Elevation 0 ' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe/Mud Rotary Log By J. Rose and M. St. Marie and E. Mkandawire

SKETCH MAP

NOTES
pp = pocket penetrometer.
tsf = tons per square foot.
Isolation casing set at 38' and monitoring well installed using mud rotary.
0'-45' log from geoprobe boring, 55'-70' log from mud rotary boring.
Lithological description of 45'-55' taken from nearby well MW-45C.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OVM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-60	60				NM		60-60.7	CLAY: clay, red (2.5 YR 4/6) mottled with gray (7.5 YR 5/1) moist, pp=4.0tsf, plastic, slicken sides present
							60.7-64	SILTY CLAY: silty clay, red (2.5 YR) mottled with gray (7.5 YR 5/1), moist, pp=3.0tsf, slightly plastic, slicken sides present, traces of white calcareous nodules <1mm
					0.8			
							64-65	NO RECOVERY
-65	65				2.9		65-69.5	SAND: sand, red (2.5 YR 4/6) mottled with yellowish brown (5 YR 5/6) saturated, loose, very fine to medium-grained, subrounded
					6			
							69.5-70	CLAY: clay, red (2.5 YR 4/6), moist, pp=3.0tsf, very plastic, black specks
-70	70				4		70-72	NOT SAMPLED
					NM			T.D. = 72 '
-75	75							

ERM Environmental Resources Management

MW-54C (SB-68) DRILLING LOG

Proj. No. 0014419 Boring/Well ID MW-54C (SB-68) Date Drilled 8/15/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 72' Boring Diam. 14"

N. Coord. 729217.62' E. Coord. 3168760.34' Surface Elevation 0' Ft. MSL Datum

Screen: Type stainless steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type stainless steel Diam. 2" Length 60' Sump Length 2'

Top of Casing Elevation 0' Stickup 0'

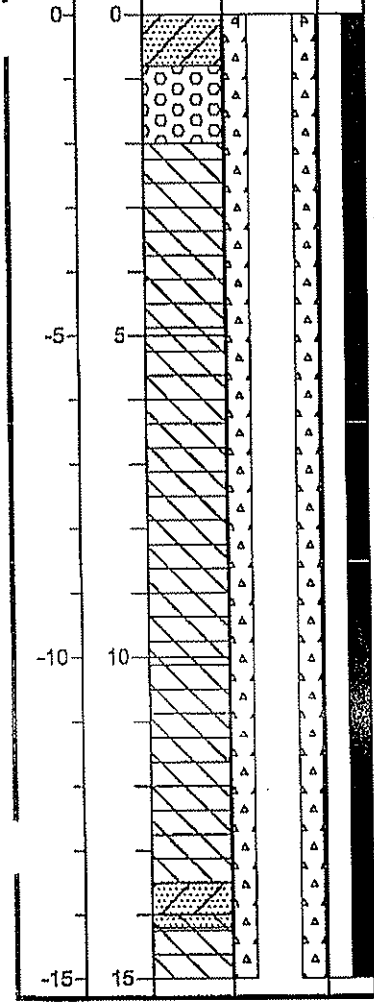
Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe/Mud Rotary Log By Marcel St. Marie and Emmanuel Mkandawire

SKETCH OF TEXAS STATE OF TEXAS CHRISTOPHER M. YOUNG GEOLOGY 3342 LICENSED PROFESSIONAL GEOSCIENTIST 1/19/07

NOTES
pp = pocket penetrometer.
tsf = tons per square foot.
Isolation casing set at 37' and monitoring well installed using mud rotary.
0'-40' log from geoprobe boring, 55'-72' log from mud rotary boring.
Lithological description of 40'-55' taken from nearby well MW-46C.



Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OWM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
						0-72	0-0.8	CLAYEY SAND: very dark grayish brown (10 YR 3/2), moist, clayey sand, very fine-grained, well sorted, subangular, some rootlets, trace gravel
					NM		0.8-2	GRAVEL: gravel, sandy
							2-5	SILTY CLAY: silty clay, very dark grayish brown (10 YR 3/2), moist, plastic, trace gravel, pp=2.0tsf, mottled, trace rootlets
							5-10	SILTY CLAY: greenish gray (Gley 1 5/10Y), moist, mottled, trace iron staining, trace rootlets, pp=0.5tsf, small black staining, black sand layer from 9.6-9.8', trace sand, silty clay
							10-13.5	SILTY CLAY: greenish gray (Gley 1 5/10Y), moist, mottled, trace iron staining, trace rootlets, pp=0.5tsf, small black staining, trace sand, silty clay
							13.5-14	CLAYEY SAND: clayey sand, dark gray (10 YR 3/1), wet, very fine-grained, well sorted, subangular, sheen
					0		14-14.2	SANDY CLAY: sandy clay, wet, calcarius lenses from 14.0-14.2, odor
							14.2-15	SILTY CLAY: greenish gray (Gley 1 5/10Y), moist, mottled, trace iron staining, trace rootlets, pp=0.5tsf, small black staining, trace sand, silty clay

ERM Environmental Resources Management

MW-54C (SB-68) DRILLING LOG

Proj. No. 0014419 Boring/Well ID MW-54C (SB-68) Date Drilled 8/15/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 72 ' Boring Diam. 14 "

N. Coord. 729217.62 ' E. Coord. 3168760.34 ' Surface Elevation 0 ' Ft. MSL Datum

Screen: Type stainless steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type stainless steel Diam. 2 " Length 60 ' Sump Length 2 '

Top of Casing Elevation 0 ' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe/Mud Rotary Log By Marcel St. Marie and Emmanuel Mkandawire

SKETCH MAP

NOTES
pp = pocket penetrometer.
tsf = tons per square foot.
Isolation casing set at 37' and monitoring well installed using mud rotary.
0'-40' log from geoprobe boring, 55'-72' log from mud rotary boring.
Lithological description of 40'-55' taken from nearby well MW-46C.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OWM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-15	15				NM		15-15.3 15.3-16.3 16.3-19	CALICHE: caliche layer, moist SILTY CLAY: silty clay, greenish gray (Gley 1 5/10GY), moist, mottled, plastic, trace calcium carbonate lenses, pp=3.0tsf CLAYEY SAND: very dark gray (2.5 Y 3/1), wet, clayey sand, very fine-grained, well sorted, subangular
					0		19-20	SILTY CLAY: silty clay, greenish gray (Gley 1 6/10GY), moist, abundant calcium carbonate lenses, pp=0.0tsf, plastic, trace iron staining
-20	20				10.5		20-23.5	SANDY CLAY: sandy clay, interlayered clayey sand, greenish gray (Gley 1 7/10GY), wet, trace iron staining, sand is very fine-grained, well sorted, subangular, soft, cohesive
							23.5-25	SILTY CLAY: silty clay, pp=4.35tsf, light gray (2.5 Y 7/2), wet, mottled, trace black nodules, trace calcium carbonate nodules and lenses
-25	25						25-28.5	SANDY CLAY: sandy clay, interlayered clayey sand, greenish gray (Gley 1 7/10GY), wet, trace iron staining, sand is very fine-grained, well sorted, subangular, soft, cohesive
							28.5-30	SILTY CLAY: silty clay, yellowish red (5 YR 4/6), wet, plastic, pp=3.75 tsf, mottled, trace black nodules
-30	30							

ERM Environmental Resources Management

MW-54C (SB-68) DRILLING LOG

Proj. No. 0014419 Boring/Well ID MW-54C (SB-68) Date Drilled 8/15/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 72 ' Boring Diam. 14 "

N. Coord. 729217.62 ' E. Coord. 3168760.34 ' Surface Elevation 0 ' Ft. MSL Datum

Screen: Type stainless steel Diam. 2 " Length 10 ' Slot Size 0.01 "

Casing: Type stainless steel Diam. 2 " Length 60 ' Sump Length 2 '

Top of Casing Elevation 0 ' Stickup 0 '

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe/Mud Rotary Log By Marcel St. Marie and Emmanuel Mkandawire

SKETCH MAP

NOTES
pp = pocket penetrometer.
tsf = tons per square foot.
Isolation casing set at 37' and monitoring well installed using mud rotary.
0'-40' log from geoprobe boring, 55'-72' log from mud rotary boring.
Lithological description of 40'-55' taken from nearby well MW-46C.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OWM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-30	30						30-33	SILTY CLAY: silty clay, yellowish red (5 YR 4/6), moist, plastic, pp=3.75 tsf, mottled, trace black nodules
							33-33.5	SAND: sand, brown (7.5 YR 5/4), moist, very fine-grained, well sorted, subangular
							33.5-35	SILTY CLAY: silty clay, dark grayish brown (2.5 Y 4/2), moist, trace black staining, plastic, pp=4.25tsf, mottled
-35	35						35-40	SILTY CLAY: silty clay, dark grayish brown (2.5 Y 4/2), moist, some black staining, plastic, pp=4.5tsf, mottled, BORING STOPPED ON 8/15/2006, CONTINUED ON 8/26/2006
-40	40				0		40-42	SILTY CLAY: strong brown (7.5YR 5/6) with light greenish gray (GLEY 7/10Y) mottling, fractured, laminated, very stiff, pp=3.75 tsf, caliche lenses, manganese oxide staining
							42-44	CLAYEY SILT: strong brown (7.5YR 5/8) with light greenish gray (GLEY 7/10Y) mottling, very stiff, pp=4.0 tsf, manganese oxide staining, odor, moist
-45	45						44-46	CLAY: strong brown (7.5YR 5/8) with light greenish gray (GLEY 7/5GY) mottling, hard, pp=>4.5 tsf, calcareous nodules up to 1/4" diameter, manganese oxide staining, odor, moist, 75% recovery

ERM Environmental Resources Management

MW-54C (SB-68) DRILLING LOG

Proj. No. 0014419 Boring/Well ID MW-54C (SB-68) Date Drilled 8/15/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 72' Boring Diam. 14"

N. Coord. 729217.62' E. Coord. 3168760.34' Surface Elevation 0' Ft. MSL Datum

Screen: Type stainless steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type stainless steel Diam. 2" Length 60' Sump Length 2'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 (_____) 2. Ft. 0 (_____)

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe/Mud Rotary Log By Marcel St. Marie and Emmanuel Mkandawire

SKETCH MAP

NOTES
pp = pocket penetrometer.
tsf = tons per square foot.
Isolation casing set at 37' and monitoring well installed using mud rotary.
0'-10' log from geoprobe boring, 55'-72' log from mud rotary boring.
Lithological description of 40'-55' taken from nearby well MW-46C.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OWM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-45	45						46-47	NO RECOVERY
							47-48	CLAYEY SILT: yellowish red (5YR 5/6) with light greenish gray (GLEY 7/5GY) mottling, fractured, slicken sides, hard, pp=>4.5 tsf), manganese oxide staining, odor, moist, 50% recovery
							48-54	SILTY CLAY: yellowish red (5YR 5/6) with pale yellow (5Y 7/3) mottling, very stiff, pp=3.5 tsf, calcareous nodules, manganese oxide staining, moist, 100% recovery, odor. At 50' becomes strong brown (7.5YR 5/6) with light greenish gray (GLEY 7/5GY) mottling, fractured, slikensides, very stiff, pp=3.0 tsf. At 52' hard, pp=>4.5tsf, slight odor
-50	50							
							54-55	CLAYEY SILT: yellow red (5YR 5/6), plastic, stiff, pp=1.5 tsf, fractured, laminated, clay lenses, moist, 75% recovery
-55	55				NA		55-57	SILTY CLAY: silty clay, red (2.5 YR 4/6), moist, pp=1.0tsf, slightly plastic, traces of light gray (7.5 YR 7/1) vein like structures
					0.5		57-60	NO RECOVERY
-60	60							

ERM Environmental Resources Management

MW-54C (SB-68) DRILLING LOG

Proj. No. 0014419 Boring/Well ID MW-54C (SB-68) Date Drilled 8/15/2006

Project Houston Wood Preserving Works Owner Union Pacific Railroad Company

Location Houston, TX Boring T.D. 72' Boring Diam. 14"

N. Coord. 729217.62' E. Coord. 3168760.34' Surface Elevation 0' Ft. MSL Datum

Screen: Type stainless steel Diam. 2" Length 10' Slot Size 0.01"

Casing: Type stainless steel Diam. 2" Length 60' Sump Length 2'

Top of Casing Elevation 0' Stickup 0'

Depth to Water: 1. Ft. 0 ( ) 2. Ft. 0 ( )

Drilling Company Fugro Geosciences, Inc. Driller Doug Isenhart

Drilling Method Geoprobe/Mud Rotary Log By Marcel St. Marie and Emmanuel Mkandawire

SKETCH MAP

NOTES
pp = pocket penetrometer.
tsf = tons per square foot.
Isolation casing set at 37' and monitoring well installed using mud rotary.
0'-40' log from geoprobe boring, 55'-72' log from mud rotary boring.
Lithological description of 40'-55' taken from nearby well MW-46C.

Elevation (Feet)	Depth (Feet)	Graphic Log	Well Construction	Sample Type	OWM (ppm)	Sample Interval (Feet)	Description Interval (Feet)	Description/Soil Classification (Color, Texture, Structure)
-60	60				NM		60-62	SILTY CLAY: silty clay, red (2.5 YR 4/6), traces of slicken sides, pp=1.5tsf, at 60.2ft traces of sandy silt, very fine to medium-grained, poorly sorted, subrounded (2 inches thick), moist to saturated
					1.0			
					0.5		62-65	NO RECOVERY
-65	65				NM		65-66	SILTY SAND: silty sand, red (2.5 YR 4/6), saturated, pp=<0tsf, loose, very fine to medium-grained, poorly sorted, subrounded
					1.0		66-70	NO RECOVERY
-70	70				NM		70-72	CLAY: clay, red (2.5 YR 4/6), moist, pp=3.0tsf, very plastic, slicken sided, traces of light gray mottling (7.5 YR 7/1), black specks
					0.5			T.D. = 72'
-75	75							

Union Pacific Railroad

Log of Boring: MW-55A

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/12/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	6
Driller:	William Bludworth	Total Depth (ft):	25.0
Driller's License:	4885	Northing:	728540.33
Field Supervisor:	Chris Moore	Easting:	3167481.93
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	49.2

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0		--	DO	FILL	(0 - 7.0) SILTY CLAY, brown, fill, moist, firm, with brick and wood fragments, odor.
5					
10		71.5	8.0/8.0	CL	(7.0 - 16.5) SILTY CLAY, CL, dark gray, with sand, moist, firm, strong odor.
		198			
		484			
15	▼	785			
		648	10.0/10.0	SM	(16.5 - 22.0) SILTY SAND, SM, light grayish brown, wet, soft, strong odor, oily sheen/NAPL pockets at 18.0-20.0.
		543			
20		1531			
		1934		CH	(22.0 - 25.0) CLAY, CH, mottled reddish brown and grayish brown, moist, hard, strong odor, stained sand lens at 22.5.
25		434			

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED PROFESSIONAL GEOSCIENTIST

1/20/2011

PBW

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Top 7 feet drilled out (DO) with a hydrovac to clear for utilities.

Initial Fluid Level (2/04/09)
▼ Depth to water: 13.79 ft BTOC

Annular Materials
(0.0 - 7.0) Bentonite Chips
(7.0 - 25.0) 16/30 Silica Sand

Well Materials
(+3.0 - 10.0) Casing, 2" Sch 40 FJT PVC
(10.0 - 25.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
44.22

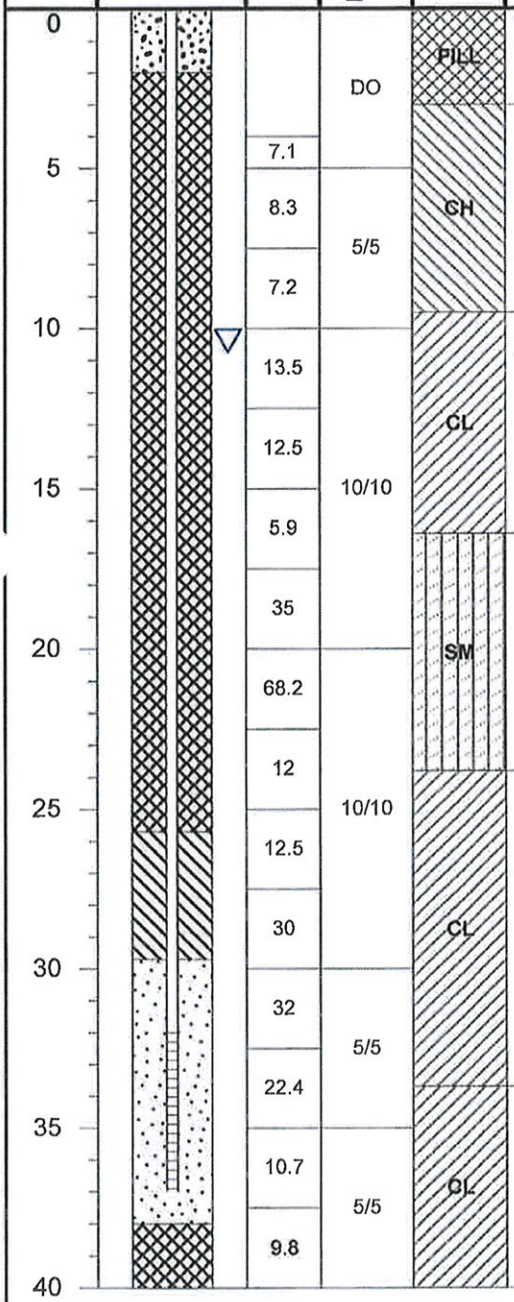
Union Pacific Railroad

Log of Boring: MW-55B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	12/14/2011	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	5
Driller:	Tim Beach	Total Depth (ft):	40
Driller's License:	58141	Northing:	728537.62
Field Supervisor:	Tim Jennings	Easting:	3167473.94
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	49.15



Lithologic Description
(0 - 3) FILL, Sand, Clay and Gravel
(3 - 9.5) SANDY CLAY, CH, dark gray, moist, ~20-40% fine sand, soft, wood fragments soaked in creosote 4-5 feet, moderate odor
(9.5 - 16.4) SANDY CLAY, CL, light gray and orange, moist, ~20-30% fine sand, firm, slight to moderate odor
(16.4 - 23.8) SILTY SAND, SM, brown, wet, ~30-40% silt in very fine to fine sand, laminated, abundant black staining below 20 feet with NAPL locally, very strong odor
(23.8 - 33.7) SANDY CLAY, CL, red 23.8-24.7 and light brown and gray mottled below 24.7, moist, ~10-20% fine sand, thin sand interbed at 24.7 feet, fine to coarse carbonate gravel seam 32.4-32.7 feet, trace NAPL in gravel after core laid out for ~1/2 hour, moderate odor, strong odor in sandier zone 32-33.7 feet
(33.7 - 40) CLAY, CL, reddish brown with gray mottling, moist, very hard, medium plasticity clay, abundant carbonate nodules, thin (<0.1' thick) carbonate gravel seams at 34.1, 34.5, and 36.7 feet, thin sand partings at 38.8, 39.1, and 39.4 feet, slight to moderate odor

PBW
Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Top 5 feet drilled out (DO) with a hydrovac to clear for utilities.
8-inch sonic isolation casing advanced to 25' then removed during grouting.

Initial Fluid Level (01/27/12)
Depth to water: 13.28 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 25.7) Portland/Bentonite Grout
(25.7 - 29.7) Bentonite Pellets
(29.7 - 38.0) 20/40 Silica Sand
38.0 - 40.0) Bentonite Pellets

Well Materials
(0 - 32.0) Casing, 2" FJT Stainless Steel
(32.0 - 37.0) Screen, 2" FJT Stainless Steel, 0.01 slot

TOC Elevation (ft AMSL)
52.04

Union Pacific Railroad

Log of Boring: MW-57A

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/22/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	6
Driller:	William Bludworth	Total Depth (ft):	30.0
Driller's License:	4885	Northing:	728858.37
Field Supervisor:	Chris Moore	Easting:	3167973.58
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	47.8

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0		--	DO	FILL	(0 - 4.0) CLAYEY GRAVEL, GC, very dark gray, moist, firm, fill, no odor.
5				CL	(4.0 - 15.4) SANDY CLAY, CL, greenish gray, moist, firm to hard, some calcareous nodules, some orange staining, odor.
10		874 715 457 653	8.0/8.0		
15		10.7 8.2	10.0/10.0	SP	(15.4 - 25.5) SAND, SP, light greenish gray, wet, soft, fine sand, odor, some NAPL stained seams from 18.0-23.0, saturated with NAPL from 23.0-25.5.
20		10.3 239 31.9			
25		63.7 46.8	5.0/5.0	CH	(25.5 - 30.0) CLAY, CH, reddish brown, moist, hard, odor, NAPL stained sand lens at 26.2.
30		23.4			

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

1/6/2011

Notes:
Top 7 feet drilled out (DO) with a hydrovac to clear for utilities.

Initial Fluid Level (2/5/09)
▼ Depth to water: 12.73 ft BTOC

Annular Materials
(0.0 - 10.0) Bentonite Chips
(10.0 - 27.0) 16/30 Silica Sand
(27.0 - 30.0) Hole cave-in

Well Materials
(0 - 12.0) Casing, 2" Sch 40 FJT PVC
(12.0 - 27.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
46.22

PBW
Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Union Pacific Railroad

Log of Boring: MW-57B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	12/21/2011	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	5
Driller:	Tim Beach	Total Depth (ft):	40
Driller's License:	58141	Northing:	728857.15
Field Supervisor:	Tim Jennings	Easting:	3167964.88
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	47.93

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			DO	FILL	(0 - 4) FILL, Sand, Gravel and Clay
5		88.6	5/5	CL	(4 - 15.4) SANDY CLAY, CL, greenish gray with heavy orange mottling 9-15.4 feet, ~20% fine sand in medium plasticity clay, carbonate nodules common below 9.8 feet, moderate to strong odor
		307			
10		510			
		497			
15		91.6	6/10	SP	(15.4 - 24.3) POORLY GRADED SAND, SP, greenish gray and grayish brown, wet, very fine to fine sand, saturated with NAPL 23.6-24.3 feet, Strong odor
20		93	10/10	CL	(24.3 - 25.5) SANDY CLAY, CL, greenish gray with red mottling, moist, firm, NAPL is visible in small fractures on broken surfaces
		149		SP	(25.5 - 26.2) POORLY GRADED SAND, SP, dark brown, wet, saturated with NAPL 25.9-26.2, strong odor
25	▽	131		CL	(26.2 - 28.1) CLAY, CL, reddish brown, moist, medium plasticity clay, firm to hard, moderate odor
		43.9		CH	(28.1 - 35) SANDY CLAY, CH, light gray and light brown mottled, ~10-20% fine sand in high plasticity clay, firm, small amount of NAPL staining on broken surfaces from 34-35 feet, strong odor, grades to clay at ~ 35.0 feet
30		51	5/5		
		65.5			
35		14.8	5/5	CL	(35 - 40) CLAY, CL, reddish brown with gray mottling, few carbonate nodules throughout, clay is very fractured with few carbonate nodules 37.5-38.4 feet, small amount of NAPL staining in fractured zone, strong odor 35-38.4 feet, slight odor 38.4-40 feet
		87.4			
40	▼	8.6			

PBW
Pastor, Behling & Wheeler, LLC
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Notes:
Top 5 feet drilled out (DO) with a hydrovac to clear for utilities,
8-inch sonic isolation casing advanced to 27' then removed during grouting.

Initial Fluid Level (01/27/12)
Depth to water: 28.83 ft BTOC
Depth to NAPL: 42.51 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 28.0) Portland/Bentonite Grout
(28.0 - 32.0) Bentonite Pellets
(32.0 - 40.0) 20/40 Silica Sand

Well Materials
(0 - 34.0) Casing, 2" FJT Stainless Steel
(34.0 - 39.0) Screen, 2" FJT Stainless Steel, 0.01 slot

TOC Elevation (ft AMSL)
50.91

Union Pacific Railroad

Log of Boring: MW-58A

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/23/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	6
Driller:	William Bludworth	Total Depth (ft):	30.0
Driller's License:	4885	Northing:	728874.59
Field Supervisor:	Chris Moore	Easting:	3168176
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	47.9

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0		--	DO	FILL	(0 - 4.0) CLAYEY GRAVEL, GC, very dark gray, moist, firm, fill, no odor.
5				CL	(4.0 - 17.2) SANDY CLAY, CL, greenish gray, moist, firm to hard, some calcareous nodules, some orange staining, odor.
		35.3	8.0/8.0		
10		155			
		271			
		231			
15		20.4	10.0/10.0		
		7.1			
20		7.6		SP	(17.2 - 28.1) SAND, SP, light greenish gray, wet, soft, fine sand, odor, trace NAPL staining from 24.0-28.1.
		10.1			
		8.7			
25		11.1	5.0/5.0		
		15.4			
30		8.9		CH	(28.1 - 30.0) CLAY, CH, reddish brown, moist, hard, odor.

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
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1/6/2011

PBW

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Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.

Initial Fluid Level (2/05/09)
▼ Depth to water: 14.55 ft BTOC

Annular Materials
(0.0 - 12.0) Bentonite Chips
(12.0 - 29.0) 16/30 Silica Sand
(29.0 - 30.0) Hole cave-in

Well Materials
(0 - 14.0) Casing, 2" Sch 40 FJT PVC
(14.0 - 29.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
52.01

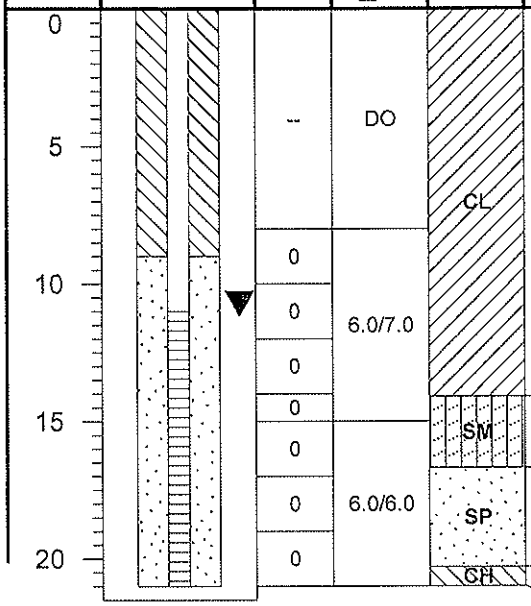
Union Pacific Railroad

Log of Boring: MW-59A

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/28/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	6
Driller:	William Bludworth	Total Depth (ft):	21.0
Driller's License:	4885	Northing:	728155.16
Field Supervisor:	Chris Moore	Easting:	3168358.06
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	44.48



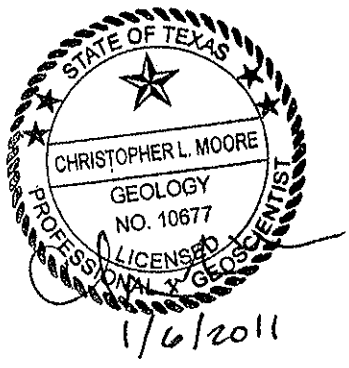
Lithologic Description

(0 - 14.1) SANDY CLAY, CL, dark gray, moist, firm, laminated, no odor.

(14.1 - 16.7) SILTY SAND, SM, light gray, moist, firm, very fine to fine sand,

(16.7 - 20.3) SAND, SP, light gray, wet, soft, very fine to fine sand, no odor.

(20.3 - 21.0) SILTY CLAY, CL, light gray, moist, hard, no odor.



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Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.

Initial Fluid Level (2/05/09)
▼ Depth to water: 10.71 ft BTOC

Annular Materials
(0.0 - 9.0) Bentonite Chips
(9.0 - 21.0) 16/30 Silica Sand

Well Materials
(0 - 11.0) Casing, 2" Sch 40 FJT PVC
(11.0 - 21.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
47.72

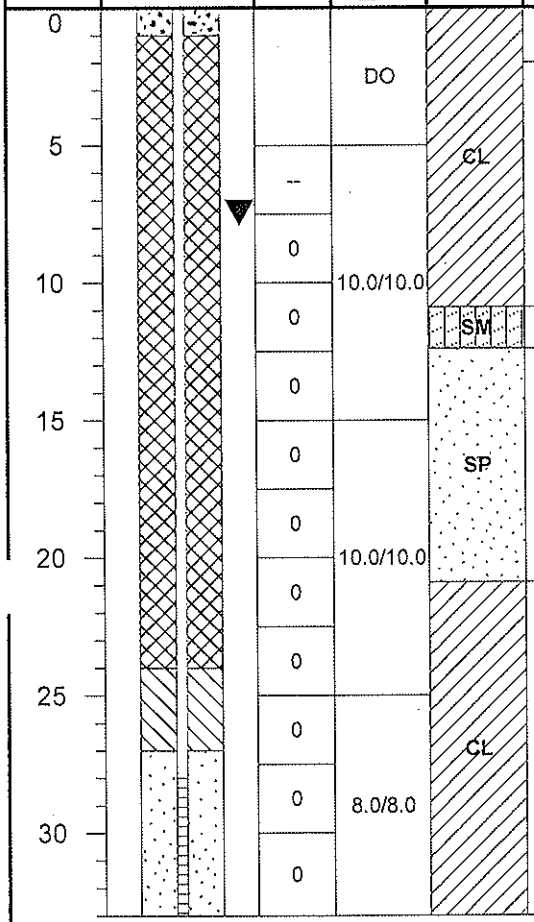
Union Pacific Railroad

Log of Boring: MW-59B

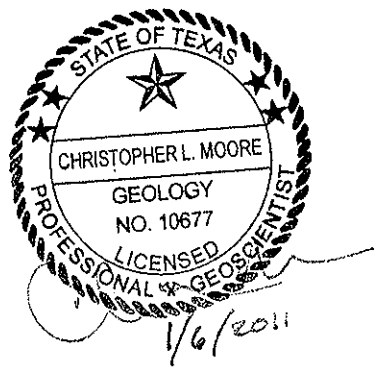
UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	6/26/10	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	6
Driller:	William Bludworth	Total Depth (ft):	33
Driller's License:	4885	Northing:	728144.74
Field Supervisor:	Chris Moore	Easting:	3168357.83
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	44.67



Lithologic Description
SANDY CLAY, very dark gray, moist, firm.
SANDY CLAY, CL, gray, moist, firm, laminated.
SILTY SAND, SM, gray wet, soft.
SAND, SP, gray, wet, soft.
SILTY CLAY, CL, mottled reddish brown and gray, moist, firm to hard, 29.4, 30.9, 31.7, 32.2, 32.7: sand and gravel size calcareous nodules/seams



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Notes:
Top 5 feet drilled out (DO) with a hydrovac to clear for utilities.

Initial Fluid Level (7/12/10)
▼ Depth to water: 7.43 ft BTOC

Annular Materials
(0.0 - 1.0) Concrete
(1.0 - 24.0) Portland/Bentonite Grout
(24.0 - 27.0) Bentonite Chips
(27.0 - 33.0) 16/30 Silica Sand

Well Materials
(0 - 28.0) Casing, 2" Sch 40 FJT PVC
(28.0 - 33.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
44.36

Union Pacific Railroad

Log of Boring: MW-59D

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/27/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	9/8/6
Driller:	William Bludworth	Total Depth (ft):	125.0
Driller's License:	4885	Northing:	728114.05
Field Supervisor:	Chris Moore	Easting:	3168365.41
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	44.52

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0		--	DO	CL	(0 - 14.0) SANDY CLAY, CL, dark gray, moist, firm, no odor.
5					
10		0	6.0/7.0		
		0			
		0			
15		5.9		SM	(14.0 - 16.5) SILTY SAND, SM, light gray, wet, soft, very fine to fine sand, slight odor
		0.5			
		0.6		SP	(16.5 - 19.8) SAND, SP, light gray, wet, soft, very fine to fine sand, no odor.
20		0	10.0/10.0		
		0		CL	(19.8 - 26.0) SILTY CLAY, CL, light gray, moist, hard, no odor.
		0			
25		0			
		2.5		SM/SC	(26.0 - 29.8) SILTY/CLAYEY SAND, SM/SC, greenish gray, moist to wet, soft, slight odor.
30		1.4	10.0/10.0		
		1.5			(29.8 - 55.5) CLAY, CH, red, moist, hard, no odor, 31.5 - 44.5: calcareous nodules and carbonaceous seams.
		1.5			
35		0			
		0			
40		0	10.0/10.0	CH	
		0			
		0			
45		0			
		0			
50		0	10.0/10.0		

STATE OF TEXAS
CHRISTOPHER L. MOORE
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Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.
Sonic isolation casings advanced to 46' and 75' then removed during grouting.

Initial Fluid Level (2/05/09)
▼ Depth to water: 84.17 ft BTOC

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Annular Materials
(0.0 - 95.0) Portland/Bentonite Grout
(95.0 - 100.0) Bentonite Chips
(100.0 - 118.0) 16/30 Silica Sand
(118.0 - 125.0) Bentonite Chips

Well Materials
(0 - 108.0) Casing, 2" Sch 40 FJT PVC
(108.0 - 118.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
47.76

Union Pacific Railroad

Log of Boring: MW-59D

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/27/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	9/8/6
Driller:	William Bludworth	Total Depth (ft):	125.0
Driller's License:	4885	Northing:	728114.05
Field Supervisor:	Chris Moore	Easting:	3168365.41
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	44.52

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
55		0			
		0			
		0		SM	(55.5 - 67.0) SILTY SAND, SM, yellowish red, wet, soft, with laminated clay lenses, n odor.
		0			
60		0	10.0/10.0		
		0			
		0			
65		0			
		0			
		0		CH	(67.0 - 74.5) CLAY, CH, reddish brown, moist, hard, no odor.
70		0	10.0/10.0		
		0			
		0			
75		0		CL	(74.5 - 84.2) SANDY CLAY, CL, greenish gray, moist, firm, trace calcareous nodules, no odor.
		0			
		0	10.0/10.0		
80		0			
		0			
85		0		SM	(84.2 - 95.8) SILTY SAND, SM, light yellowish brown, wet, very fine to fine sand, no odor.
		0			
		0			
90		0	10.0/10.0		
		0			
		0			
95		0			(95.8 - 116.8) SAND, SP, light brown, very fine to fine sand, trace clay lenses, no odor.
		0			
		0			
100		0	10.0/10.0		

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Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.
Sonic isolation casings advanced to 46' and 75' then removed during grouting.

Initial Fluid Level (2/05/09)
▼ Depth to water: 84.17 ft BTOC

Annular Materials
(0.0 - 95.0) Portland/Bentonite Grout
(95.0 - 100.0) Bentonite Chips
(100.0 - 118.0) 16/30 Silica Sand
(118.0 - 125.0) Bentonite Chips

Well Materials
(0 - 108.0) Casing, 2" Sch 40 FJT PVC
(108.0 - 118.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
47.76

Union Pacific Railroad

Log of Boring: MW-59D

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/27/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	9/8/6
Driller:	William Bludworth	Total Depth (ft):	125.0
Driller's License:	4885	Northing:	728114.05
Field Supervisor:	Chris Moore	Easting:	3168365.41
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	44.52

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
105		0		SP	
		0			
		0	10.0/10.0		
		0			
110		0			
		0			
		0			
115		0			
		0			
		0	10.0/10.0	CL	(116.8 - 125.0) SILTY CLAY, CL, greenish gray, moist, hard, no odor.
120		0			
		0			
125		0			

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Notes:
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Sonic isolation casings advanced to 46' and 75' then removed during grouting.

Initial Fluid Level (2/05/09)
▼ Depth to water: 84.17 ft BTOC

Annular Materials
(0.0 - 95.0) Portland/Bentonite Grout
(95.0 - 100.0) Bentonite Chips
(100.0 - 118.0) 16/30 Silica Sand
(118.0 - 125.0) Bentonite Chips

Well Materials
(0 - 108.0) Casing, 2" Sch 40 FJT PVC
(108.0 - 118.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
47.76

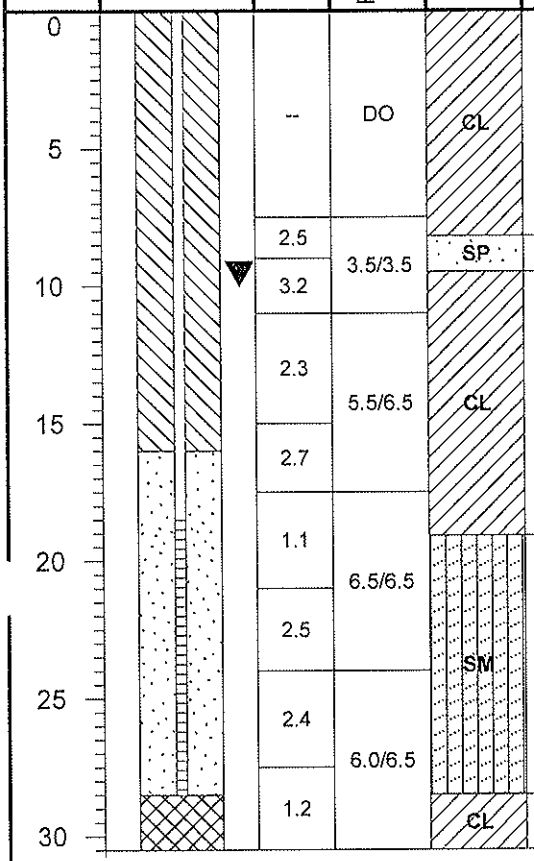
Union Pacific Railroad

Log of Boring: MW-60A

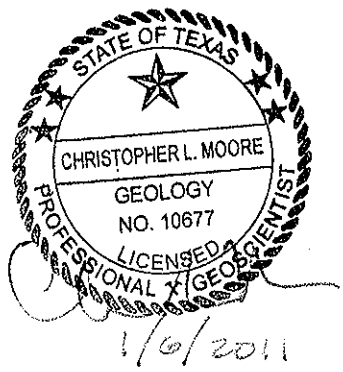
UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/26/09	Drilling Method:	Direct Push Sonic
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	2
Driller:	Keith Barge	Total Depth (ft):	30.5
Driller's License:	4786	Northing:	728825.06
Field Supervisor:	Tim Jennings	Easting:	3168822.57
Sampling Method:	2"x6.5' Barrel	Ground Elev. (ft AMSL):	47.17



Lithologic Description
(0 - 8.2) SANDY/GRAVELLY CLAY, CL, brown to yellowish brown, moist, soft, no odor.
(8.2 - 9.5) SAND, brown, moist, soft, medium sand, no odor.
(9.5 - 19.1) SILTY/SANDY CLAY, yellowish gray, moist, firm, no odor.
(19.1 - 28.5) SILTY SAND, SM, reddish brown, wet, soft, fine sand, no odor.
(28.5 - 30.5) SILTY CLAY, CL, dark reddish brown, moist, firm, no odor.



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Notes:
Top 7 feet drilled out (DO) with a hydrovac to clear for utilities.

Initial Fluid Level (2/05/09)
▼ Depth to water: 9.56 ft BTOC

Annular Materials
(0.0 - 16.0) Bentonite Chips
(16.0 - 28.5) 16/30 Silica Sand
(18.5 - 28.5) Pre Pack Silica Sand
(28.5 - 30.5) Cuttings cave-in

Well Materials
(0 - 18.5) Casing, 1" Sch 40 FJT PVC
(18.5 - 28.5) Screen, 1" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
46.79

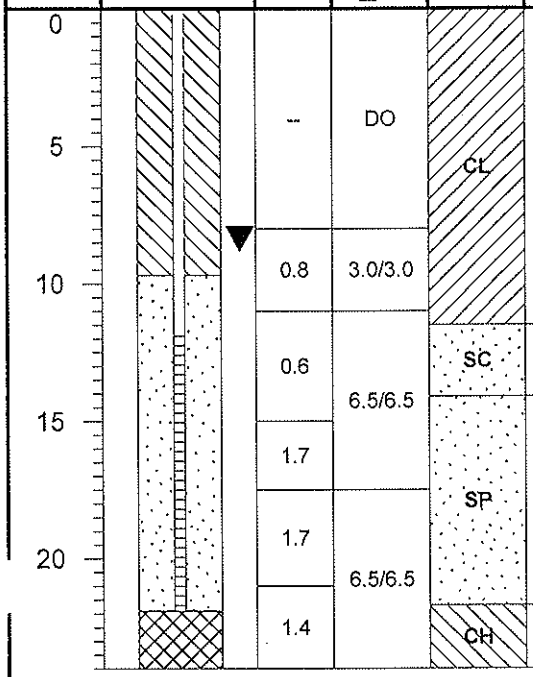
Union Pacific Railroad

Log of Boring: MW-61A

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/26/09	Drilling Method:	Direct Push Sonic
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	2
Driller:	Keith Barge	Total Depth (ft):	24.0
Driller's License:	4786	Northing:	728336.29
Field Supervisor:	Tim Jennings	Easting:	3168629.69
Sampling Method:	2"x6.5' Barrel	Ground Elev. (ft AMSL):	45.15



Lithologic Description
(0 - 11.5) SANDY/GRAVELLY CLAY, CL, light brown to light gray, moist, firm, no odor.
(11.5 - 14.1) CLAYEY SAND, SC, grayish brown, wet, soft, no odor.
(14.1 - 21.7) SAND, SP, greenish gray, wet, soft, no odor, grades to reddish brown and brown at 16.1.
(21.7 - 24.0) SILTY CLAY, CH, reddish brown, moist, firm, no odor.

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Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.

Initial Fluid Level (2/03/08)
▼ Depth to water: 8.35 ft BTOC

Annular Materials
(0.0 - 9.7) Bentonite Chips
(9.7 - 21.9) 16/30 Silica Sand
(11.9- 21.9) Pre Pack Silica Sand
(21.9 - 24.0) Cuttings cave-in

Well Materials
(0 - 11.9) Casing, 1" Sch 40 FJT PVC
(11.9 - 21.9) Screen, 1" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
44.67

Union Pacific Railroad

Log of Boring: MW-62B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/21/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	6
Driller:	William Bludworth	Total Depth (ft):	35.0
Driller's License:	4885	Northing:	728189.57
Field Supervisor:	Chris Moore	Easting:	3165880.32
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	45.4

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0		0	4.5/5.0	CL	(0 - 14.2) SILTY CLAY, CL, dark gray, with sand, moist, soft to firm, laminated, no odor.
		0			
5		0			
		0			
		0			
10		0	10.0/10.0		
		0			
		0			
15		0		SP	(14.2 - 15.8) SAND, SP, light gray, wet, soft, laminated, very fine to fine sand, no odo
		0	10.0/10.0	CL	(15.8 - 25.8) SILTY CLAY, CL, light gray, moist, hard, some orange staining, slight odor to 17.0.
20		0			
		0			
		0			
25		0			
		0.4	10.0/10.0	SP	(25.8 - 34.5) SAND, SP, yellowish red, wet, soft, fine sand, laminated, slight odor.
30		0.2			
		1			
35		0.8		CH	(34.5 - 35.0) CLAY, CH, red, moist, hard, trace calcareous nodules, slight odor.

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Notes:
Sonic isolation casing advanced to 20' then removed during grouting.

Initial Fluid Levels (2/04/09)
▼ Depth to water: 6.99 ft BTOC

Annular Materials
(0.0 - 20.0) Portland/Bentonite Grout
(20.0 - 23.0) Bentonite Chips
(23.0 - 35.0) 16/30 Silica Sand

Well Materials
(0 - 25.0) Casing, 2" Sch 40 FJT PVC
(25.0 - 35.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
48.16

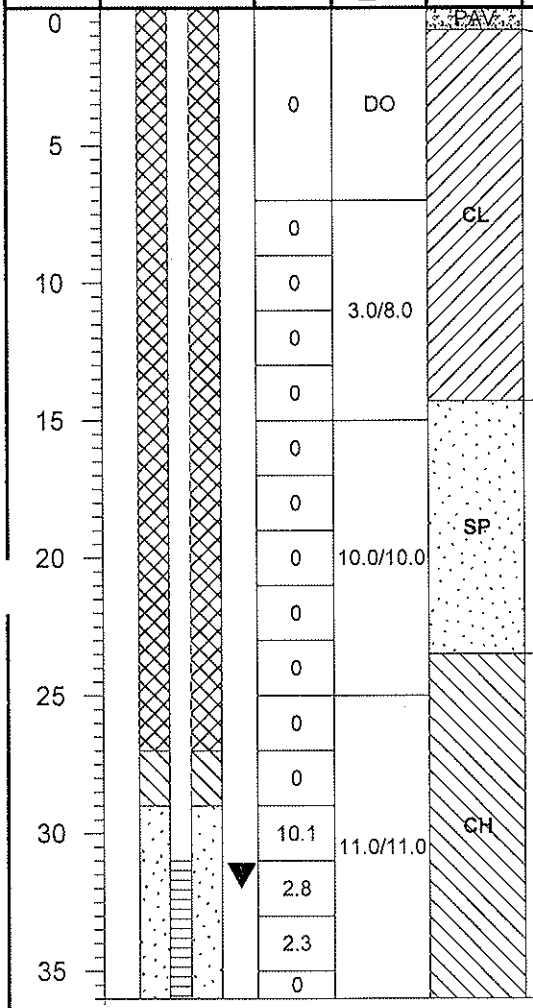
Union Pacific Railroad

Log of Boring: MW-63B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/28/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	6
Driller:	William Bludworth	Total Depth (ft):	36.0
Driller's License:	4885	Northing:	729361.26
Field Supervisor:	Chris Moore	Easting:	3167652.03
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	44.8



Lithologic Description
(0 - 0.8) PAVEMENT and base material.
(0.8 - 14.3) SILTY/SANDY CLAY, CL, light gray, moist, firm, no odor.
(14.3 - 23.5) SAND, SP, light yellowish brown, wet, soft, very fine to fine sand, no odor.
(23.5 - 36.0) CLAY, CH, reddish brown, moist, hard, odor, some coarse sand size nodules with NAPL 26.0-31.0, wet carbonate gravel seams from 31.6-35.0.

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Notes:
Top 7 feet drilled out (DO) with a hydrovac to clear for utilities.
Sonic isolation casing advanced to 25' then removed during grouting.

Initial Fluid Level (2/05/08)
▼ Depth to water: 31.54 ft BTOC

Annular Materials
(0.0 - 27.0) Portland/Bentonite Grout
(27.0 - 29.0) Bentonite Chips
(29.0 - 36.0) 16/30 Silica Sand

Well Materials
(0 - 31.0) Casing, 2" Sch 40 FJT PVC
(31.0 - 36.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
44.48

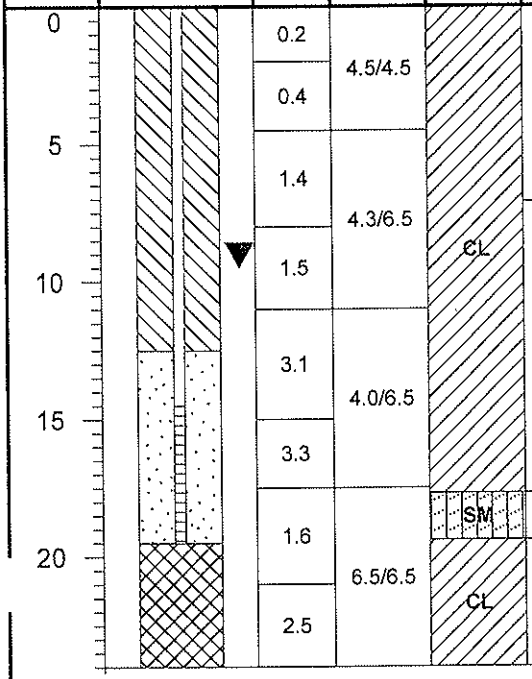
Union Pacific Railroad

Log of Boring: MW-64A

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/26/09	Drilling Method:	Direct Push Sonic
Drilling Company:	Universal Drilling	Borehole Diameter (in.):	2
Driller:	Keith Barge	Total Depth (ft):	24.0
Driller's License:	4786	Northing:	727495.89
Field Supervisor:	Tim Jennings	Easting:	3165572.82
Sampling Method:	2"x6.5' Barrel	Ground Elev. (ft AMSL):	44.81



Lithologic Description

(0 - 7.1) SANDY CLAY, CL, brown, moist, firm, no odor, fine sand, black staining at 2.3-2.5.

(7.1 - 17.7) SANDY CLAY, CL, gray, moist, firm to hard, no odor, trace carbonate gravel.

(17.7 - 19.4) SILTY SAND, SM, brown, wet, soft, fine sand, no odor.

(19.4 - 24.0) SILTY CLAY, CL, gray, moist, firm to hard.

STATE OF TEXAS
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GEOLOGY
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1/6/2011

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Notes:

Initial Fluid Level (2/04/09)
▼ Depth to water: 9.02 ft BTOC

Annular Materials
(0.0 - 12.5) Bentonite Chips
(12.5 - 19.5) 16/30 Silica Sand
(14.5 - 19.5) Pre Pack Silica Sand
(19.5 - 24.0) Cuttings cave-in

Well Materials
(0 - 14.5) Casing, 1" Sch 40 FJT PVC
(14.5 - 19.5) Screen, 1" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
44.55

Union Pacific Railroad

Log of Boring: MW-65D

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/17/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	9/8/6
Driller:	William Bludworth	Total Depth (ft):	110.0
Driller's License:	4885	Northing:	729512.29
Field Supervisor:	Chris Moore	Easting:	3168331.33
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	46.83

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0		-	DO	CL	(0 - 13.7) SILTY CLAY, CL, light gray, moist, firm to hard, laminated, no odor.
5					
10		0	7.0/7.0		
		0			
		0			
15		0			(13.7 - 28.5) SILTY SAND/SAND, SP, light gray, wet, soft, fine to very fine sand, no odor
		0	10.0/10.0	SP	
20		0			
		0			
		0			
25		0	8.5/10.0		
		0			
30		0			(28.5 - 54.4) CLAY, CH, red, moist, hard, trace carbonaceous lenses, no odor.
		0			
		0			
35		0	10.0/10.0	CH	
		0			
40		0			
		0			
		0			
45		0			
		0			
50		0	10.0/10.0		

STATE OF TEXAS
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Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.
Sonic isolation casings advanced to 46' and 75' then removed during grouting.

Initial Fluid Level (2/05/09)
▼ Depth to water: 86.72 ft BTOC

Annular Materials
(0.0 - 92.0) Portland/Bentonite Grout
(92.0 - 97.0) Bentonite Chips
(97.0 - 110.0) 16/30 Silica Sand

Well Materials
(0 - 100.0) Casing, 2" Sch 40 FJT PVC
(100.0 - 110.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
46.51

Union Pacific Railroad

Log of Boring: MW-65D

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/17/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	9/8/6
Driller:	William Bludworth	Total Depth (ft):	110.0
Driller's License:	4885	Northing:	729512.29
Field Supervisor:	Chris Moore	Easting:	3168331.33
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	46.83

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
55		0			
		0			
		0		SM	(54.4 - 57.7) SILTY SAND, SM, wet, soft, fine sand, no odor.
		0			
60		0	10.0/10.0	CH	(57.7 - 61.8) CLAY, CH, red, no odor, moist, hard, no odor.
		0			
		0		SM	(61.8 - 68.2) SILTY SAND, SM, red, wet, soft, very fine to fine sand, no odor.
65		0			
		0			
		0	10.0/10.0	CH	(68.2 - 103.7) CLAY, CH, red, moist, hard, some thinly laminated silt lenses, no odor.
70		0			
		0			
		0			
75		0			
		0			
		0	8.0/10.0		
80		0			
		0			
		0			
85		0			
		0			
		0	10.0/10.0		
90		0			
		0			
		0			
95		0			
		0			
		0			
100		0	10.0/10.0		

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1/6/2011

Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.
Sonic isolation casings advanced to 46' and 75' then removed during grouting.

Initial Fluid Level (2/05/09)
▼ Depth to water: 86.72 ft BTOC

Annular Materials
(0.0 - 92.0) Portland/Bentonite Grout
(92.0 - 97.0) Bentonite Chips
(97.0 - 110.0) 16/30 Silica Sand

Well Materials
(0 - 100.0) Casing, 2" Sch 40 FJT PVC
(100.0 - 110.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
46.51

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Union Pacific Railroad

Log of Boring: MW-65D

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/17/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	9/8/6
Driller:	William Bludworth	Total Depth (ft):	110.0
Driller's License:	4885	Northing:	729512.29
Field Supervisor:	Chris Moore	Easting:	3168331.33
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	46.83

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
105		0	5.0/5.0	SP	(103.7 - 105.5) SAND, SP, yellowish red, wet, soft, very fine to fine sand, no odor.
		0		CH	(105.5 - 107.0) CLAY, CH, reddish brown to gray, moist, hard, no odor.
		0		CL	(107.0 - 110.0) SILTY CLAY, CL, gray, with sand, moist, firm, some thinly laminated sand lenses.
110		0			

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Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.
Sonic isolation casings advanced to 46' and 75' then removed during grouting.

Initial Fluid Level (2/05/09)
▼ Depth to water: 86.72 ft BTOC

Annular Materials
(0.0 - 92.0) Portland/Bentonite Grout
(92.0 - 97.0) Bentonite Chips
(97.0 - 110.0) 16/30 Silica Sand

Well Materials
(0 - 100.0) Casing, 2" Sch 40 FJT PVC
(100.0 - 110.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
46.51

Union Pacific Railroad

Log of Boring: MW-66D

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/20/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	9/8/6
Driller:	William Bludworth	Total Depth (ft):	105.0
Driller's License:	4885	Northing:	729136.87
Field Supervisor:	Chris Moore	Easting:	3169381.04
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	45.3

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0		0	5.0/5.0	GC	(0 - 6.0) CLAYEY GRAVEL, GC, very dark gray, fill, trace wood fragments, no odor.
		0			
5		0			
		0		CH	(6.0 - 8.0) CLAY, CH, very dark gray, moist, firm, no odor, trace carbonate gravel.
		0	9.0/10.0	CL	(8.0 - 14.4) SILTY CLAY, CL, light brownish gray, with sand, moist, firm, no odor.
10		0			
		0			
		0			
15		0	10.0/10.0	CL/ML	(14.4 - 21.5) SANDY CLAY/SILT, CL/ML, light brownish gray, moist, soft to firm, no odor.
		0			
20		2.8			
		2.7		SP	(21.5 - 30.5) SAND, SP, light brownish gray, wet, soft, laminated, slight creosote odor grades to reddish brown at 25'.
		2.4			
25		3	10.0/10.0		
		2.7			
30		2.2			
		2.1		CH	(30.5 - 36.0) CLAY, CH, reddish brown, moist, hard, slight odor 30.5-32.5.
		1			
35		2.3	10.0/10.0	SP	(36.0 - 40.5) SAND, SP, reddish brown, wet, soft, slight odor.
		2.2			
40		2.7			
		0		CH	(40.5 - 55.5) CLAY, CH, yellowish brown, moist, hard, some sand size calcareous nodules, no odor.
		0			
45		0	10.0/10.0		
		0			
		0			
50		0			

STATE OF TEXAS
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1/6/2011

Notes:
Sonic isolation casings advanced to 46' and 75' then removed during grouting.

Initial Fluid Level (2/05/09)
▼ Depth to water: 86.18 ft BTOC

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Annular Materials
(0.0 - 86.0) Portland/Bentonite Grout
(86.0 - 91.0) Bentonite Chips
(91.0 - 105.0) 16/30 Silica Sand

Well Materials
(0 - 93.0) Casing, 2" Sch 40 FJT PVC
(93.0 - 103.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
48.31

Union Pacific Railroad

Log of Boring: MW-66D

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/20/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	9/8/6
Driller:	William Bludworth	Total Depth (ft):	105.0
Driller's License:	4885	Northing:	729136.87
Field Supervisor:	Chris Moore	Easting:	3169381.04
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	45.3

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
55		0			
		0			
		0		SM	(55.5 - 59.0) SILTY SAND, SM, red, wet, soft, no odor, very fine to fine sand.
		0			
60		0	10.0/10.0	SP	(59.0 - 61.4) SAND, SP, red, wet, soft, no odor.
		0		CH	(61.4 - 63.0) CLAY, CH, red, moist, hard, no odor.
		0		SM	(63.0 - 65.5) SILTY SAND, SM, red, wet, soft to firm, no odor.
65		0		CL	(65.5 - 66.8) SILTY CLAY, CL, red, moist, hard, some sand lenses, no odor.
		0		SP	(66.8 - 69.3) SAND, SP, red, wet, soft, fine sand, no odor.
70		0	10.0/10.0	CH	(69.9 - 70.3) CLAY, CH, red, moist, hard, no odor.
		0		SP	(70.3 - 72.0) SAND, SP, red, wet, soft, fine sand, no odor.
		0			
75		0		CH	(72.0 - 87.0) CLAY, CH, red, moist, hard, trace silt lenses and sand size calcareous nodules, no odor.
		0			
		0	10.0/10.0		
80		0			
		0			
		0			
85		0			
		0			
		0		CL	(87.0 - 94.6) SILTY CLAY, CL, yellowish red, moist, firm, no odor.
90		0	10.0/10.0		
		0			
		0			
95		0		SM	(94.6 - 100.8) SILTY SAND, SM, yellowish red, wet, soft, very fine to fine sand, no odor.
		0			
100		0	8.0/10.0		

PBW

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Notes:
Sonic isolation casings advanced to 46' and 75' then removed during grouting.

Initial Fluid Level (2/05/09)
▼ Depth to water: 86.18 ft BTOC

Annular Materials
(0.0 - 86.0) Portland/Bentonite Grout
(86.0 - 91.0) Bentonite Chips
(91.0 - 105.0) 16/30 Silica Sand

Well Materials
(0 - 93.0) Casing, 2" Sch 40 FJT PVC
(93.0 - 103.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
48.31

Union Pacific Railroad

Log of Boring: MW-66D

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/20/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	9/8/6
Driller:	William Bludworth	Total Depth (ft):	105.0
Driller's License:	4885	Northing:	729136.87
Field Supervisor:	Chris Moore	Easting:	3169381.04
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	45.3

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
105		0 0		CH	(100.8 - 105.0) CLAY, CH, reddish brown, moist, hard, no odor.

PBW

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Notes:
Sonic isolation casings advanced to 46' and 75' then removed during grouting.

Initial Fluid Level (2/05/09)
▼ Depth to water: 86.18 ft BTOC

Annular Materials
(0.0 - 86.0) Portland/Bentonite Grout
(86.0 - 91.0) Bentonite Chips
(91.0 - 105.0) 16/30 Silica Sand

Well Materials
(0 - 93.0) Casing, 2" Sch 40 FJT PVC
(93.0 - 103.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
48.31

Union Pacific Railroad

Log of Boring: MW-67B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	6/26/10	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	6
Driller:	William Bludworth	Total Depth (ft):	40
Driller's License:	4885	Northing:	729781.52
Field Supervisor:	Chris Moore	Easting:	3167587.88
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	44.53

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			DO	PAV	Asphalt Pavement
					Gravel Base Material
					SILTY CLAY, CL, gray, moist, firm, laminated.
5		--		CL	
		0			
10		0	10.0/10.0		
		0			
15		0			SILTY SAND, SM, gray wet, soft, very fine grained.
		0			
20		0	2.0/10.0	SP	
		0			
25		0			
		0			
30		0	5.0/10.0		
		0			
35		0		CH	CLAY, CH, reddish brown, moist, firm to hard, 34.3-34.5 and 37.2-37.4: wet sand lens, 38.0-38.1 and 38.7-38.8: sand to gravel size calcaroues nodules.
		0	5.0/5.0		
40		0			

STATE OF TEXAS
CHRISTOPHER L. MOORE
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6/6/2011

Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.

Initial Fluid Level (7/12/10)
▼ Depth to water: 5.76 ft BTOC

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Annular Materials
(0.0 - 1.0) Concrete
(1.0 - 32.0) Portland/Bentonite Grout
(32.0 - 34.0) Bentonite Chips
(34.0 - 40.0) 16/30 Silica Sand

Well Materials
(0 - 35.0) Casing, 2" Sch 40 FJT PVC
(35.0 - 40.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
43.93

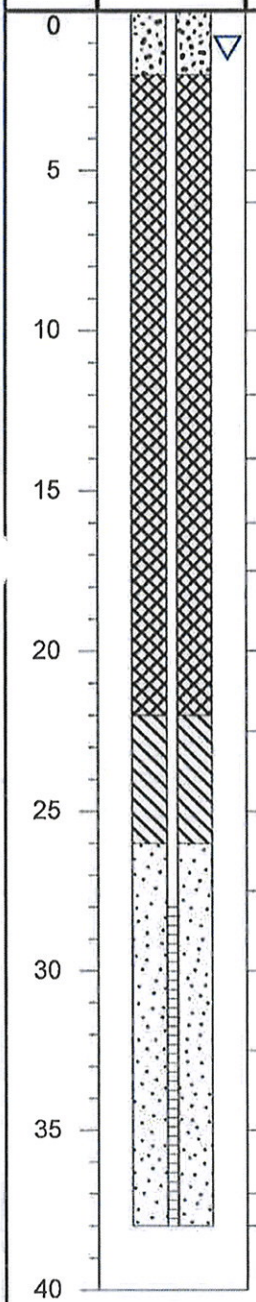
Union Pacific Railroad

Log of Boring: MW-68B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	12/15/2011	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	5
Driller:	Tim Beach	Total Depth (ft):	40
Driller's License:	58141	Northing:	729161.75
Field Supervisor:	Tim Jennings	Easting:	3167327.53
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	44.93



PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
	DO	PAV.	(0 - 0.2) Asphalt Pavement
			(0.2 - 0.7) Gravel Base Material
		FILL	(0.7 - 5) FILL, Sand, Gravel and Clay
0.2	1/5	CL	(5 - 6) SANDY CALY, CL, light brown, moist, ~20% fine sand in medium plasticity clay, firm
		SM	(6 - 18.8) SILTY SAND, SM, greenish gray, moist to wet below ~10 feet, ~30-40% fines, very soft, no odor
0.3	7.5/10		
0.4			
0.2			
0.4			
		CL	(18.8 - 19.5) SANDY CLAY, CL, reddish brown with gray mottling, ~20% fine sand in medium plasticity clay, slight odor
0.2	5/5	SP	(19.5 - 22.5) POORLY GRADED SAND, SP, brown, wet, very fine to fine sand, soft, slight odor
0.5		CH	(22.5 - 38) SANDY CLAY, CL, orange and reddish brown mottled 22.5-26 feet and becomes reddish brown with gray mottling below 26 feet, moist to wet, ~20-40% fine sand in high plasticity clay, firm to soft, sand to gravel sized carbonate nodules in thin seams at 22.5, 24.0, 24.6, 32.4, and 33.1 feet, slight NAPL staining at 22.5 feet, sand lined fractures common from 33.5-35 feet, sand is stained with NAPL from 34.5-35 feet, fractures with slickensides and sand to gravel sized carbonate nodules in fractures 36.3, 37.1, and 37.7 feet, slight odor in clay and moderate to strong odor near fractures
6.7	5/5		
13.4			
52.1	5/5		
58.3			
8.7	3/3		
5.4			

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Notes:
Top 5 feet drilled out (DO) with a hydrovac to clear for utilities.
8-inch sonic isolation casing advanced to 25' then removed during grouting.

Initial Fluid Level (01/27/12)
Depth to water: 1.16 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 22.0) Portland/Bentonite Grout
(22.0 - 26.0) Bentonite Pellets
(26.0 - 38.0) 20/40 Silica Sand

Well Materials
(0 - 28.0) Casing, 2" FJT Stainless Steel
(28.0 - 38.0) Screen, 2" FJT Stainless Steel, 0.01 slot

TOC Elevation (ft AMSL)
44.63

Union Pacific Railroad

Log of Boring: MW-68C

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	6/25/10	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	6
Driller:	William Bludworth	Total Depth (ft):	73
Driller's License:	4885	Northing:	729164.26
Field Supervisor:	Chris Moore	Easting:	3167345.75
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	44.98

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			DO	PAV	Asphalt Pavement
					Gravel Base Material
				CH	CLAY, CH, gray, moist, soft to firm, with gravel.
5		--			
		0			
10		0	1.0/10.0		
		0			
		0		CL	SILTY CLAY, CL, gray, moist, firm, laminated, with sand, 19.2-20.2: clay lens.
15	▼	0			
		0.1		SP	SAND, SP, gray, wet, soft, very fine grained, slight odor.
20		0.3	10.0/10.0		
		0			
25		1		CH	CLAY, CH, reddish brown, moist, firm to hard, some gray mottling, strong odor, 28.4, 31.2,and 33.4: sand to gravel size calcaroues nodules with sheen/NAPL, 35.9-36.7: sand layer, odor, 37.0-44.0: slickensided fractures.
		54.4			
30		82.1	10.0/10.0		
		46.7			
35		100.3			
		0			
40		1.5	10.0/10.0		
		2.6			
45		0.7		CL	SILTY CLAY, CL, reddish brown, moist, soft to firm, slight odor.
		3.4			CLAY, CH, reddish brown, moist, firm to hard.
50			10.0/10.0		

STATE OF TEXAS
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Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.
Sonic isolation casing advanced to 55' then removed during grouting.

Initial Fluid Level (7/12/10)
▼ Depth to water: 16.52 ft BTOC

Annular Materials
(0.0 - 1.0) Concrete
(1.0 - 56.0) Portland/Bentonite Grout
(56.0 - 58.0) Bentonite Chips
(58.0 - 70.0) 16/30 Silica Sand
(70.0 - 73.0) Hole cave-in

Well Materials
(0 - 60.0) Casing, 2" Sch 40 FJT PVC
(60.0 - 70.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
44.8

Union Pacific Railroad

Log of Boring: MW-68C

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	6/25/10	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	6
Driller:	William Bludworth	Total Depth (ft):	73
Driller's License:	4885	Northing:	729164.26
Field Supervisor:	Chris Moore	Easting:	3167345.75
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	44.98

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
55		0.3		CH	
		0			
		0	10.0/10.0	SM	SILTY SAND, reddish brown, moist, soft, slight odor, very fine grained.
60		0			
		0.1			
		0		SP	SAND, SP, reddish brown, wet, soft, very fine grained, slight odor.
65		0			
		0	8.0/8.0	CH	CLAY, CH, reddish brown, moist, firm to hard, 68.3-69.4: silty.
70		0		CL	SILTY CLAY, CL, brown, moist, firm, laminated.

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Notes:
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Sonic isolation casing advanced to 55' then removed during grouting.

Initial Fluid Level (7/12/10)
▼ Depth to water: 16.52 ft BTOC

Annular Materials
(0.0 - 1.0) Concrete
(1.0 - 56.0) Portland/Bentonite Grout
(56.0 - 58.0) Bentonite Chips
(58.0 - 70.0) 16/30 Silica Sand
(70.0 - 73.0) Hole cave-in

Well Materials
(0 - 60.0) Casing, 2" Sch 40 FJT PVC
(60.0 - 70.0) Screen, 2" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
44.8

Union Pacific Railroad

Log of Boring: MW-69A

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	6/26/10	Drilling Method:	Geoprobe
Drilling Company:	Alpine Field Services	Borehole Diameter (in.):	3
Driller:	Clay Neal	Total Depth (ft):	23
Driller's License:	56591	Northing:	728135.7
Field Supervisor:	Tim Jennings	Easting:	3168234.02
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	45.7

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0		0	3.1/4.0	PAV	Asphalt Pavement
		0			Gravel Base Material
					SANDY CLAY, CL, dark brown, moist, firm.
5		0	4.0/4.0		
		0		CL	SILTY CLAY, CL, mottled gray and orange, moist, soft to firm, trace calcaroues nodules, becomes sandy with depth.
		0	4.0/4.0		
10		0			SANDY CLAY, CL, mottled light gray and orange, moist, soft.
		1.2	4.0/4.0		
		1.5		SP	SAND, light gray, wet, soft, fine grained, some sandy clay interbeds.
15		1.3	3.7/4.0		
		0.6		CL	CLAY, CL, mottled gray and orange, moist, hard.
20		0	3.0/3.0	SP	SAND, light brown, wet, soft, fine grained.

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

1/4/2011

PBW

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Notes:
Top 5 feet drilled out (DO) with a hydrovac to clear for utilities.

Initial Fluid Level (7/12/10)
▼ Depth to water: 11.81 ft BTOC

Annular Materials
(0.0 - 1.0) Concrete
(1.0 - 3.5) Bentonite Chips
(3.5 - 18.5) 16/30 Silica Sand

Well Materials
(0 - 8.5) Casing, 1" Sch 40 FJT PVC
(8.5 - 18.5) Screen, 1" Sch 40 FJT PVC, 0.01 slot

TOC Elevation (ft AMSL)
45.71

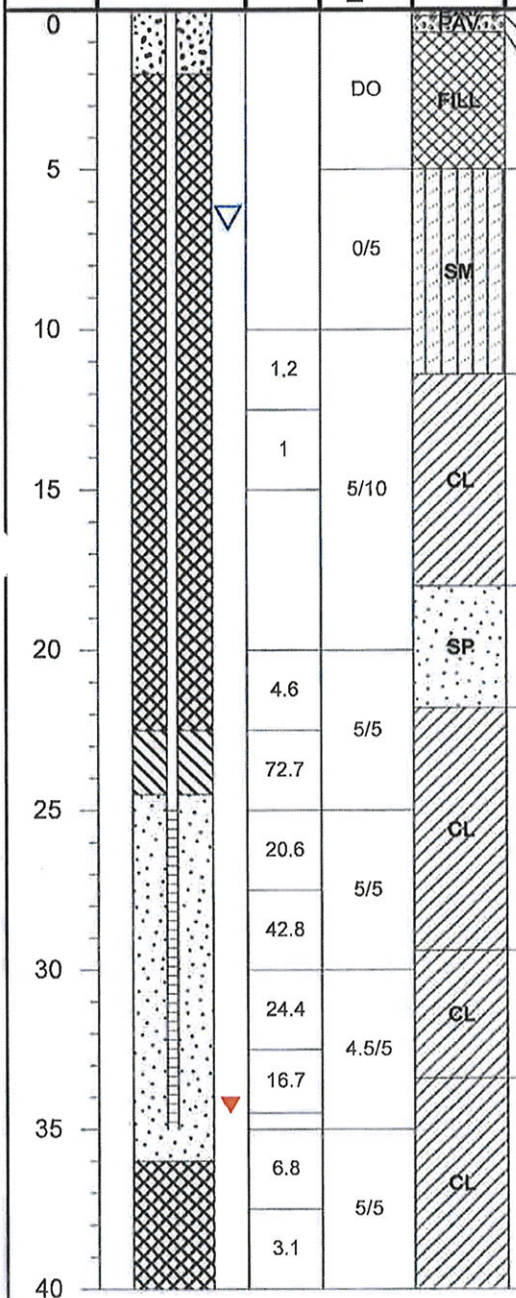
Union Pacific Railroad

Log of Boring: MW-70B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	12/14/2011	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	5
Driller:	Tim Beach	Total Depth (ft):	40
Driller's License:	58141	Northing:	728944.39
Field Supervisor:	Tim Jennings	Easting:	3167671.2
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	45.02



Lithologic Description

(0 - 0.2) Asphalt Pavement
(0.2 - 0.7) Gravel Base Material
(0.7 - 5) FILL, Sand, Gravel and Clay

(5 - 11.4) SILTY SAND, SM, gray, moist, ~10-20% fines in very fine to fine sand, soft, slight odor

(11.4 - 18) SANDY CLAY, CL, reddish brown with gray mottling, ~10-20% fine sand in medium plasticity clay, firm, slight odor

(18 - 21.8) POORLY GRADED SAND, SP, greenish gray, wet, very fine to fine sand, soft

(21.8 - 29.4) SANDY CLAY, CL, reddish brown to orange with gray mottling, moist, ~20-30% fine sand medium plasticity clay, firm, abundant small carbonate nodules, strong odor, abundant carbonate nodules below 25.4 feet, thin seams of carbonate nodules 26.8 to 27.2 feet

(29.4 - 33.4) SILTY CLAY, CL, reddish brown with gray mottling, moist, hard, medium plasticity clay, thin carbonate gravel seams at 30.5, 32.2, and 33.2, strong odor, no visible NAPL

(33.4 - 40) CLAY, CL, red with gray mottling, moist, very hard medium plasticity clay, locally fractured with slickensides common, all fractures in the same direction at approximately 45-degree angle, large carbonate nodules at 38.2 feet, no visible NAPL, moderate to slight odor

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Notes:
Top 5 feet drilled out (DO) with a hydrovac to clear for utilities.
8-inch sonic isolation casing advanced to 25' then removed during grouting.

Initial Fluid Level (01/27/12)
Depth to water: 6.51 ft BTOC
Depth to NAPL: 34.26 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 22.5.0) Portland/Bentonite Grout
(22.5 - 24.5) Bentonite Pellets
(24.5 - 36.0) 20/40 Silica Sand
(36.0-40.0) Caved Formation

Well Materials
(0 - 25.0) Casing, 2" FJT Stainless Steel
(25.0 - 35.0) Screen, 2" FJT Stainless Steel, 0.01 slot

TOC Elevation (ft AMSL)
44.86

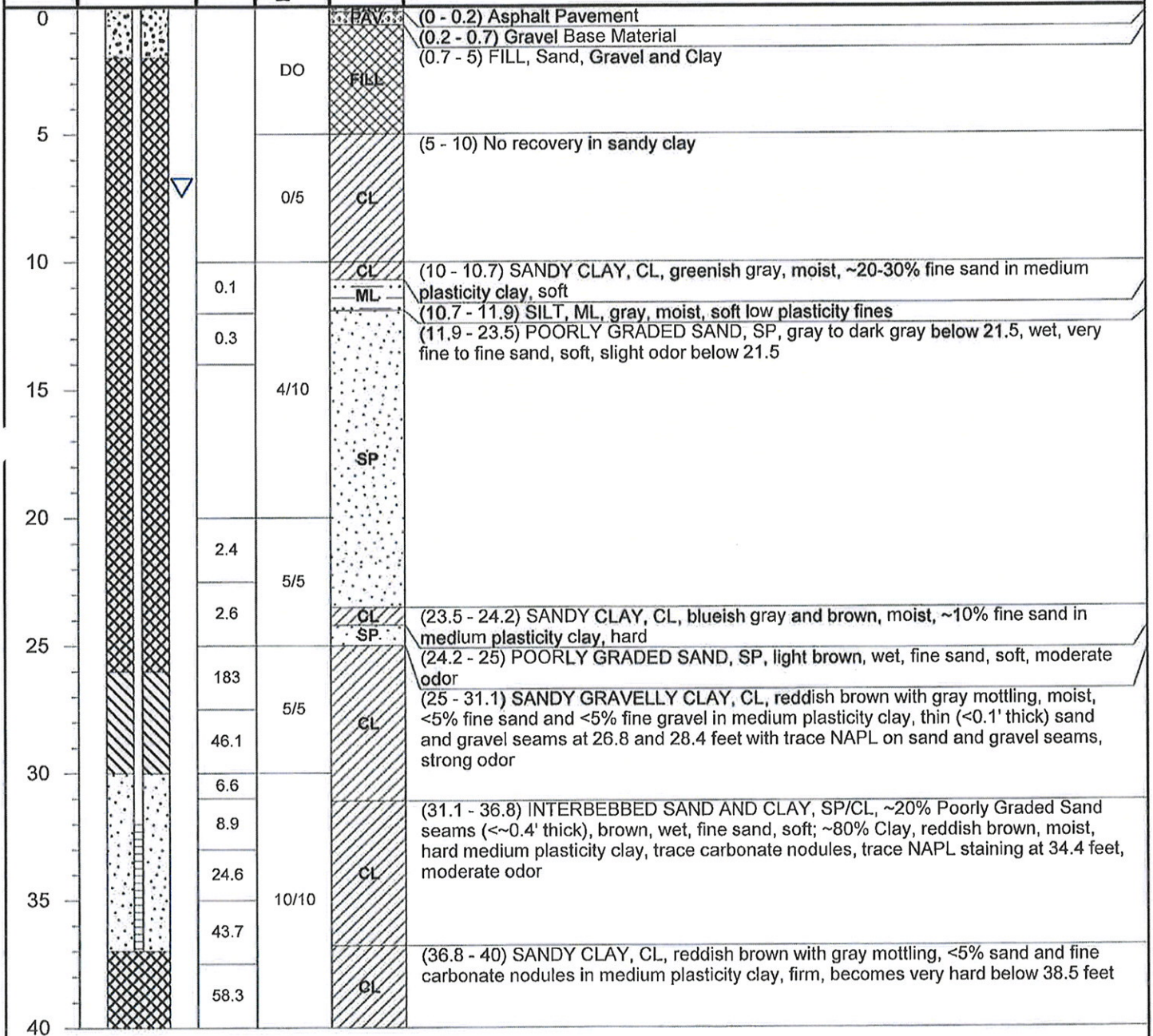
Union Pacific Railroad

Log of Boring: MW-71B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	12/13/2011	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	5
Driller:	Tim Beach	Total Depth (ft):	40
Driller's License:	58141	Northing:	728956.44
Field Supervisor:	Tim Jennings	Easting:	3167950.69
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	45.06



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Notes:
Top 5 feet drilled out (DO) with a hydrovac to clear for utilities.
8-Inch sonic isolation casing advanced to 26' then removed during grouting.

Initial Fluid Level (01/27/12)
Depth to water: 7.08 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 26.0) Portland/Bentonite Grout
(26.0 - 30.0) Bentonite Pellets
(30.0 - 37.0) 20/40 Silica Sand
(37.0-40.0) Caved Formation

Well Materials
(0 - 32.0) Casing, 2" FJT Stainless Steel
(32.0 - 37.0) Screen, 2" FJT Stainless Steel, 0.01 slot

TOC Elevation (ft AMSL)
44.59

Union Pacific Railroad

Log of Boring: MW-72B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	12/21/2011	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	5
Driller:	Tim Beach	Total Depth (ft):	41
Driller's License:	58141	Northing:	728790.47
Field Supervisor:	Tim Jennings	Easting:	3167792.48
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	48.69

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			DO	PAV	(0 - 3) FILL, Gravel Base
5		14.5	5/5	SC	(3 - 9) CLAYEY SAND, SC, black, moist, ~40-50% high plasticity clay in fine sand, soft, locally oily, strong odor, grades to sandy clay at ~ 9 feet
		3.1			
10		15.3	8/10	CH	(9 - 15.2) SANDY CLAY, CH, gray to light gray with brown mottling, moist, ~20-30% fine sand in high plasticity clay, abundant (~30%) carbonate nodules 12.5-13.3 feet, strong odor throughout
		4.1			
15		10.6		SM	(15.2 - 17.3) SILTY SAND, SM, greenish gray, wet, ~20-40% fines in very fine to fine sand, soft, well bedded with brown viscous NAPL (staining) locally along bedding planes
		6.2			(17.3 - 28.7) POORLY GRADED SAND AND SILTY SAND, SP/SM, brown, wet, very fine to fine sand with silt, well bedded, NAPL sheen and/or staining, with very heavy staining and brown NAPL 26.8-28.7
20		6.8	10/10	SP/SM	
		39.7			
25		217.5			
		96.1		CL	(28.7 - 29) CLAY, CL, reddish brown with gray mottling, moist, hard medium plasticity clay, NAPL staining on sharp lower contact
30		70.2	5/5	CH	(29 - 31.8) SANDY CLAY, CH, light brown with gray mottling, moist, ~10-20% fine sand in high plasticity clay, firm
		170		CL	(31.8 - 39) SANDY CLAY, CL, reddish brown with gray mottling, moist, ~10% fine sand in medium plasticity clay, firm to hard, fine gravel sized chalky carbonate nodules throughout, seams of sand to gravel sized carbonate fragments at 31.8, 33.1, and 34.8-35 feet, small amount of NAPL in seams at 33.1 and 34.8-35 feet, clay is very fractured 36.5-36.9 feet, small amount of staining in fractures, horizontal sand lined fracture at 38.4 - small amount of NAPL in sand, strong odor throughout, grades to clay at ~ 39 feet
35		101.8	6/6		
		14		CL	(39 - 41) CLAY, CL, reddish brown with gray mottling, moist, very hard medium plasticity clay, fractures with slicken sides at ~45 degrees from 39-40 feet, moderate odor decreases to slight odor at 41 feet
40					

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Notes:
Top 5 feet drilled out (DO) with a hydrovac to clear for utilities.
8-inch sonic isolation casing advanced to 31' then removed during grouting.

Initial Fluid Level (01/27/12)
Depth to water: 38.76 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 27.0) Portland/Bentonite Grout
(27.0 - 31.0) Bentonite Pellets
(31.0 - 37.5) 20/40 Silica Sand
(37.5-40.0) Bentonite Pellets

Well Materials
(0 - 32.0) Casing, 2" FJT Stainless Steel
(32.0 - 37.0) Screen, 2" FJT Stainless Steel, 0.01 slot

TOC Elevation (ft AMSL)
51.97

Union Pacific Railroad

Log of Boring: MW-73B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	12/13/2011	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	5
Driller:	Tim Beach	Total Depth (ft):	55
Driller's License:	58141	Northing:	728419.47
Field Supervisor:	Tim Jennings	Easting:	3167122.74
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	48.66

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			DO	FILL	(0 - 5) FIIL, Sand Clay and Gravel
5		0.5	1/5	CH	(5 - 13.3) SANDY CLAY, CH, dark brown, moist, ~20-30% fine sand in high plasticity clay, soft, moderate odor below 10 feet
		1.3			
10		5.7	8/10		
		1.5		SW	(13.3 - 14) GRADED SAND, SW, dark brown, moist, fine to coarse sand, moderate odor
15		6.7		CL	(14 - 16.2) SILTY CLAY, CL, light brown with orange mottling, moist, medium plasticity clay, soft, locally fractured with NAPL along fractures
		13.8			
20				SM	(16.2 - 23.3) SILTY SAND, SM, light brown, moist to wet below 17.5 feet, ~20-30% fines in very fine sand, NAPL visible locally on fresh beak, grades to sandy clay at ~23.3 feet
	▽	2.1	5/5		
		1.5			
25		2.1	5/5	CL	(23.3 - 31.5) SANDY CLAY, CL, light gray with orange mottling, moist, ~20-30% fine sand in medium plasticity clay, firm, slight odor
		2.5			
30		1.8	5/5		
		3.4		CL	(31.5 - 33.5) SANDY CLAY, CL, gray with orange mottling, moist, ~10% fine sand in medium plasticity clay
35		5	5/5	CL	(33.5 - 38) CLAY, CL, reddish brown with gray mottling, moist, very hard medium plasticity clay, carbonate gravel seams at 34.2, 35.5, and 37.3, no visible NAPL, moderate odor
		178.2		CL	(38 - 40) CLAY, CL, as above with thin (<0.2 feet thick) very fine sand interbeds at 38.0, 38.9, and 39.9 feet, sand is saturated with NAPL, NAPL in fracture at 40 feet, strong odor
40		9.7	5/5		
		3.6		CL	(40 - 48.3) CLAY, CL, reddish brown with gray mottling, moist, locally silty, locally fractured with slickensides common, no NAPL, moderate odor, grades to silty clay sand below 48.3 feet
45		2.4	5/5		
		5.3		SM	(48.3 - 51.3) SILTY SAND, SM, reddish brown, wet, ~30-40% fines in very fine sand, NAPL locally - increasing downward and saturated with NAPL 50-51.3 feet, strong odor
50		9.6	5/5	CL	(51.3 - 55) CLAY, CL, reddish brown, moist, medium plasticity clay, few carbonate nodules, very hard, fractures at 53.5 and 54.8, moderate odor
		1.7			
55					

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Notes:
Top 5 feet drilled out (DO) with a hydrovac to clear for utilities.
8-inch sonic isolation casing advanced to 29' then removed during grouting.

Initial Fluid Level (01/27/12)
Depth to water: 25.48 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 40.0) Portland/Bentonite Grout
(40.0 - 44.0) Bentonite Pellets
(44.0 - 52.5) 20/40 Silica Sand
(52.5-55.0) Bentonite Pellets

Well Materials
(0 - 47.0) Casing, 2" FJT Stainless Steel
(47.0 - 52.0) Screen, 2" FJT Stainless Steel, 0.01 slot

TOC Elevation (ft AMSL)
51.42

Union Pacific Railroad

Log of Boring: MW-74B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	12/20/2011	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	5
Driller:	Tim Beach	Total Depth (ft):	40
Driller's License:	58141	Northing:	728372.95
Field Supervisor:	Tim Jennings	Easting:	3167717.81
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	47.83

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			DO	FILL	(0 - 4.5) FILL, Sand, Clay and Gravel, heavy black staining at 2.5 feet
5		11.7	5/5	CH	(4.5 - 14.2) SANDY CLAY, CH, greenish gray and light gray with light brown mottling, moist, ~20-40% fine sand in high plasticity clay, sand increasing downward, soft, strong odor
		2.7			
		4.1			
10		9.3	8/10		
		24.5			
15		10		SM	(14.2 - 16.5) SILTY SAND, SM, greenish gray, wet, ~40-50% silt, soft, strong odor
		6.9		SP	(16.5 - 23.1) POORLY GRADED SAND, SP, light gray to brown, wet, very fine to fine sand, soft, saturated with NAPL, 22.1-23.1, very strong odor
20		146.2	5/5		
		47		CL	(23.1 - 26.1) SANDY CLAY, CH, reddish brown with gray mottling, moist, ~10-30% fine sand in medium plasticity clay with very sandy zone 23.5-24.3 with NAPL in sandy zone, firm to soft and locally friable, fracture lined with chalky carbonate 25.8-26.1 with small amount of NAPL, strong odor
25		24.7	5/5		(26.1 - 35) SANDY CLAY, CL, light brown with gray mottling, moist, ~10-20% fine sand in medium plasticity clay, clay is moderately fractured 29-35 feet, fractures are commonly lined with fine sand, with NAPL present along most fractures, strong odor, grades to hard sandy clay
		70.8			
30		140.8	5/5	CL	
		148.5			
35		17.2	5/5	CL	(35 - 39.1) SANDY CLAY, CL, reddish brown with gray mottling, ~10-20% fine sand in hard, medium plasticity clay, sand to gravel sized carbonate nodules in thin seams at 36.3, 37.6, 38, and 38.7 feet, small amount of NAPL in carbonate seam at 38.7 feet, strong odor
		5.8			
40				CL	(39.1 - 40) CLAY, CL, reddish brown with gray mottling, hard, dense medium plasticity clay, slight odor

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Notes:
Top 5 feet drilled out (DO) with a hydrovac to clear for utilities.
8-inch sonic isolation casing advanced to 27' then removed during grouting.

Initial Fluid Level (01/27/12)
Depth to water: 7.63 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 21.5) Portland/Bentonite Grout
(21.5 - 25.5) Bentonite Pellets
(25.5 - 37.5) 20/40 Silica Sand
(37.5 - 40.0) Bentonite Pellets

Well Materials
(0 - 26.5) Casing, 2" FJT Stainless Steel
(26.5 - 36.5) Screen, 2" FJT Stainless Steel, 0.01 slot

TOC Elevation (ft AMSL)
47.58

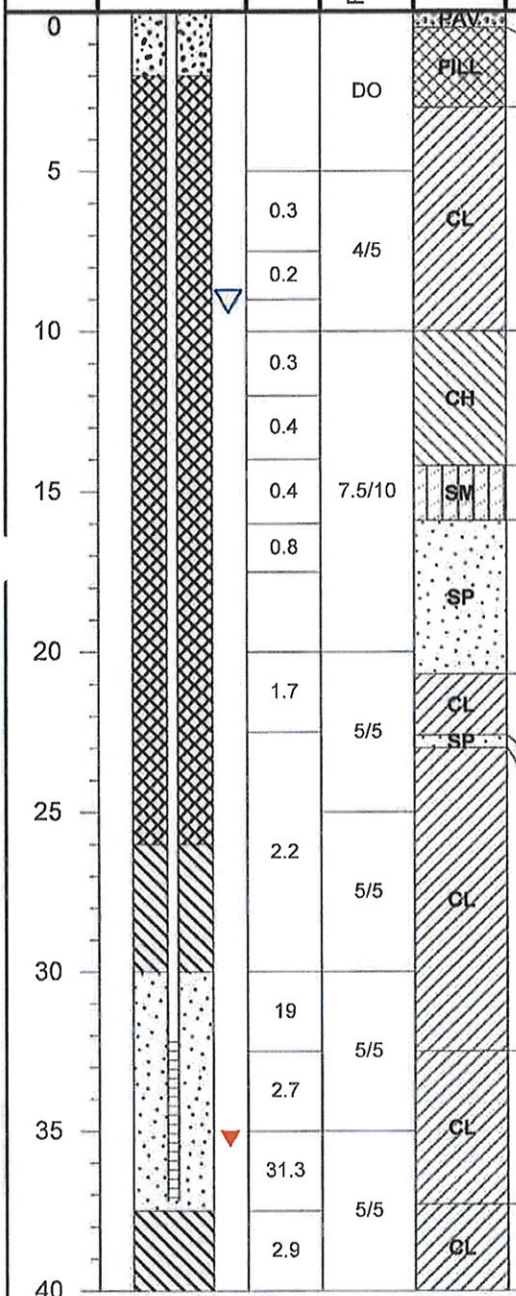
Union Pacific Railroad

Log of Boring: MW-75B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	12/20/2011	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	5
Driller:	Tim Beach	Total Depth (ft):	40
Driller's License:	58141	Northing:	728066.11
Field Supervisor:	Tim Jennings	Easting:	3168022.07
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	47.18



Lithologic Description

(0 - 0.5) Concrete

(0.5 - 3) FILL, Gravel Base

(3 - 10) SANDY, GRAVELLY, CLAY, CL, gray with brown mottling, moist, ~30-40% fine to coarse carbonate sand and fine to coarse carbonate gravel in medium plasticity clay, firm

(10 - 14.2) SANDY CLAY, CH, light gray and light brown mottled, moist, ~20-40% fine sand increasing downward in high plasticity clay, firm to soft, very slight odor

(14.2 - 15.9) SILTY SAND, SM, greenish gray, wet, ~30-40% silt in fine sand, soft, slight odor

(15.9 - 20.7) POORLY GRADED SAND, SP, gray and grayish brown, wet, fine sand, soft, moderate odor

(20.7 - 22.6) SANDY CLAY, CL, reddish brown and gray, moist to locally wet, ~20-30% fine sand in medium plasticity clay, with fine sand interbeds at 21.1 and 21.6-21.8, firm to hard

(22.6 - 23) POORLY GRADED SAND, SP, grayish brown, wet, soft

(23 - 32.5) SANDY CLAY, CL, gray with brown mottling, moist, ~20-30% fine sand (decreasing near base) in medium plasticity clay, firm, moderate to strong odor

(32.5 - 37.3) SANDY CLAY, CL, reddish brown with gray mottling, moist, ~10-20% fine sand in medium plasticity clay, clay is very fractured and friable 35-37 feet, sand to gravel sized carbonate fragments in thin zones at 33.4, 34.4, and 37.1 feet, carbonate fragments are coated with Fe/Mn mineralization, clay is v. sandy (~50% fn snd), 36.4 to 36.8 heavy NAPL present, mod. strong odor

(37.3 - 40) CLAY, CL, reddish brown, moist, very hard, medium plasticity clay, with slickenside fractures at 37.6 and 38.8 feet, slight odor near top

PBW

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Notes:
Top 5 feet drilled out (DO) with a hydrovac to clear for utilities,
8-inch sonic isolation casing advanced to 25' then removed during grouting.

Initial Fluid Level (01/27/12)
Depth to water: 9.07 ft BTOC
Depth to NAPL: 35.26 ft BTOC

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 26.0) Portland/Bentonite Grout
(26.0 - 30.0) Bentonite Pellets
(30.0 - 37.5) 20/40 Silica Sand
(37.5 - 40.0) Bentonite Pellets

Well Materials
(0 - 32.2) Casing, 2" FJT Stainless Steel
(32.2 - 37.2) Screen, 2" FJT Stainless Steel, 0.01 slot

TOC Elevation (ft AMSL)
46.78

Union Pacific Railroad

Log of Boring: MW-76C

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	5/7/2014	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	10
Driller:	Tim Beach	Total Depth (ft):	70
Driller's License:	58141	Northing:	727485.1524
Field Supervisor:	Patrick Ferrell	Easting:	3166628.2572
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	48.17

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0					(0 - 10) No Recovery, NR, concrete cored and soils removed to 10' by hydrovac to clear for utilities.
5			0.0/0.0	NR	
10		3			(10 - 19.4) SILTY CLAY, CL, grey with trace orange mottling, few iron nodules and large (2 to 5 cm diameter) calcareous nodules to 14.6', orange mottling increases after 14.6' and continues to 18.2' where it becomes tan-grey and red with abundant iron nodules between 18.4' to 18.6'.
		2.8			
15			10.0/10.0	CL	
		2.9			
		3.4			
20				SP	(19.4 - 21.1) SAND, SP, tan and red-brown with abundant calcareous nodules between 20.2 and 21.1, wet.
		1.2			(21.1 - 47.2) SILTY CLAY, CL, tan with some orange mottling which increases with depth, becomes red-orange with black streaks at 33.5', carbonate gravel seams between 35.4' to 35.7', moist carbonate gravel seams between 37.3' to 37.7', 38.1' to 38.3', 39.2' to 39'6, and 40.4' to 40.7', dry, very hard with no plasticity.
		1.4			
25			10.0/10.0		
		1.7			
		1.1			
30		3.4			
		3.2			
35			10.0/10.0	CL	
		2.1			
		3			
40		2.2			
		1.9			
45			10.0/10.0		
		1			
		1.2		SP	(47.2 - 48) SAND, SP, medium grained with large cobbles (3 to 6 cm in diameter) at the bottom of interval, dry to moist.
50		1.7			(48 - 54.4) SILTY CLAY, CL, red-brown, with carbonate seam between 49.4' to 49.5', and trace carbonate nodules throughout, dry, very very hard with no plasticity.
		1.4			
55			10.0/10.0	CL	(54.4 - 60.8) SANDY CLAY, CL, red-brown, approximately 35% sand and 65% clay, carbonate seam between 58.2' to 58.4', clay content decreases with depth, moist, soft with low to medium plasticity.
		2.1			
		2.1			
60		1.4			(60.8 - 68) CLAYEY SAND, SP, orange-brown, very fine grained, saturated, trace calcareous nodules between 65.8' to 65.9'.
		0.9			
65			10.0/10.0	SP	
		0.8			
		0.8		CL SP	(68 - 68.2) SILTY CLAY, CL, orange-brown, dry, very hard with no plasticity.
70					(68.2 - 70) SAND, SP, brown-orange, medium grained, very homogeneous, moist.

PBW

Pastor, Behling & Wheeler, LLC
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Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Top 10 feet drilled out (DO) with a hydrovac to clear for utilities, approximately 8 to 12 inches of concrete.
8-inch sonic isolation casing advanced to 25' then removed during grouting.
6-inch sonic casing advanced to 70', then removed during grouting.

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 55.0) Portland/Bentonite Grout
(55.0 - 58.0) Bentonite Pellets
(58.0 - 70.0) 20/40 Silica Sand

Well Materials
(0 - 60.0) Casing, 2" FJT Sch 40 PVC
(60.0 - 70.0) Screen, 2" FJT Sch 40 PVC,
0.01 slot

TOC Elevation (ft AMSL)
47.84

Union Pacific Railroad

Log of Boring: MW-77A

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	5/7/2014	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	10
Driller:	Tim Beach	Total Depth (ft):	25
Driller's License:	58141	Northing:	727671.8914
Field Supervisor:	Patrick Ferrell	Easting:	3166981.4842
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	49.41

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0					(0 - 10) No Recovery, NR, concrete cored and soils removed to 10' by hydrovac to clear for utilities.
5			0.0/0.0	NR	
10		3.2	10.0/10.0	CL	(10 - 16.4) SILTY CLAY, CL, grey with orange mottling, becomes grey-green at 13.3' with abundant black and some calcareous nodules between 10.5' and 13.3', calcareous nodules are abundant between 10.5' to 10.7' and 11.5' to 12.4', no odor, dry, firm with medium plasticity.
		2.9			
15		2.6			
		13.2		SW	(16.4 - 22.1) SAND, SW, grey with trace black staining and mild odor, grades from a finer grained to a medium grained sand with depth, becomes wet at 18.6'.
20		6.8	5.0/5.0		
		3.7		CL	(22.1 - 25) SILTY CLAY, CL, grewy with orange-brown mottling, no visible staining or odors present, dry, very hard with no plasticity.
25					

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Notes:
Top 10 feet drilled out (DO) with a hydrovac to clear for utilities, approximately 8 to 12 inches of concrete.
6-inch sonic casing advanced to 25', then removed during grouting.

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 9.0) Portland/Bentonite Grout
(9.0 - 11.0) Bentonite Pellets
(11.0 - 23.0) 20/40 Silica Sand
(23.0 - 25.0) Bentonite Pellets

Well Materials
(0 - 13.0) Casing, 4" FJT Sch 40 PVC
(13.0 - 23.0) Screen, 4" FJT Sch 40 PVC,
0.01 slot

TOC Elevation (ft AMSL)
49.05

Union Pacific Railroad

Log of Boring: MW-78A

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	5/6/2014	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	10
Driller:	Tim Beach	Total Depth (ft):	30
Driller's License:	58141	Northing:	727952.5744
Field Supervisor:	Patrick Ferrell	Easting:	3167512.1962
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	48.89

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0					(0 - 8) No Recovery, NR, concrete cored and soils removed to 8' by hydrovac to clear for utilities.
5			2.0/10.0	NR	
10				CL	(8 - 14.8) SILTY CLAY, CL, grey with some orange mottling, creosote mixed with water around the core, no staining in the sample, strong odor, dry, firm with low plasticity.
15			10.0/10.0	SP	(14.8 - 24.9) SAND, SP, grey, medium grained becomes wet at 16.3', with light staining and strong odor beyond 17', saturated with creosote between 22.8' and 23.8', small clayey zone between 23.8' to 24.2'.
20					
25			9.0/10.0	CL	(24.9 - 25.9) SILTY CLAY, CL, grey and red-brown, dry, very hard with no plasticity. (25.9 - 30) SILTY CLAY, CL, grey to brown, creosote staining within fractures and seeping out of pores/matrix, dry, very hard with no plasticity.
30					

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Notes:
Top 10 feet drilled out (DO) with a hydrovac to clear for utilities, approximately 8 to 12 inches of concrete.
6-inch sonic casing advanced to 25', then removed during grouting.

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 10.0) Portland/Bentonite Grout
(10.0 - 13.0) Bentonite Pellets
(13.0 - 25.0) 20/40 Silica Sand
(25.0 - 30.0) Bentonite Pellets

Well Materials
(0 - 15.0) Casing, 4" FJT Sch 40 PVC
(15.0 - 25.0) Screen, 4" FJT Sch 40 PVC,
0.01 slot

TOC Elevation (ft AMSL)
48.677

Union Pacific Railroad

Log of Boring: MW-79A

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	5/7/2014	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	10
Driller:	Tim Beach	Total Depth (ft):	30
Driller's License:	58141	Northing:	728237.1364
Field Supervisor:	Patrick Ferrell	Easting:	3167665.8862
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	49.34

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0					(0 - 9.8) No Recovery, NR, concrete cored and soils removed to 9.8' by hydrovac to clear for utilities.
5			0.0/0.0	NR	
10		501	10.0/10.0	CL	(9.8 - 15.6) SILTY CLAY, CL, grey with orange mottling, dry, hard with no plasticity, calcareous nodules between 10.7' to 11.0' with creosote staining in fracture seams and strong odor.
		803			
15		758			(15.6 - 27.3) SAND, SP, medium grained, grey with creosote staining throughout, heavy staining begins at 19.0' and becomes saturated with creosote at 22.0' to 27.0', very strong odor, wet.
		346			
20		287		SP	
		146			
25		58	10.0/10.0		
		51		CL	(27.3 - 30) SILTY CLAY, CL, red-brown between 27.3' to 27.9', then becomes grey to 28.2' and grey with tan-brown below 28.2', some staining in fractures with a strong creosote odor, dry.
30					

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Notes:
Top 10 feet drilled out (DO) with a hydrovac to clear for utilities, approximately 8 to 12 inches of concrete.
6-inch sonic casing advanced to 27', then removed during grouting.

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 12.0) Portland/Bentonite Grout
(12.0 - 14.0) Bentonite Pellets
(14.0 - 27.0) 20/40 Silica Sand
(27.0-30.0) Bentonite Pellets

Well Materials
(0 - 17.0) Casing, 4" FJT Sch 40 PVC
(17.0 - 27.0) Screen, 4" FJT Sch 40 PVC,
0.01 slot

TOC Elevation (ft AMSL)
48.946

Union Pacific Railroad

Log of Boring: MW-80B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	5/8/2014	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	10
Driller:	Tim Beach	Total Depth (ft):	35
Driller's License:	58141	Northing:	727906.7414
Field Supervisor:	Patrick Ferrell	Easting:	3168200.8792
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	47.24

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0					(0 - 10) No Recovery, NR, concrete cored and soils removed to 10' by hydrovac to clear for utilities.
5			0.0/0.0	NR	
10		8.6	9.0/10.0	CL	(10 - 18.5) SILTY CLAY, CL, grey with trace, small calcareous nodules, trace orange and dark grey mottling between 16.4' to 18.2', dry and firm.
		6.4			
15		5.8			
		3.1		SP	(18.5 - 23.7) SAND, SP, grey, medium grained, with some orange and brown streaks between 18.5' and 19.1', clay content increases near 22.2' with few calcareous nodules, moist to wet, firm to soft.
20		3.2			
		4.1	9.0/10.0	CL	(23.7 - 30.2) SILTY CLAY, CL, grey, becomes red-brown and grey at 24.3' with a wet small sand lense between 25.6' to 25.9', dry and firm.
25		2.9			
		2.3			
30		2.3	5.0/5.0		(30.2 - 35) SILTY CLAY, CL, red-brown with black and grey streaks, carbonate gravel seams between 30.6' to 30.9', 31.1' to 31.3', 31.4' to 31.8', 33.0' to 33.4', and 33.8' to 34.4'.
		2.1			
35					

PBW

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Notes:
Top 10 feet drilled out (DO) with a hydrovac to clear for utilities, approximately 8 to 12 inches of concrete.
8-inch sonic isolation casing advanced to 25' then removed during grouting.
6-inch sonic casing advanced to 34', then removed during grouting.

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 24.0) Portland/Bentonite Grout
(24.0 - 27.0) Bentonite Pellets
(27.0 - 34.0) 20/40 Silica Sand
(34.0 - 35.0) Bentonite Pellets

Well Materials
(0 - 29.0) Casing, 2" FJT Stainless Steel
(29.0 - 34.0) Screen, 2" FJT Stainless Steel, 0.01 slot

TOC Elevation (ft AMSL)
47.107

Union Pacific Railroad

Log of Boring: MW-81B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	5/11/2014	Drilling Method:	Roto Sonic
Drilling Company:	Walker-Hill	Borehole Diameter (in.):	10
Driller:	Tim Beach	Total Depth (ft):	40
Driller's License:	58141	Northing:	727291.7534
Field Supervisor:	Patrick Ferrell	Easting:	3167925.9062
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	47.05

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0					(0 - 10) No Recovery, NR, soils removed to 10' by hydrovac to clear for utilities.
5			0.0/0.0	NR	
10		2	8.5/10.0	CL	(10 - 16.1) SILTY CLAY, CL, grey with some orange mottling which increases with depth, some black streaks, calcareous gravel at 12.2' to 12.4', and 14.6' to 14.9', dry, firm with no plasticity.
		1.8			
15		2.3			(16.1 - 17.5) SANDY CLAY, CL, grey with orange mottling, dry to moist, soft with low to no plasticity.
		2.1		SP	(17.5 - 18.5) SAND, SP, grey, medium grained, with some black and dark grey streaks, no odor, moist.
20				NR	(18.5 - 21) No Recovery, NR, likely sand.
		1.4	9.0/10.0	SP	(21 - 23.2) SAND, SP, grey, medium grained, with some black and dark grey streaks, no odor, moist.
		1.7			(23.2 - 29.8) SILTY CLAY, CL, grey with orange mottling, becomes red-brown at 28.8' with grey calcareous seams at 29.6', dry, very very hard with no plasticity.
25		2.4			
		2.1			
30		1.2	8.5/10.0	CL	(29.8 - 33.6) SANDY SILTY CLAY, CL, grey-brown with some orange mottled zones, carbonate gravel zones at 31.2' and 32.6', moist, soft with low plasticity.
		1.3			(33.6 - 40) SILTY CLAY, CL, grey and red-brown, very tight, carbonate seams at 36.6', 36.9', 37.8' and 39.4', dry, very very hard with no plasticity.
35		1.6			
		1.2			
40					

PBW

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Notes:
Top 10 feet drilled out (DO) with a hydrovac to clear for utilities.
8-inch sonic isolation casing advanced to 25' then removed during grouting.
6-inch sonic casing advanced to 40', then removed during grouting.

Annular Materials
(0.0 - 2.0) Concrete
(2.0 - 24.0) Portland/Bentonite Grout
(24.0 - 27.0) Bentonite Pellets
(27.0 - 34.0) 20/40 Silica Sand
(34.0-40.0) Bentonite Pellets

Well Materials
(0 - 29.0) Casing, 2" FJT Stainless Steel
(29.0 - 34.0) Screen, 2" FJT Stainless Steel, 0.01 slot

TOC Elevation (ft AMSL)
46.766

Union Pacific Railroad

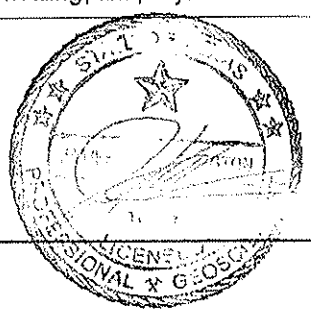
Log of Boring: TW-03

UPRR Houston Wood Preserving Works
Houston, Texas

PBW Project No. 1358

Completion Date:	3/12/07	Drilling Method:	Direct Push
Drilling Company:	Best Drilling, Inc.	Borehole Diameter (in.):	3
Driller:	Alfredo Palicos	Total Depth (ft):	25
Driller's License:	5036	Northing:	3167007.08
Field Supervisor:	John Brayton	Easting:	727733.70
Sampling Method:	2" x 5' Split Spoon	Casing Elevation (ft):	--

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (%)	USCS	Lithologic Description
0		0.5		Fill	(0.0 to 2.0) FILL, asphalt and gravel road base.
		0.6		CH	(2.0 to 6.0) CLAY, dark gray, firm
5					
		3.6		CL	(6.0 to 11.0) Silty/sandy CLAY, gray, firm
10					
		19.6	NA	CL	(11.0 to 15.0) Silty CLAY, tan with gray mottling, firm, black staining throughout, strong odor.
15					
		4.1		CL	(15.0 to 19.0) Silty CLAY, gray with tan mottling, firm, slight odor.
20					
		43.5		SC	(19.0 to 24.0) Clayey SAND, gray, wet, strong odor.
25				CL	(24.0 to 25.0) Silty CLAY, gray with tan mottling, firm, dry.



PBW

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Notes:
1. Temporary monitoring well plugged 3/13/2007

Annular Materials
(0 to 12.0) Bentonite Pellets
(12.0 to 24.0) 20-40 Silica Sand

Well Materials
(0 to 14.0) Casing, 1" Sch 40 FJT PVC
(14.0 to 24.0) Screen 1" Sch 40 FJT PVC
0.010 slot

Union Pacific Railroad

Log of Boring: TW-41B

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/22/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	6
Driller:	William Bludworth	Total Depth (ft):	40.0
Driller's License:	4885	Northing:	728221.84
Field Supervisor:	Chris Moore	Easting:	3166002.28
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	46.9

Depth (ft)	Well Materials	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0		0	5.0/5.0	FILL	(0 - 2.4) CLAYEY SAND, SC, dark grayish brown, with gravel, moist, soft, no odor.
		1.9			
5		0.5			
		0			
		0			
10		0		CL	(2.4 - 16.5) SILTY CLAY, CL very dark gray, with sand, moist, firm, laminated, odor from 2.5-5.0.
		0	10.0/10.0		
		0			
15		0			
		0.2			
		0.4		SP	(16.5 - 22.0) SAND, SP, light gray, wet, soft, laminated, odor.
20		0.2	10.0/10.0		
		0			
		0			
25		0		CL	(22.0 - 29.3) SILTY CLAY, CL, light gray, with sand, moist, hard.
		0			
30		0.3	10.0/10.0		
		1.9		SP	(29.3 - 38.5) SAND, SP, yellowish red, wet, soft, laminated, odor.
		2.9			
35		1			
		0.4	5.0/5.0		
		0.1		CH	(38.5 - 40.0) CLAY, CH, red, moist, hard, with sand size calcareous nodules, slight odor.
40					

STATE OF TEXAS
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

1/6/2011

Notes:
Sonic isolation casing advanced to 25' then removed during grouting.

Initial Fluid Levels (2/04/09)
▼ Depth to water: 8.44 ft BTOC

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Annular Materials
(0.0 - 25.0) Portland/Bentonite Grout
(25.0 - 27.5) Bentonite Chips
(27.5 - 39.5) 16/30 Silica Sand
(39.5 - 40.0) Hole cave-in

Well Materials
(+3 - 29.5) Casing, 4" FJT Stainless Steel
(29.5 - 39.5) Screen, 4" FJT Stainless Steel, 0.01 wire wrap

TOC Elevation (ft AMSL)
49.67

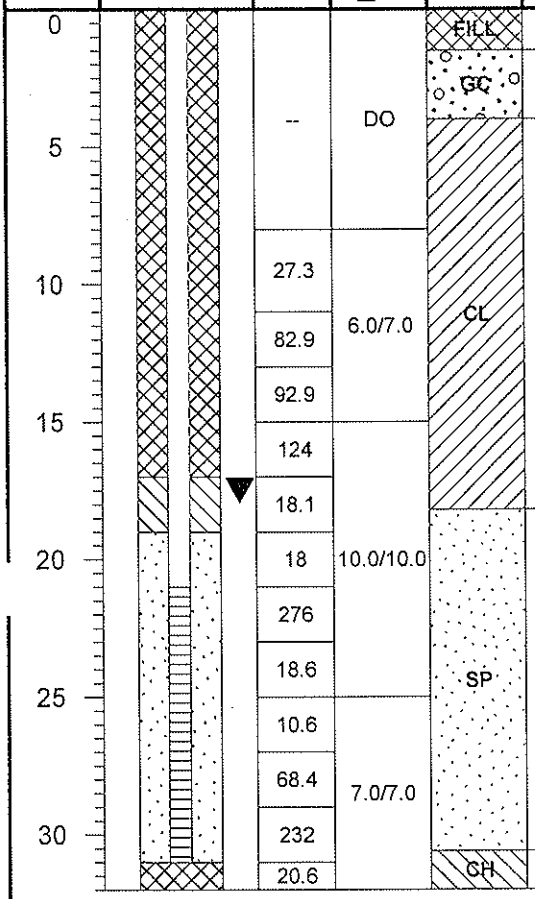
Union Pacific Railroad

Log of Boring: TW-56A

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/23/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	6
Driller:	William Bludworth	Total Depth (ft):	32.0
Driller's License:	4885	Northing:	728757.67
Field Supervisor:	Chris Moore	Easting:	3168069.59
Sampling Method:	4"x10' Barrel	Ground Elev. (ft AMSL):	49.1



Lithologic Description
(0 - 1.5) GRAVEL, fill.
(1.5 - 4.0) CLAYEY GRAVEL, GC, very dark gray, moist, hard, odor.
(4.0 - 18.2) SANDY CLAY, CL, light greenish gray, moist, firm to hard, some orange staining, odor.
(18.2 - 30.6) SAND, SP, light greenish gray, wet, soft, fine sand, odor, some NAPL staining from 27.5-28.7, clay lens from 28.7-29.5, saturated with NAPL from 29.5-30.6
(30.6 - 32.0) CLAY, CH, red, moist, hard, odor.

STATE OF TEXAS
CHRISTOPHER L. MOORE
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NO. 10677
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1/6/2011

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Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.

Initial Fluid Level (2/05/08)
▼ Depth to water: 17.48 ft BTOC

Annular Materials
(0.0 - 17.0) Portland/Bentonite Grout
(17.0 - 19.0) Bentonite Chips
(19.0 - 31.0) 16/30 Silica Sand
(31.0 - 32.0) Hole cave-in

Well Materials
(+3 - 21.0) Casing, 4" FJT Stainless Steel
(31.0 - 31.0) Screen, 4" FJT Stainless Steel, 0.01 wire wrap

TOC Elevation (ft AMSL)
51.89

Union Pacific Railroad

Log of Boring: GB-1

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/14/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	9/8/6
Driller:	William Bludworth	Total Depth (ft):	135.0
Driller's License:	4885	Northing:	729145.94
Field Supervisor:	Chris Moore	Easting:	3169447.46
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	46.1

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			FILL	(0 - 1.0) CLAYEY GRAVEL, GC, very dark gray, fill, trace wood fragments, no odor.
				(1.0 - 13.7) SILTY CLAY, CL, light brownish gray, with sand, moist, firm, no odor.
5	--	DO		
	0		CL	
10	0	8.0/8.0		
	0			
	0			
15	0			(13.7 - 25.0) SILTY SAND, SM, light brownish gray, wet, soft, laminated, no odor.
	0			
	0		SM	
20	0			
	0			
	0			
25	0	8.0/20.0		(25.0 - 33.5) SILTY CLAY, CL, light brownish gray, moist, firm, no odor.
	0			
	0		CL	
30	0			
	0			
	15.7		SP	(33.5 - 36.0) SAND, SP, reddish brown, wet, soft, odor.
35	1.6			(36.0 - 44.0) CLAY, CH, brown, moist, hard, some sand size calcareous nodules, no odor.
	0			
	0	9.0/10.0		
40	0			
	0			
	0			(44.0 - 54.5) CLAY, CH, red, moist, hard, some silt lenses, no odor.
45	0		CH	
	0			
	0			
50	0	8.5/10.0		

STATE OF TEXAS
1/6/2011
CHRISTOPHER L. MOORE
GEOLOGY
NO. 10677
LICENSED
PROFESSIONAL GEOSCIENTIST

Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.

PBW
Pastor, Behling & Wheeler, LLC
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Tel (512) 671-3434 Fax (512) 671-3446

Union Pacific Railroad

Log of Boring: GB-1

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/14/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	9/8/6
Driller:	William Bludworth	Total Depth (ft):	135.0
Driller's License:	4885	Northing:	729145.94
Field Supervisor:	Chris Moore	Easting:	3169447.46
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	46.1

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
	0			
	0			
55	0		SM	(53.5 - 63.3) SILTY SAND, SM, red, wet, soft, no odor, very fine to fine sand.
	0			
	0			
60	0	10.0/10.0		
	0			
	0		CL	(63.3 - 66.7) SILTY CLAY, CL, red, moist, soft to firm, laminated, no odor.
65	0			
	0		SP	(66.7 - 68.5) SAND, SP, red, wet, soft, medium to fine sand, no odor.
	0		CL	(68.5 - 69.7) SILTY CLAY, CL, red, moist, soft to firm, laminated, no odor.
70	0	10.0/10.0	SP	(69.7 - 71.0) SAND, SP, red, wet, soft, medium to fine sand, no odor.
	0			(71.0 - 88.3) CLAY, CH, red, moist, hard, some silt lenses, no odor, color grades to brown at 76.0 and light gray at 82.0.
	0			
75	0			
	0			
	0		CH	
80	0	10.0/10.0		
	0			
	0			
85	0			
	0			
	0		CL	(88.3 - 93.8) SILTY CLAY, CL, yellowish red, moist, soft to firm, trace sand size calcareous nodules no odor.
90	0	9.5/10.0		
	0			
	0			
95	0		SM	(93.8 - 100.8) SILTY SAND, SM, yellowish red, wet, soft, fine to very fine sand, no odor.
	0			
	0			
100	0	8.5/10.0		

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Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.

Union Pacific Railroad

Log of Boring: GB-1

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	1/14/09	Drilling Method:	Roto Sonic
Drilling Company:	WDC Exploration	Borehole Diameter (in.):	9/8/6
Driller:	William Bludworth	Total Depth (ft):	135.0
Driller's License:	4885	Northing:	729145.94
Field Supervisor:	Chris Moore	Easting:	3169447.46
Sampling Method:	4"/6"x10' Barrel	Ground Elev. (ft AMSL):	46.1

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
105	0		CH	(100.8 - 106.6) CLAY, CH, reddish brown, moist, firm, no odor.
	0			
	0			
	0		SM	(106.6 - 108.7) SILTY SAND, SM, yellowish red, wet, soft, fine to very fine sand, no odor.
110	0	10.0/10.0	CH	(108.7 - 112.4) CLAY, CH, reddish brown, moist, firm, no odor.
	0			
	0		SP	(112.4 - 115.0) SAND, SP, grayish brown, wet, soft, fine to very fine sand, no odor.
115	0		ML	(115.0 - 118.1) SILT, ML, dark gray, with sand, moist to wet, soft, no odor.
	0		SP	(118.1 - 119.3) SAND, SP, grayish brown, wet, soft, fine to very fine sand, no odor.
120	0	10.0/10.0	CL	(119.3 - 129.0) SILTY CLAY, CL, greenish gray, moist, hard, laminated, trace thin sand lenses, no odor.
	0			
	0			
125				
130		10.0/10.0	SM/SC	(129.0 - 130.6) SILTY/CLAYEY SAND, SM/SC, greenish gray, wet, soft, medium to fine sand, some calcareous nodules, no odor.
			CL	(130.6 - 132.9) SILTY CLAY, CL, greenish gray, moist, hard, laminated, trace thin sand lenses, no odor.
135				(132.9 - 135.0) SANDY CLAY, CL, greenish gray mottled reddish brown, moist, soft, no odor.

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Notes:
Top 8 feet drilled out (DO) with a hydrovac to clear for utilities.

Client: SP ENVIRONMENTAL SYSTEMS, INC.

Date: MARCH 26, 1991

Location: N 727859.71; E 3166207.41

Ground Elev. 45.90

Boring Type: WASH/SHELBY TUBE SAMPLER/SPLIT SPOON

LOG OF BORING

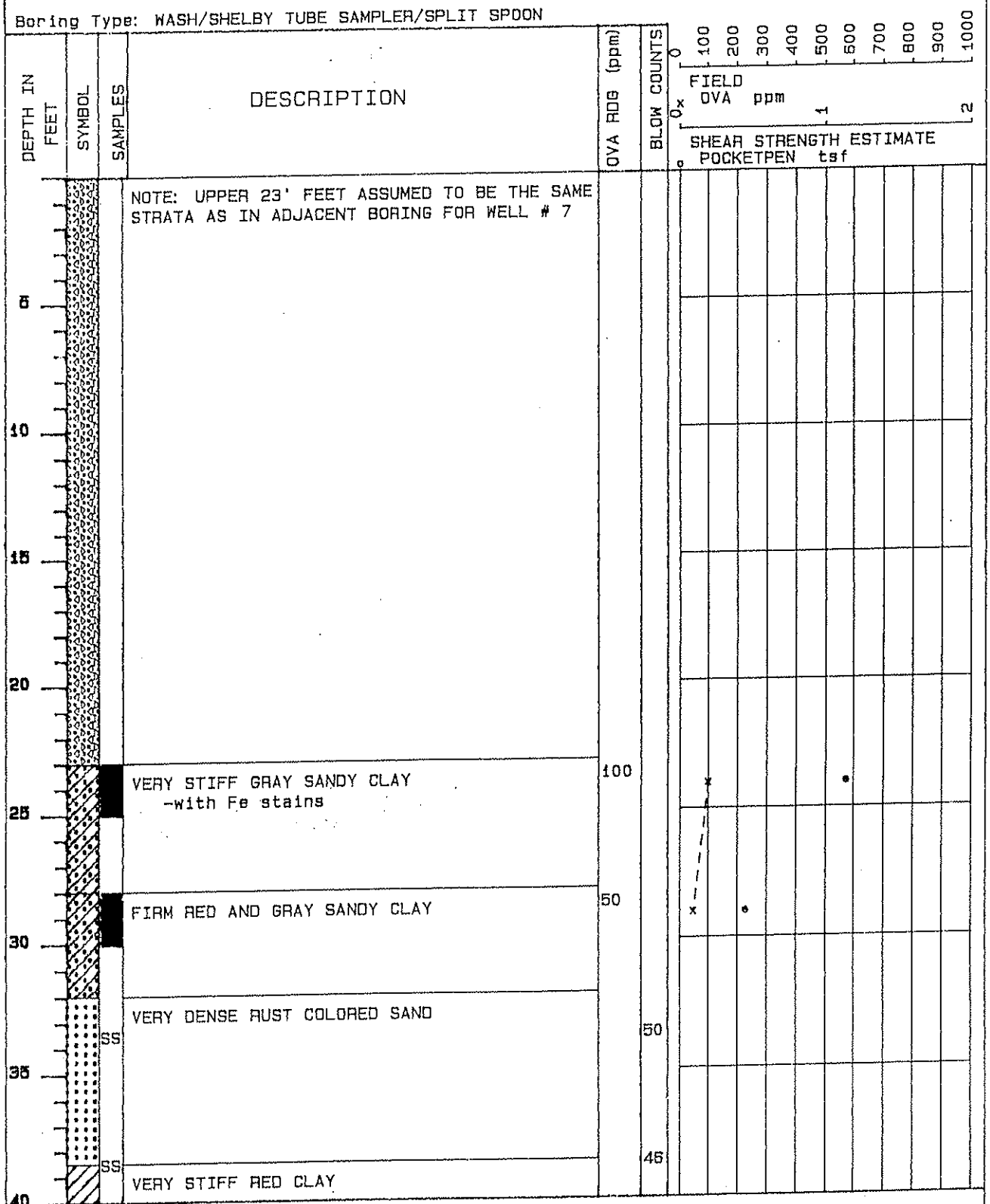
No. P10

GEO ASSOCIATES

Job No. 241

Water Level Depth=

Caving Depth=



Total Depth= 50.0

Logged By: D. BRAGG

Drilled By: GULF COAST CORING

Client: SP ENVIRONMENTAL SYSTEMS, INC.

Date: MARCH 26, 1991

Location: N 727859.71; E 3166207.41

Ground Elev. 45.90

Boring Type: WASH/SHELBY TUBE SAMPLER/SPLIT SPOON

LOG OF BORING

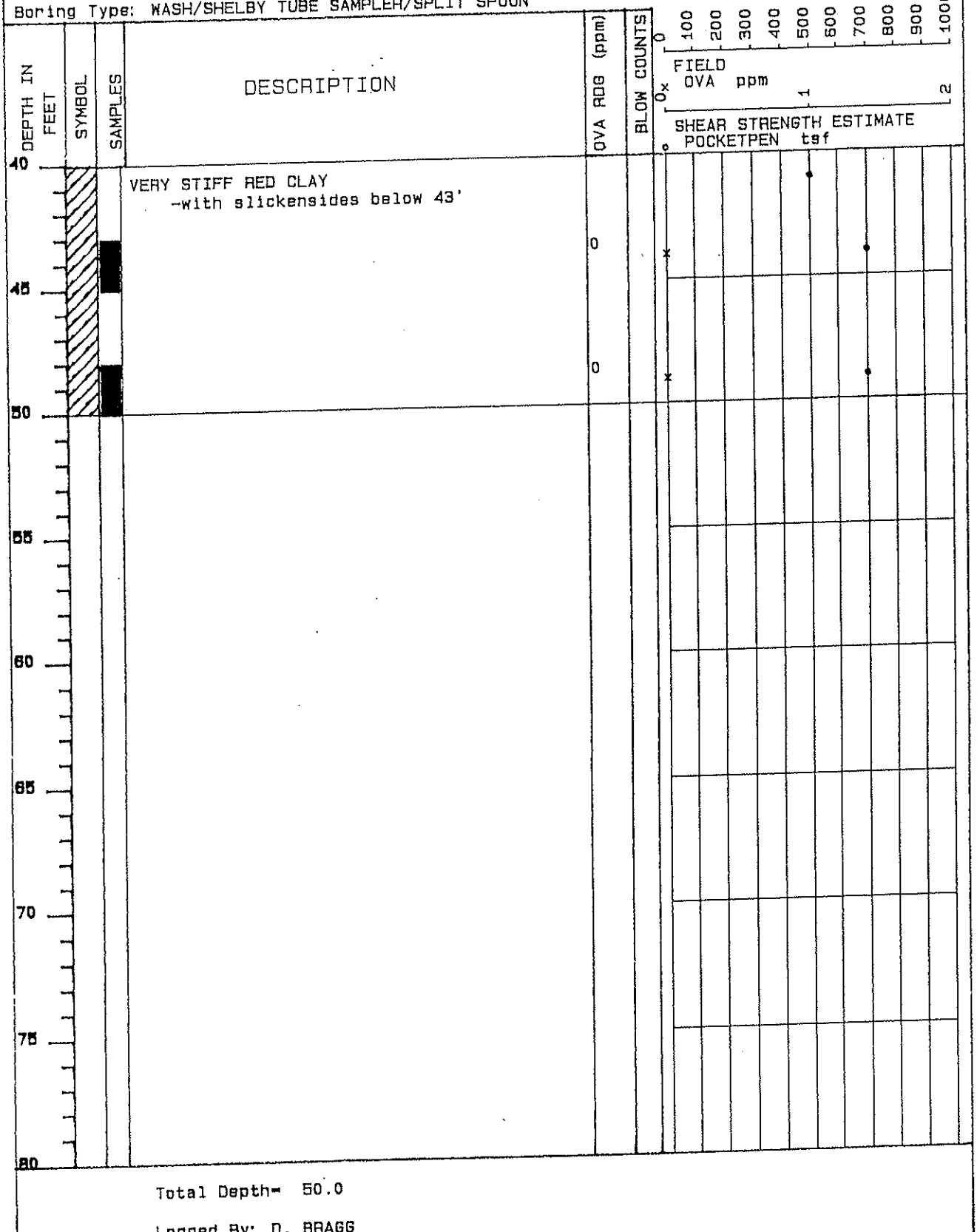
No. P10

GEO ASSOCIATES

Job No. 241

Water Level Depth=

Caving Depth=



Total Depth= 50.0

Logged By: D. BRAGG

Drilled By: GULF COAST CORING

Client: SP ENVIRONMENTAL SYSTEMS, INC.

Date: MARCH 25, 1991

Location: N 728129.26; E 3166365.03

Ground Elev. 47.20

Boring Type: WASH/SHELBY TUBE SAMPLER/SPLIT SPOON

LOG OF BORING

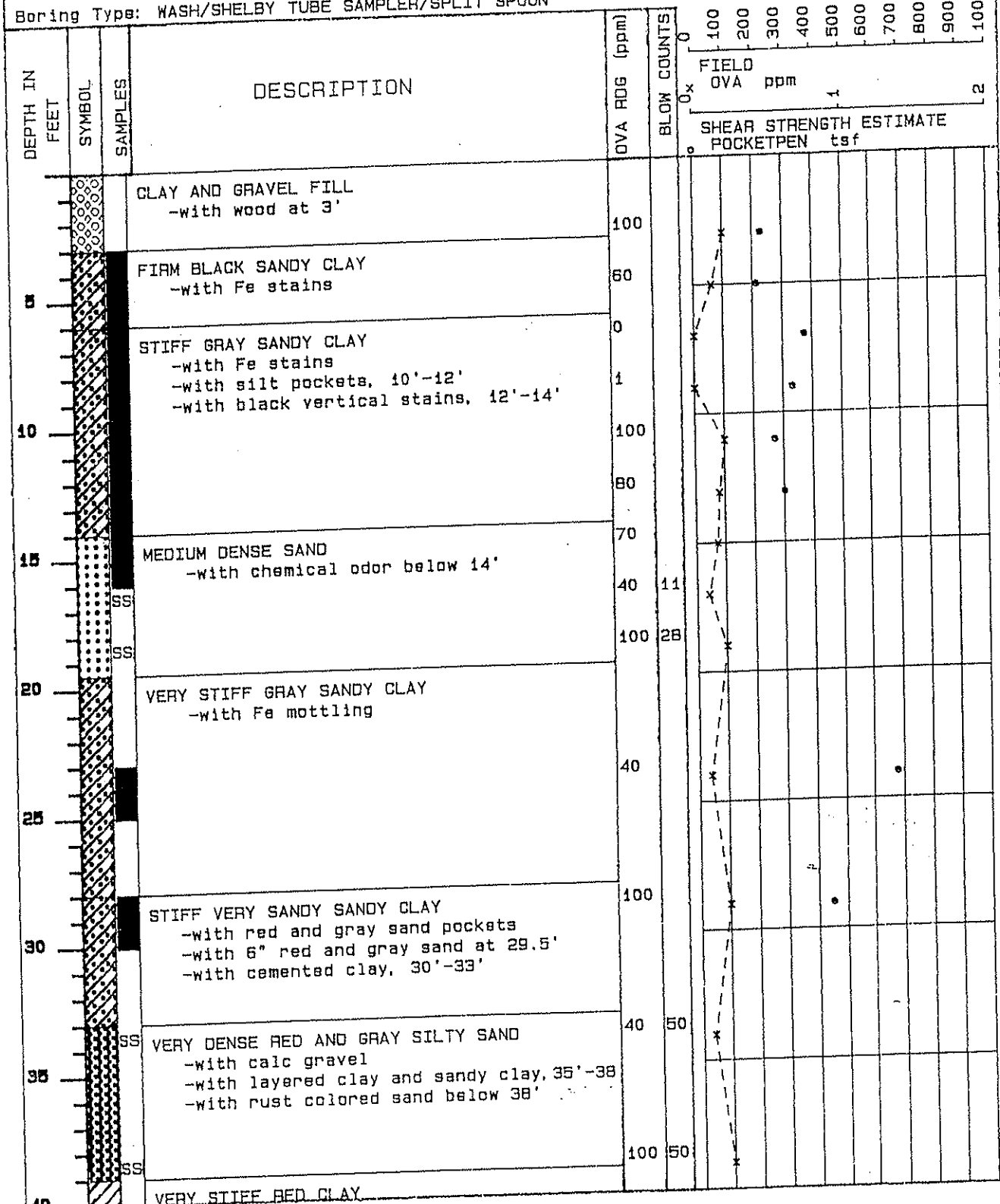
No. P11

GEO ASSOCIATES

Job No. 241

Water Level Depth=

Caving Depth=



Total Depth= 50.0

Logged By: D. BRAGG

Drilled By: GULF COAST CORING

Client: SP ENVIRONMENTAL SYSTEMS, INC.

Date: MARCH 25, 1991

Location: N 728129.26; E 3166365.03

Ground Elev. 47.20

Boring Type: WASH/SHELBY TUBE SAMPLER/SPLIT SPOON

LOG OF BORING

No. P11

GEO ASSOCIATES

Job No. 241

Water Level Depth=

Caving Depth=

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	OVA RDG (ppm)	BLOW COUNTS
40			VERY STIFF RED CLAY -with slickensides -with calc nodules, 43'-45'	0	
45				0	
50					
55					
60					
65					
70					
75					
80					

FIELD OVA ppm

0 100 200 300 400 500 600 700 800 900 1000

0 1 2

SHEAR STRENGTH ESTIMATE POCKETPEN tsf

Total Depth= 50.0

Logged By: D. BRAGG

Drilled By: GULF COAST CORING

Client: SP ENVIRONMENTAL SYSTEMS, INC.

Date: MARCH 27, 1991

Location: N 727988.51; E 3166470.48

Ground Elev. 47.10

Boring Type: WASH/SHELBY TUBE SAMPLER/SPLIT SPOON

LOG OF BORING

No. P12

GEO ASSOCIATES

Job No. 241

Water Level Depth=

Caving Depth=

DEPTH IN FEET	SYMBOL	SAMPLES	DESCRIPTION	OVA RDG (ppm)	BLOW COUNTS
			NOTE: UPPER 23' ASSUMED TO BE THE SAME STRATA AS IN ADJACENT BORING FOR WELL #9		
25			VERY STIFF GRAY AND RED SANDY CLAY -stiff below 28' -w/ red and gray silt pockets below 28'	40 90	
30		SS	DENSE RED AND GRAY SILT -with calc nodules -with cemented clay		82
35		SS	MEDIUM DENSE RED SAND -with layered red silt	25	31
40					

FIELD OVA ppm: 0, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000; 1; 2

SHEAR STRENGTH ESTIMATE POCKETPEN tsf

Total Depth= 50.0

Logged By: D. BRAGG

Drilled By: GULF COAST CORING

Client: SP ENVIRONMENTAL SYSTEMS, INC.

GEO ASSOCIATES

Date: MARCH 27, 1991

LOG OF BORING

Job No. 241

Location: N 727988.51; E 3166470.48

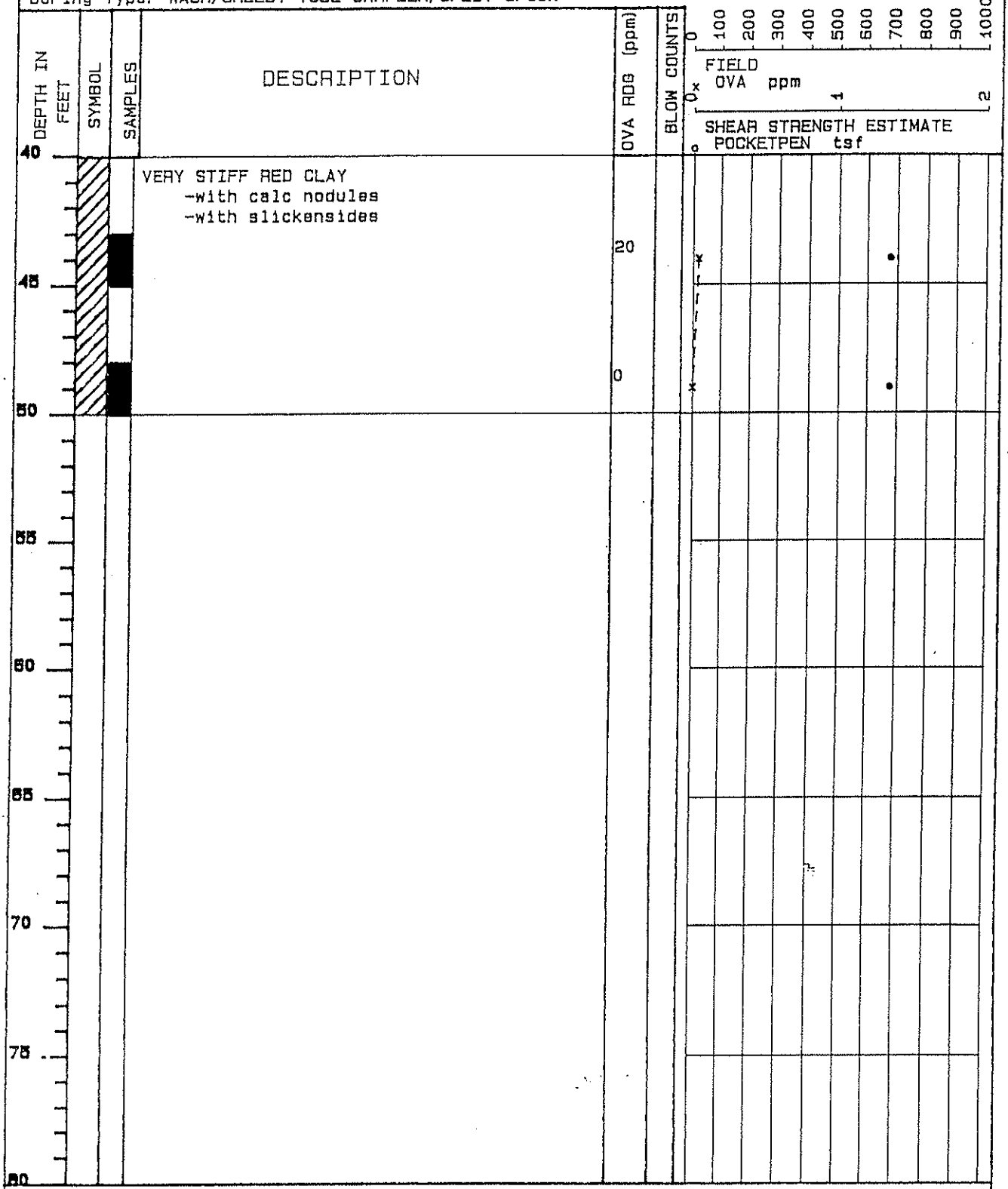
No. P12

Water Level Depth=

Ground Elev. 47.10

Caving Depth=

Boring Type: WASH/SHELBY TUBE SAMPLER/SPLIT SPOON



Total Depth= 50.0

Logged By: D. BRAGG

Drilled By: GULF COAST CORING

Union Pacific Railroad

Log of Boring: CPT-01-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/11/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	727093
Field Supervisor:	Carolyn Sexton	Easting:	3165988
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0–2	0.5	4.3/5	FILL	FILL, gravel and silt, unconsolidated.
2–4	0.5			SILTY CLAY, CL, dark gray brown, slightly moist, slightly firm.
4–6	0.9		CL	SILTY CLAY, CL, with SAND, gray, dark gray/orange mottling, carbonate gravels 7.1 to 16.2', increasing sand with depth, slightly moist, firm.
6–8	1.8	5/5		
8–10	2.5			
10–12	0.9	3.7/5		
12–14	1.2			
14–16	1.5	3.8/5		CLAY, CL, gray, some oxididation staining, moist, slightly firm. (No recovery from 18.8 to 20'.)
16–18				
18–20				

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Notes:
Samples collected at 2-5', 10-12.5', and 17.5-20'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-02-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/11/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	727176
Field Supervisor:	Carolyn Sexton	Easting:	3166585
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				
1	1.3		FILL	FILL, gravel and silt, unconsolidated.
2				
3		5.1/5		SILTY CLAY, CL, dark gray brown, slightly moist, firm.
4	1.4			
5				SILTY CLAY, CL, with SAND,light gray, wet, soft.
6	1.4			
7		4.8/5		
8				
9	1.6		CL	
10				
11	3.5			
12		5/5		
13				CLAY, CL, gray, red mottling, silt filled root casts.
14	11.3			
15				
16	2.8		SP	SAND, SP, gray, wet, soft.
17				SILTY CLAY, CL, light tan, some orange mottling, slightly moist, firm. (No recovery from 19.3 to 20'.)
18		4.3/5	CL	
19	2.9			
20				

PBW
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Notes:
Samples collected at 2-5' and 12.5-15'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-03-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/11/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	727268
Field Supervisor:	Carolyn Sexton	Easting:	3167047
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			FILL	(0 - 3.2) FILL, dark gray brown, gravel, silt, clay, dry, unconsolidated.
1	2.9			
2		5.1/5		
3	6.3		ML	(3.2 - 5.9) CLAYEY SILT, SM, dark gray brown, slightly moist, firm, low plasticity.
4				
5				
6	3.9		CL	(5.9 - 6.9) SANDY CLAY, CL,reddish tan, fine grained, moist, soft.
7		4.8/5		(6.9 - 13.5) SANDY/SILTY CLAY, CL, light gray, abundant carbonate nodules, orange modeling, slightly moist, firm.
8	3.1			
9				
10				
11	2.5			
12		4.7/5		
13				
14	5.2		SC	(13.5 - 20.0) CLAYEY SAND, SC, gray, fine grained, wet, soft.
15				
16	5.3			
17		5/5		
18				
19	6.2			
20				

PBW
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Notes:
Samples collected at 2-5' and 12.5-13.5'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-04-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/11/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	727554
Field Supervisor:	Carolyn Sexton	Easting:	3167957
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			CON	(0 - 2) CONCRETE.
1	-			
2		2.8/5	FILL	(2 - 2.5) FILL, gravel base material, unconsolidated.
3	2.6		CL	(2.5 - 5.3) SILTY CLAY, CL, dark green gray, moist, slightly firm, low plasticity, mottled dark gray brown and orange.
4				
5				
6	1.5	3/5		(5.3 - 10.3) SILTY CLAY, CL, with GRAVEL, dark gray brown, moist, soft, low plasticity, mottled green gray.
7				
8				
9	-			
10				
11	1.8			(10.3 - 12.2) SILTY CLAY, CL with SAND, light gray, mloist, slightly moist, firm, low plasticity, orange mottling.
12		3.4/5		(12.2 - 15.3) SANDY CLAY, CL, light green gray, very fine grained, moist, slightly firm, medium plasticity clay.
13	1.4			
14				
15			SC	(15.3 - 20.0) CLAYEY SAND, SC, light gray to green, fine grained, moderately sorted, unconsolidated, wet, soft. (No recovery from 18.6 to 20'.)
16	1.6			
17		3.6/5		
18	1.8			
19				
20				

PBW
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Notes:
Samples collected at 2-5' and 10-12.5'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-05-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/11/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	727674
Field Supervisor:	Carolyn Sexton	Easting:	3168198
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				(0 - 4.0) CONCRETE.
1				
2	-	1/5	CON	
3				
4	1.4			(4.0 - 5.0) SILTY CLAY, CL, dark gray, slightly moist, firm.
5				(5.0 - 10.4) SILTY CLAY, CL, light gray, abundant carbonate clasts, slightly moist, firm.
6	2.1			
7		5/5		
8			CL	
9	2.7			
10				
11				(10.4 - 12.2) SILTY/SANDY CLAY, CL, gray, very fine grained, orange mottling, moist, slightly firm.
12	1.2			
13		3.2/5	SP	(12.2 - 15.0) SILTY SAND, SP, with CLAY, tan, fine grained, orange staining, moist, firm. (No recovery from 13.2 to 15'.)
14				
15				

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Notes:
Samples collected at 4-5' and 7.5-10'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-06-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/12/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	728014
Field Supervisor:	Carolyn Sexton	Easting:	3168174
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0–3	-	1.5/5	CON	CONCRETE.
3–5	6.6		FILL	FILL, gray to dark brown, gravel, silt, clay, glass.
5–10	0 0	4.8/5	CL	SILTY CLAY, CL, dark brown to light gray, abundant carbonate clasts, gray green and orange mottling, slightly moist, firm to hard, becomes sandy with depth.
10–15	0 0 0	4.6/5	SC	CLAYEY SAND, SC, with SILT, green tan, very fine grained, moist, firm.
15–19	0 0	4/5	CL	SAND, SP, green gray, fine grained, wet, unconsolidated. (No recovery from 19 to 20'.) SP

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Notes:
Samples collected at 3-5', and 13-15'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-07-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/12/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	728043
Field Supervisor:	Carolyn Sexton	Easting:	3168045
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			CON.	(0 - 2.4) CONCRETE.
1	-			
2		2.6/5	FILL	(2.4 - 3.2) FILL, black, gravel base, silt, glass fragements, unconsolidated.
3			SM	(3.2 - 5) SANDY SILT, SM, with CLAY, dark gray, very fine grained, moist, firm, low plasticity.
4	33.8			
5			CL	(5 - 12.2) SANDY CLAY, CL, light gray, fine grained, abundant carbonate gravels and clasts, slighty moist, firm, increasing sand and orange mottling with depth.
6	11.6			
7		4.7/5		
8				
9	18.6			
10				
11	12.9			
12				
13		3/5		(12.2 - 15.3) SILTY/SANDY CLAY, gray, some pink and green staining, fine grained, moist, slightly firm, low plasticity, no mottling, slight odor.
14	17.4			
15				
16			SP	(15.3 - 20.0) SAND, SP, light greenish gray, fine to medium grained, subrounded, moderately sorted, wet, unconsolidated, slight odor. (No recovery from 18.6 to 20'.)
17	15.3	3.6/5		
18				
19				
20				

PBW
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Notes:
Samples collected at 2-5', and 7.5-10'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-08-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/12/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	727834
Field Supervisor:	Carolyn Sexton	Easting:	3167778
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0–2	-	2.7/5	CON	CONCRETE.
2–4	143		FILL	FILL, black, pebbles, sand, silt, wood.
4–5			SP	SAND, SP, brown, fine to medium grained, wet, unconsolidated.
5–10	98	5/5	CL	SILTY CLAY, CL, with SAND, dark gray brown to light green gray, tan sand, orange mottling, increasing sand with depth, moist, firm.
10–14	13.2	4.9/5		
14–15	62		SC	SANDY, SILTY CLAY, SC, green gray, orange mottling.
15–18	0	3.5/5	SP	SAND, SP, green gray, fine to medium grained, wet, unconsolidated. (No recovery from 18.5 to 20'.)
18–20	114			

PBW
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Notes:
Samples collected at 2.3-5', 5-7.5', and 15-16'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-09-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/12/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	727640
Field Supervisor:	Carolyn Sexton	Easting:	3167397
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			CON.	(0 - 0.6) CONCRETE.
1	101	4.4/5	FILL	(0.6 - 5.3) FILL, whitish gray, dark gray brown, and black, gravel, silt, clay, glass and trash.
2				
3				
4	88			
5				
6	6	4.8/5	CL	(5.3 - 13.3) SANDY/SILTY CLAY, CL, dark gray, carbonate clasts, increasing orange mottling and sand with depth, lighter gray with depth, moist, firm.
7				
8				
9	23			
10				
11	38	4.2/5		
12				
13				
14	25		SC	(13.3 - 15.7) CLAYEY SAND, SC, green gray, fine grained, mottled orange, moist, firm.
15				
16		3.3/5	SP	(15.7 - 20.0) SILTY SAND, SP, light brown, wet, very soft no odor. (No recovery from 18.3 to 20'.)
17	23			
18				
19				
20				

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Notes:
Samples collected at 2-5', 5-7.5', and 15-15.7'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-10-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/15/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	728116
Field Supervisor:	Carolyn Sexton	Easting:	3167847
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			CON	(0 - 2) CONCRETE.
1	-			
2		3/5	FILL	(2 - 3.3) FILL, black, gravel, sand, glass.
3	133		SP	(3.3 - 4.1) SAND, SP, tan, coarse grained, moderately sorted, slightly moist, hydrocarbon staining and odor.
4			SM	(4.1 - 5.7) CLAYEY SILT, SM, with SAND, dark gray brown, moist, soft.
5				
6	1474		CL	(5.7 - 12.4) SILTY CLAY, CL, green gray, orange red and black mottling, abundant carbonate clasts, hydrocarbon odor and staining throughout.
7		4.7/5		
8				
9	1468			
10				
11	1449			
12				
13	824	4.6/5		(12.4 - 14.4) SANDY CLAY, CL, green gray, medium to fine grained, some orange mottling, hydrocarbon staining, moist slightly soft to firm.
14			SP	(14.4 - 15.0) SAND, SP, green gray, fine to medium grained, moist, soft. (No recovery from 14.6 to 15'.)
15				

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Notes:
Samples collected at 2-5' and 5-7.5'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-11-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/12/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	727835
Field Supervisor:	Carolyn Sexton	Easting:	3167467
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			CON	CONCRETE
1	166			
2		3.6/5	FILL	FILL, black, gravel, white sand, sheen at base.
3				
4	68			SANDY CLAY, CL, dark brown black, fine grained, slightly moist, firm.
5				
6	13.6			SANDY CLAY, CL, with SILT, green gray, abundant carbonate clasts, orange mottling, slightly moist, firm.
7		5/5		
8				
9	5.1		CL	
10				
11	14.4			
12		2.8/5		
13				
14	-			
15			SP	SAND, SP, green gray, fine to medium grained, wet, slightly soft. (No recovery from 18.6 to 20'.)
16				
17	1.6	3.6/5		
18				
19				
20				

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Notes:
Samples collected at 1.4-2.5' and 10-12.5'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-12-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/13/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	727698
Field Supervisor:	Carolyn Sexton	Easting:	3167220
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			CON	(0 - 1.4) CONCRETE.
1	0			
2		3.6/5	FILL	(1.4 - 3.9) FILL, white sand and gravel, black gravel and silt, glass, wet 3.2-3.9, unconsolidated.
3				
4	2		SM	(3.9 - 5) SANDY SILT, SM, with CLAY, hydrocarbon staining and odor to 4.2, moist, soft.
5				(5 - 15.9) SILTY CLAY, CL, with SAND, dark gray brown to gray tan, caronate nodule at 4.3, orange mottling, some fine sant at base, moist, firm to hard.
6	0			
7		4.7/5		
8				
9	0			
10			CL	
11	-			
12		0/5		
13				
14	-			
15				
16	0		SP	(15.9 - 17) SILTY SAND, SP, green gray, some mottling, moist, slightly firm.
17		2.6/5		(17 - 20.0) SAND, green gray, no mottling, moist, soft. (No recovery from 17.6 to 20'.)
18				
19				
20				

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Notes:
Samples collected at 2-5', 5-7.5', and 15-15.9'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-13-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/13/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	727591
Field Supervisor:	Carolyn Sexton	Easting:	3167015
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			CON	CONCRETE.
1	MAX			
2		2.4/5	FILL	FILL, black, gravel, sand, silt, glass, moist, no odor.
3	1023			
4			ML	CLAYEY, SANDY SILT, ML, dark gray brown, slightly moist, slightly firm to hard.
5				SANDY CLAY, CL, green gray, carbonate clasts, orange mottling with depth, slightly moist, firm.
6	68			
7		5.1/5		
8				
9	0			
10			CL	
11	12.4			
12		4.1/5		
13				
14	0			
15				
16	10.8			
17				
18	9.5	3.3/5	SP	SAND, SP, green gray, wet, soft. (No recovery from 18.3 to 20'.)
19				
20				

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Notes:
Samples collected at 1.5-2.5', 5-7.5', and 15-17.2'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-14-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/14/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	728000
Field Supervisor:	Carolyn Sexton	Easting:	3167439
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			CON.	(0 - 1.4) CONCRETE.
1	390			
2		3.6/5	FILL	(1.4 - 5.3) FILL, white gravel and silt to 1.6, black gravel; silt and glass, tarry, strong hydrocarbon odor to 3', wet; whitish gray silt and caly to 4.8, slightly moist, firm; wood debris and strong odor to 5.3, wet, soft.
3				
4	407			
5				
6	423		SC	(5.3 - 10.8) CLAYEY SAND, SC, with SILT, dark gray, some mottling, slightly moist, firm.
7		5.2/5		
8				
9	210			
10				
11	336		CL	(10.8 - 16.4) SILTY, SANDY CLAY, CL, light gray, increasing sand with depth, mottled orange, red mottling at base.
12		4.5/5		
13				
14	763			
15				
16	601			
17	3905		SP	(16.4 - 20.0) SAND, SP, green gray, strong hydrocarbon staining/mottling of brown and tan stains, wet. (No recovery from 17.5 to 20'.)
18		2.5/5		
19				
20				

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Notes:
Samples collected at 1.4-2.5', 12.5-15', and 15-16.4'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-15-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/14/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	727886
Field Supervisor:	Carolyn Sexton	Easting:	3167290
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0–1	-		CON	CONCRETE.
2–3	2009	3/5	FILL	FILL, black, gravel, silt, glass, sheen at base, wet, unconsolidated.
4				SILT, whitish gray, wet, slightly firm.
5			SM	SANDY, CLAYEY SILT, SM, black brown, hydrocarbon staining, very moist, soft to slightly firm.
6–7	MAX			SILTY, SANDY CLAY, CL, dark gray to light gray, medium to fine grained sand, carbonate clasts, red and orange mottling, slightly moist, firm.
8–9	1345	5/5		
10–11	92.8		CL	
12–13	333	3.4/5		
14–15	88		SC	CLAYEY SAND, SC, with SILT, green gray, fine grianed, some tan mottling, moist, slightly firm.
16–17	58	3.2/5	SP	SAND, SP, gray, fine to medium grained, hydrocarbon staining and strong odor, wet, soft. (No recovery from 18.2 to 20'.)
18–20				

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Notes:
Samples collected at 2-5', 5-7.5', and 15-16.2'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-16-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/13/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	727721
Field Supervisor:	Carolyn Sexton	Easting:	3166906
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				
1	-		CON	(0 - 1.9) CONCRETE.
2		2.1/5		
3	5.8		FILL	(1.9 - 5) FILL, gravel, sand, silt, glass, brick, unconsolidated.
4				
5			SM	(5 - 5.6) SANDY SILT, SM, with CLAY, dark gray brown, fine grained, very moist, soft.
6	2.6			(5.6 - 15.7) SANDY/SILTY CLAY, CL, dark brown gray to light gray, fine grained, carbonate clasts, mottling and sand increasing with depth and lighter gray, slightly moist, firm, low plasticity.
7		5/5		
8				
9	4.8			
10				
11	38.2		CL	
12		4.8/5		
13				
14	21			
15				
16	84			(15.7 - 17.8) SANDY CLAY, CL, green gray, some orange staining, increasing sand with depth
17		3/5		
18	19.4			(17.8 - 20.0) SAND, green gray, wet, unconslidated. (No recovery from 18 to 20'.)
19			SP	
20				

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Notes:
Samples collected at 1.9-5', 10-12.5', and 15-17.5'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-17-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/15/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	728210
Field Supervisor:	Carolyn Sexton	Easting:	3167657
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			PAV	(0 - 2.3) ASPHALT.
1	-			
2				
3		2.7/5	FILL	(2.3 - 4.9) FILL, black, gravel, sand, silt, glass, hydrocarbon odor and staining throughout, moist, unconsolidated.
4	MAX			
5				(4.9 - 5.6) WOOD, hydrocarbon odor and staining, wet, soft.
6	MAX		SM	(5.6 - 7.6) CLAYEY SILT, dark gray brown, moist to wet, soft.
7		3.7/5		
8			CL	(7.6 - 14.2) SILTY CLAY, CL, with SAND, green gray, orange mottling, hydrocarbon odor and staining throughout, slightly moist, firm.
9	MAX			
10				
11	MAX			
12		5/5		
13				
14	MAX			
15	38.6		SC	(14.2 - 15.8) CLAYEY SAND, SC, green gray, light orange mottling, hydrocarbon odor and staining, slightly moist, firm.
16			SP	(15.8 - 20.0) SAND, SP, green gray, fine to medium grained, very strong hydrocarbon odor and abundant staining, wet, soft. (No recovery from 19 to 20'.)
17				
18	489	4.5/5		
19				
20				

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Notes:
Samples collected at 2.3-5' and 13-15'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-18-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/14/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	728275
Field Supervisor:	Carolyn Sexton	Easting:	3168143
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0–1	-	3.3/5	CON	CONCRETE.
2–3	158		FILL	FILL, gravel, sand, silt, glass, unconsolidated.
4–5			SM	SANDY/SILT, SM, with CLAY, black brown, very fine grained, moist, soft, some odor.
6–7	0	4.7/5	CL	SILTY CLAY, CL, with SAND, green gray, very fine grained, abundant carbonate clasts, to 8.4', mottled gray and orange, slightly moist, firm.
8–9	11			
10–11	0	4.6/5		
12–13	8.7			SANDY CLAY, CL, gray tan, fine to medium grained, moist, soft, medium plasticity.
14–15				
16–17	0	3.6/5	SP	SAND, SP, green gray, fine grained, moderately sorted, wet, soft. (No recovery from 18.6 to 20'.)
18–19				
20				

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Notes:
Samples collected at 1.7-5' and 12.5-14.3'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-19-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/14/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	728442
Field Supervisor:	Carolyn Sexton	Easting:	3168004
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			CON.	(0 - 1.9) CONCRETE.
1	-			
2		3.1/5	FILL	(1.9 - 4.1) FILL, black, gravel, sand, silt, glass, moist to wet, unconsolidated, hydrocarbon odor and appearance below 3.4'.
3	138			
4			SM	(4.1 - 5.9) CLAYEY SILT, SM, with SAND, dakr gray, moist, hard.
5				
6	0		CL	(5.9 - 15.6) SILTY, SANDY CLAY, CL, gray, orange and dark gray mottling, increasing sand with depth, moist, slightly firm.
7		5/5		
8				
9	43			
10				
11	9.3			
12		4.8/5		
13				
14	37			
15				
16			SP	(15.6 - 20.0) SAND, green gray, fine to medium grained, wet, soft. (No recovery from 18.6 to 20'.)
17	30.2	3.6/5		
18				
19				
20				

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Notes:
Samples collected at 1.9-5' and 7.5-10'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-20-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/14/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	727301
Field Supervisor:	Carolyn Sexton	Easting:	3167511
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				
1	MAX			
2		3.8/5	FILL	FILL, dark gray, gravel, silt, glass, wet, unconsolidated.
3				
4	208			
5				
6	108			
7			SM	SANDY, CLAYEY SILT, SM, dark brown gray, moist, soft.
8		5.1/5		
9	156			
10				
11	3.4			
12			CL	SILTY CLAY, CL, with SAND, gray to tan, carbonate clasts at 10.2 - 10.5, orange and red mottling, moist, firm.
13		4.2/5		
14	24.1			
15				
16	-			
17			SC	SAND, with CLAY, gray, fine to medium grained, wet, soft.
18	-	4/5		
19			CL	SANDY CLAY, white. (No recovery from 19 to 20'.)
20				

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Notes:
Samples collected at 0-2.5' and 5-7.5'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: CPT-21-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/15/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	728379
Field Supervisor:	Carolyn Sexton	Easting:	3167773
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0			FILL	(0 - 3.6) FILL, gravel, sand, clay, hydrocarbon odor and staining, unconsolidated.
1	170			
2		4.2/5		
3				
4	1666			(3.6 - 5.4) CLAYEY SILT, SM, with SAND, dark brown gray, moist, soft, hydrocarbon odor and staining.
5				
6	333		CL	(5.4 - 15.4) SANDY/SILTY CLAY, CL, green gray, mottled gray and orange increasing with depth, slightly moist, firm, carbonate nodules locally, 7.6 - 9.6, hydrocarbon staining and odor in fractures at top.
7		5/5		
8				
9	473			
10				
11	231			
12		4.5/5		
13				
14	169			
15				
16			SP	(15.4 - 20.0) SAND, SP, green gray, wet, soft, hydrocarbon odor and staining. (No recovery from 18.4 to 20'.)
17	-			
18		3.4/5		
19				
20				

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Notes:
Samples collected at 2-5' and 7.5-10'.

Location is adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Union Pacific Railroad

Log of Boring: SB-22-13

UPRR Houston Wood Preserving Works
Houston, TX

PBW Project No. 1358

Completion Date:	2/15/2013	Drilling Method:	Geoprobe
Drilling Company:	Fugro	Borehole Diameter (in.):	3
Driller:	Doug Isenhart	Total Depth (ft):	20
Driller's License:		Northing:	728501
Field Supervisor:	Carolyn Sexton	Easting:	3167891
Sampling Method:	2"x 5' Barrel	Ground Elev. (ft AMSL):	

Depth (ft)	PID (ppm-v)	Recovery (ft/ft)	USCS	Lithologic Description
0				
1	1003			FILL, black brown, gravel, sand, silt, hydrocarbon odor and staining
2		3.9/5	FILL	
3				
4	2103			
5				
6	988			SILTY CLAY, CL, dark gray, carbonate clasts at base, balck and orange mottling, hydrocarbon odor and stianing throughout, moist, slightly firm.
7		4.7/5		
8				
9	3838			SANDY/SILTY CLAY, CL, light green gray, increasing sand with depth, orange and green mottling, hydrocarbon odor and staining, moist, firm.
10			CL	
11	1786			
12				
13		2.6/5		
14	-			
15	387			SANDY CLAY, moist, firm.
16				SAND, green white, fine to medium grained, wet, soft. (No recovery from 18.2 to 20'.)
17	168			
18		3.2/5	SP	
19				
20				

PBW
Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock, TX 78664
Tel (512) 671-3434 Fax (512) 671-3446

Notes:
Samples collected at 2-5' and 7.5-10'.

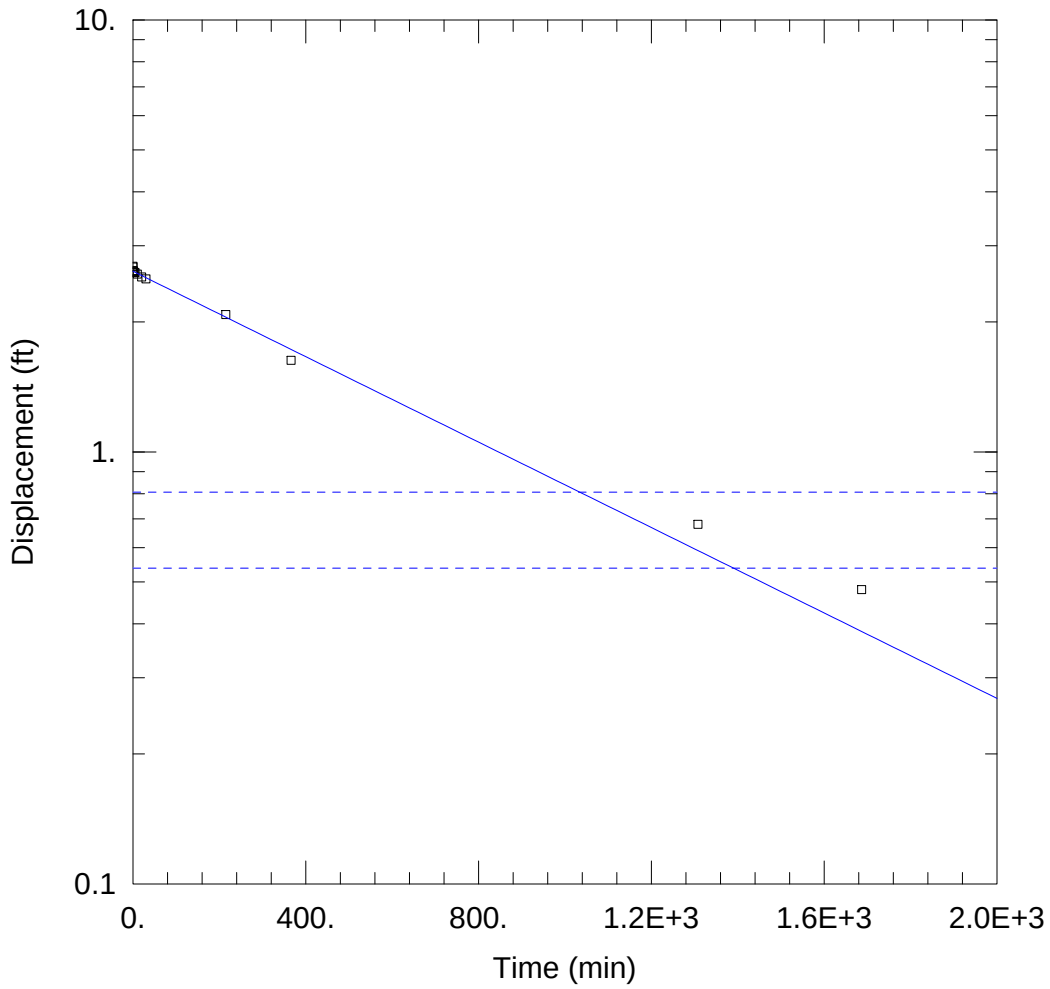
Location is NOT adjacent to CPT location.

Borehole plugged with bentonite chips upon completion.

Appendix VI.C

SLUG TEST RESULTS

Houston Wood Preserving Works
Houston, Texas



SLUG IN TEST - MW-32B

Data Set: J:\...\MW32B_Slugin_Mar12_full_thickness.aqt
Date: 08/28/14 Time: 16:13:47

PROJECT INFORMATION

Company: Pastor, Behling & Wheeler, LLC
Client: UPRR
Project: 1358
Location: HWPW
Test Well: MW-32B
Test Date: 03/06/12

AQUIFER DATA

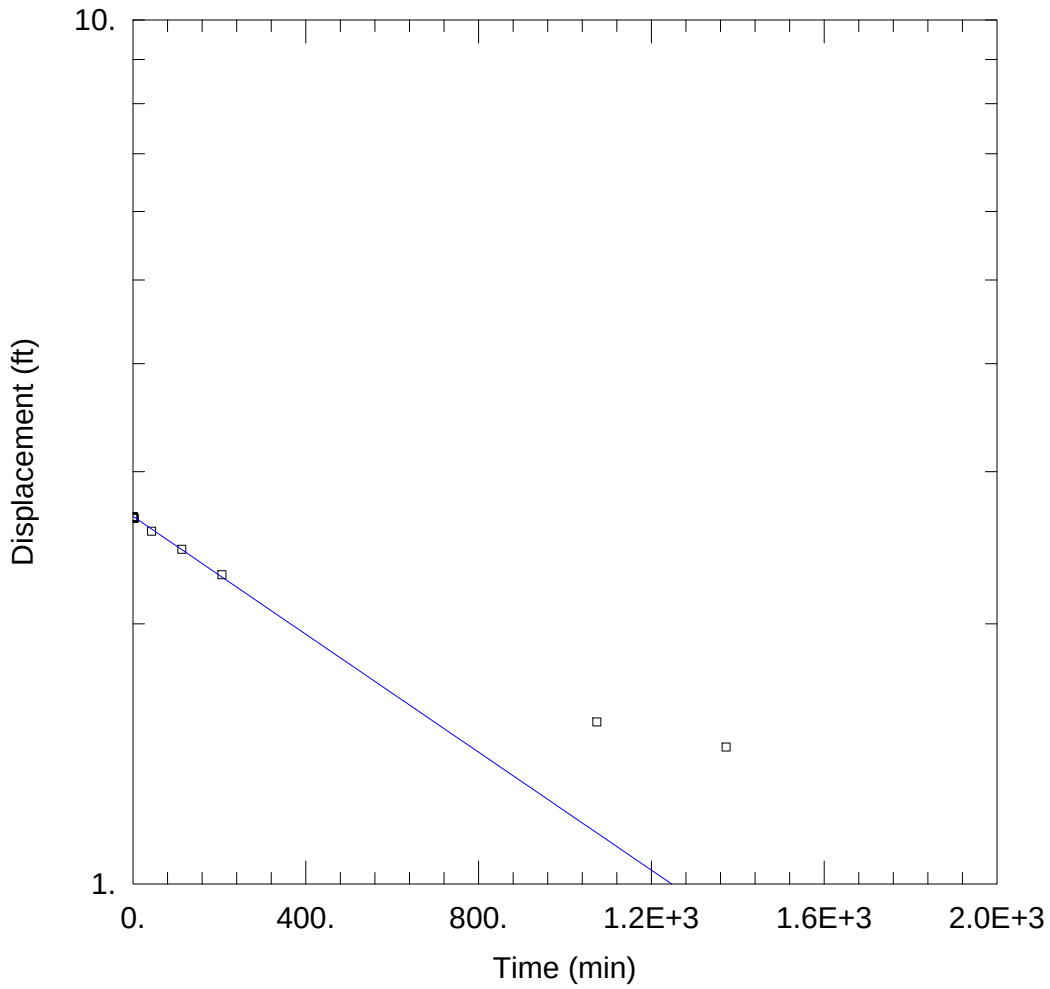
Saturated Thickness: 40. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-32B)

Initial Displacement: 2.69 ft
Total Well Penetration Depth: 16.3 ft
Casing Radius: 0.083 ft
Static Water Column Height: 32.07 ft
Screen Length: 10. ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 7.321E-7 cm/sec
y0 = 2.619 ft



SLUG OUT TEST - MW-32B

Data Set: J:\...\MW32B_Slugout_Mar12_full_thickness.aqt
Date: 08/28/14 Time: 16:12:31

PROJECT INFORMATION

Company: Pastor, Behling & Wheeler, LLC
Client: UPRR
Project: 1358
Location: HWPW
Test Well: MW-35B
Test Date: 01/22/10

AQUIFER DATA

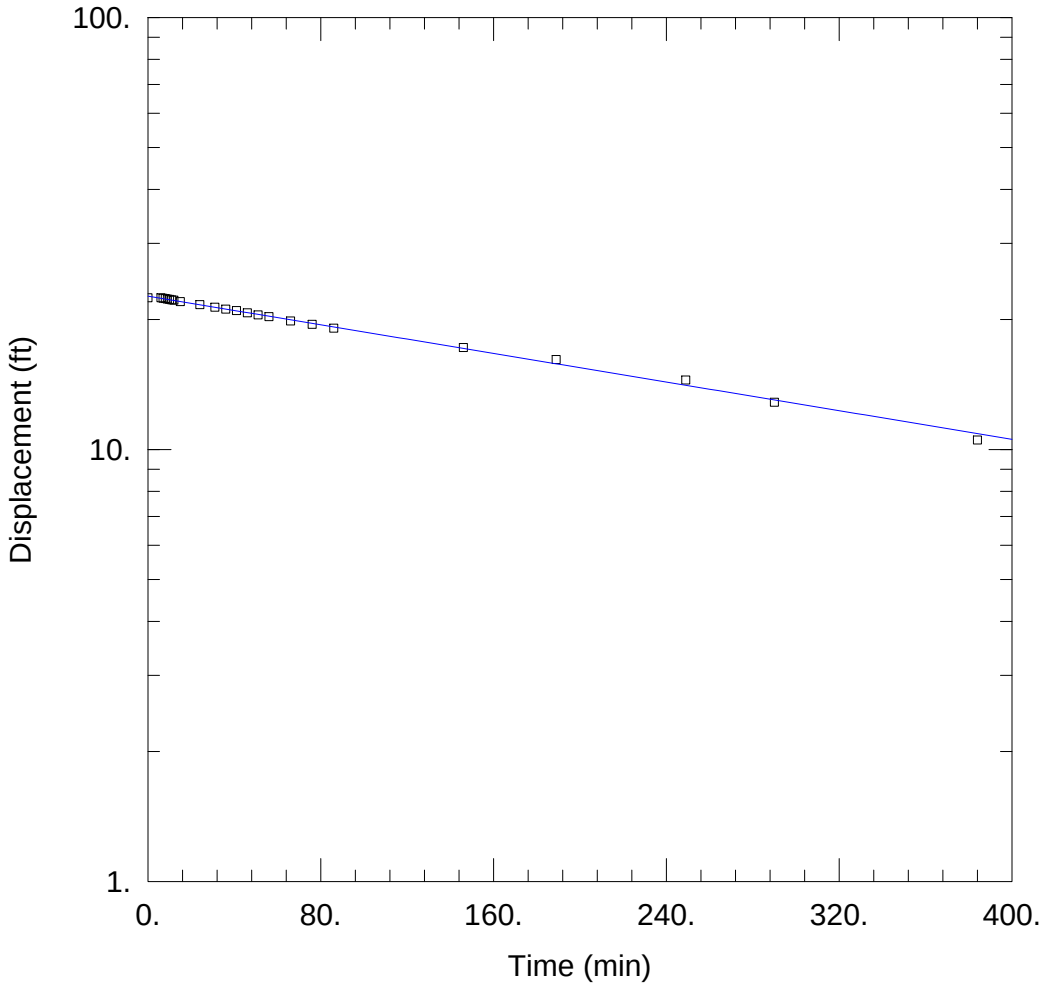
Saturated Thickness: 40. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-32B)

Initial Displacement: 2.66 ft
Total Well Penetration Depth: 16.3 ft
Casing Radius: 0.083 ft
Static Water Column Height: 32.07 ft
Screen Length: 10. ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 5.054E-7 cm/sec
y0 = 2.663 ft



BAILDOWN TEST - MW-33B

Data Set: J:\...\MW33B_baildown_full_thickness.aqt
Date: 08/29/14 Time: 13:46:34

PROJECT INFORMATION

Company: Pastor, Behling & Wheeler, LLC
Client: UPRR
Project: 1358
Location: HWPW, Houston, TX
Test Well: MW-33B
Test Date: 02/25/09

AQUIFER DATA

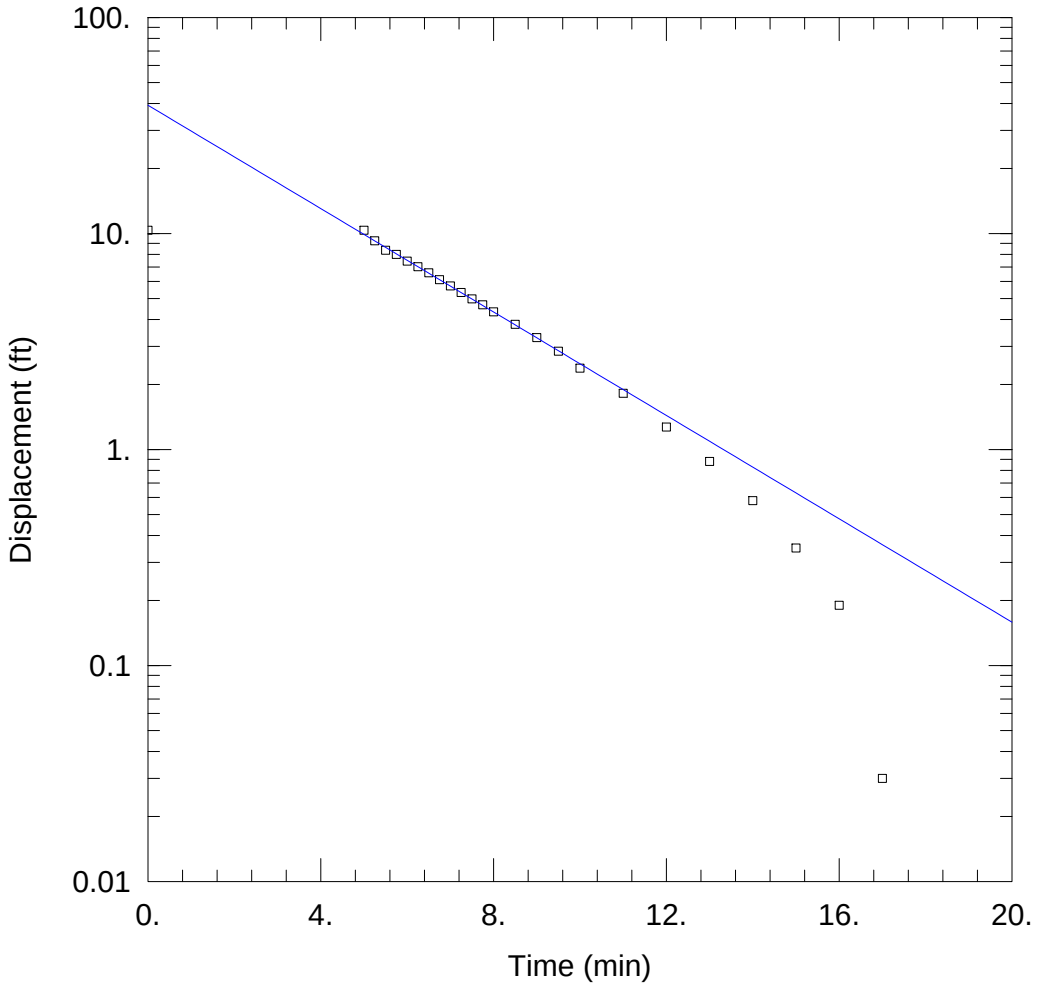
Saturated Thickness: 35. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-33B)

Initial Displacement: 22.46 ft
Total Well Penetration Depth: 15. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 32.31 ft
Screen Length: 10. ft
Well Radius: 0.3125 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 1.117E-6 cm/sec
y0 = 22.64 ft



BAILDOWN TEST - MW-35B BAIL DOWN TEST 1

Data Set: J:\...\MW35B_baildown_full_thickness.aqt
Date: 08/29/14 Time: 11:57:41

PROJECT INFORMATION

Company: Pastor, Behling & Wheeler, LLC
Client: UPRR
Project: 1358
Location: HWPW, Houston, TX
Test Well: MW-35B
Test Date: 02/25/09

AQUIFER DATA

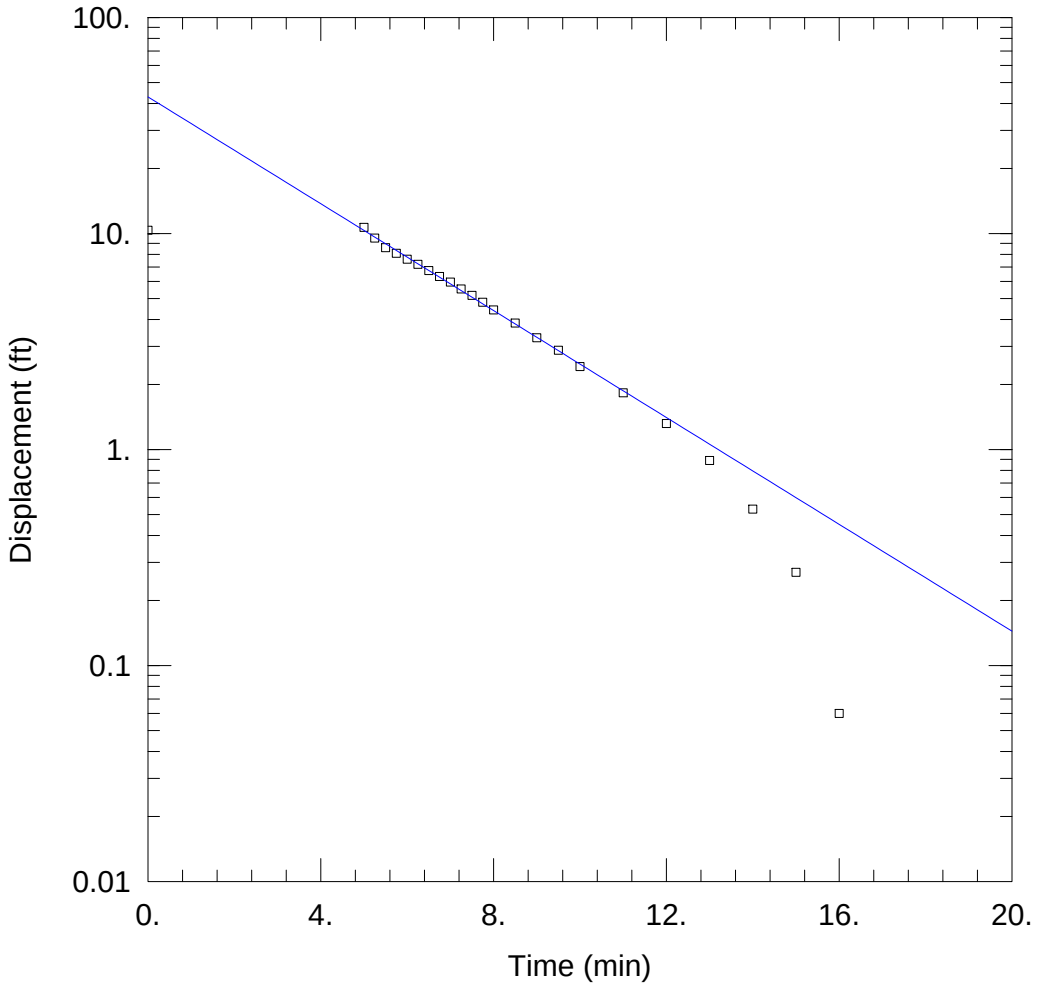
Saturated Thickness: 35. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-35B)

Initial Displacement: 10.36 ft
Total Well Penetration Depth: 15. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 36.21 ft
Screen Length: 10. ft
Well Radius: 0.354 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0001565 cm/sec
y0 = 39.26 ft



BAILDOWN TEST - MW-35B BAIL DOWN TEST 2

Data Set: J:\...\MW35B_baildown2_full_thickness.aqt
Date: 08/29/14 Time: 13:18:18

PROJECT INFORMATION

Company: Pastor, Behling & Wheeler, LLC
Client: UPRR
Project: 1358
Location: HWPW, Houston, TX
Test Well: MW-35B
Test Date: 02/25/09

AQUIFER DATA

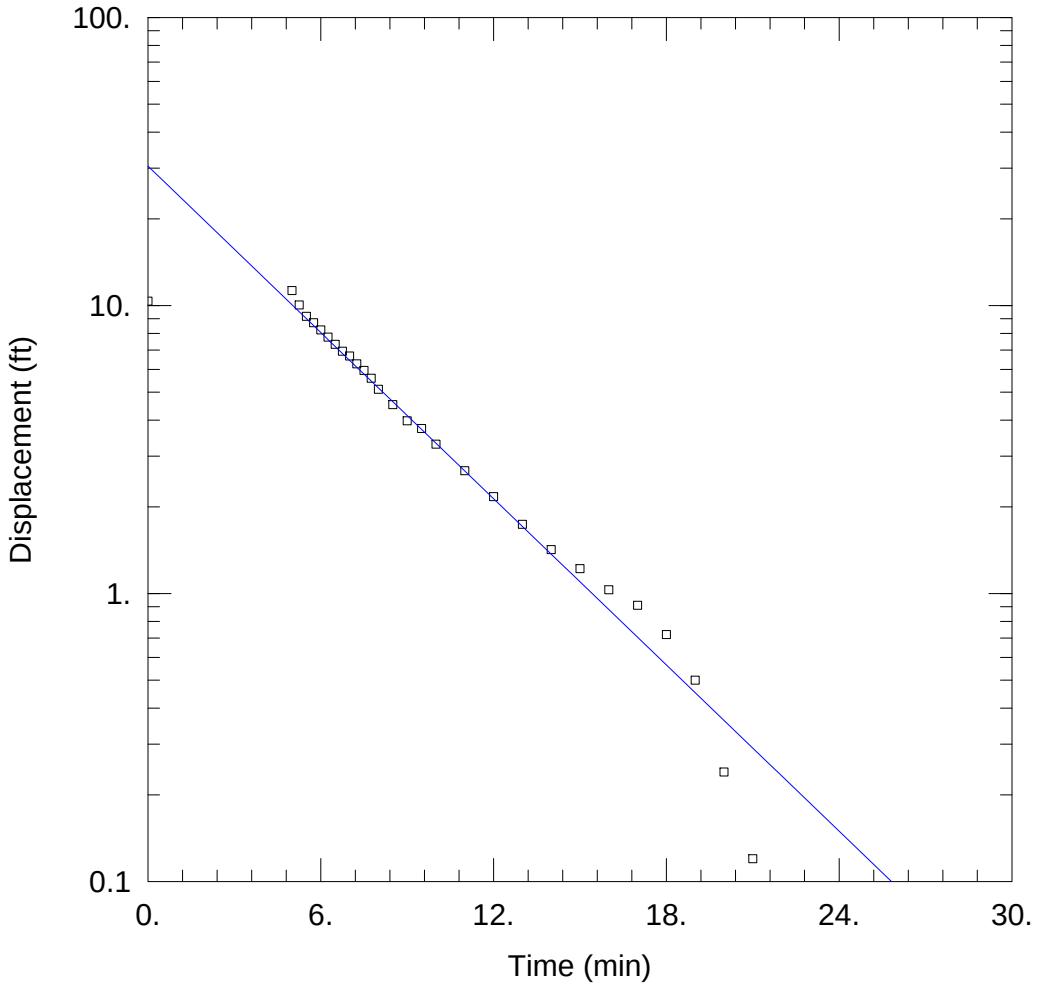
Saturated Thickness: 35. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-35B)

Initial Displacement: 10.36 ft
Total Well Penetration Depth: 15. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 36.21 ft
Screen Length: 10. ft
Well Radius: 0.354 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0001618 cm/sec
y0 = 42.91 ft



BAILDOWN TEST - MW-35B BAIL DOWN TEST 3

Data Set: J:\...\MW35B_baildown3_full_thickness.aqt
Date: 08/29/14 Time: 13:20:34

PROJECT INFORMATION

Company: Pastor, Behling & Wheeler, LLC
Client: UPRR
Project: 1358
Location: HWPW, Houston, TX
Test Well: MW-35B
Test Date: 02/25/09

AQUIFER DATA

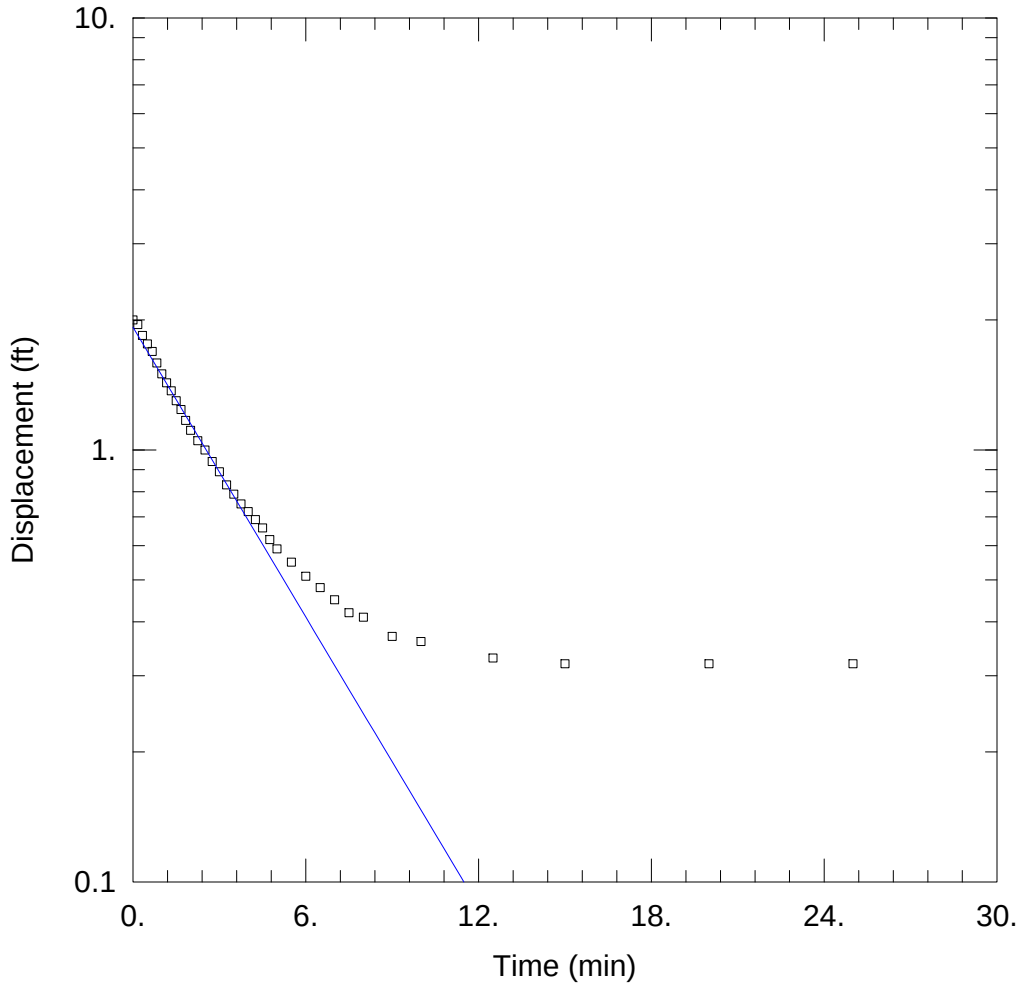
Saturated Thickness: 35. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-35B)

Initial Displacement: 10.36 ft
Total Well Penetration Depth: 15. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 36.21 ft
Screen Length: 10. ft
Well Radius: 0.354 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0001259 cm/sec
y0 = 30.47 ft



WELL TEST ANALYSIS

Data Set: J:\...\MW35B_Slugin_full_thickness.aqt
Date: 08/29/14 Time: 13:27:28

PROJECT INFORMATION

Company: Pastor, Behling & Wheeler, LLC
Client: UPRR
Project: 1358
Location: HWPW
Test Well: MW-35B
Test Date: 01/22/10

AQUIFER DATA

Saturated Thickness: 35. ft Anisotropy Ratio (Kz/Kr): 0.1

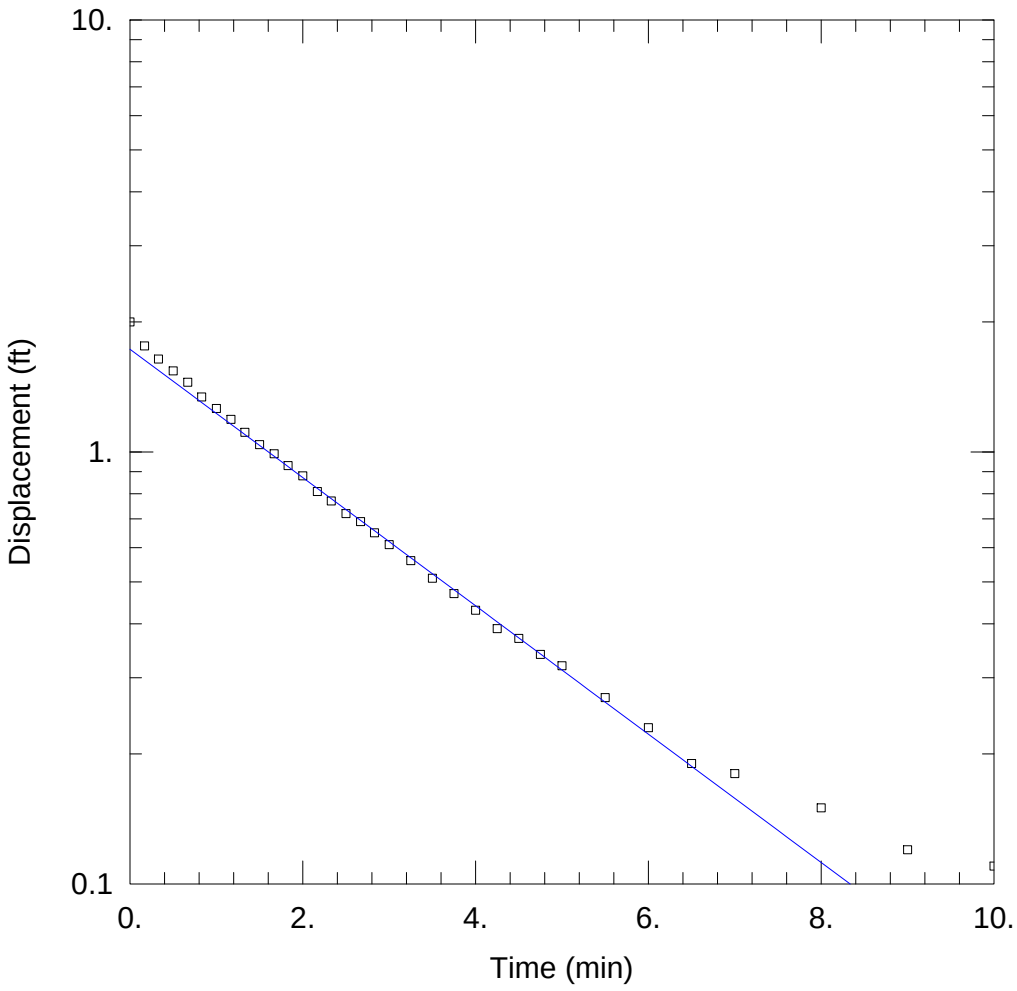
WELL DATA (MW-35B)

Initial Displacement: 2. ft
Total Well Penetration Depth: 15. ft
Casing Radius: 0.083 ft
Static Water Column Height: 38.48 ft
Screen Length: 10. ft
Well Radius: 0.354 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 0.0001452 cm/sec y0 = 1.923 ft



WELL TEST ANALYSIS

Data Set: J:\...\MW35B_Slugout_full_thickness.aqt
Date: 08/29/14 Time: 13:34:10

PROJECT INFORMATION

Company: Pastor, Behling & Wheeler, LLC
Client: UPRR
Project: 1358
Location: HWPW
Test Well: MW-35B
Test Date: 01/22/10

AQUIFER DATA

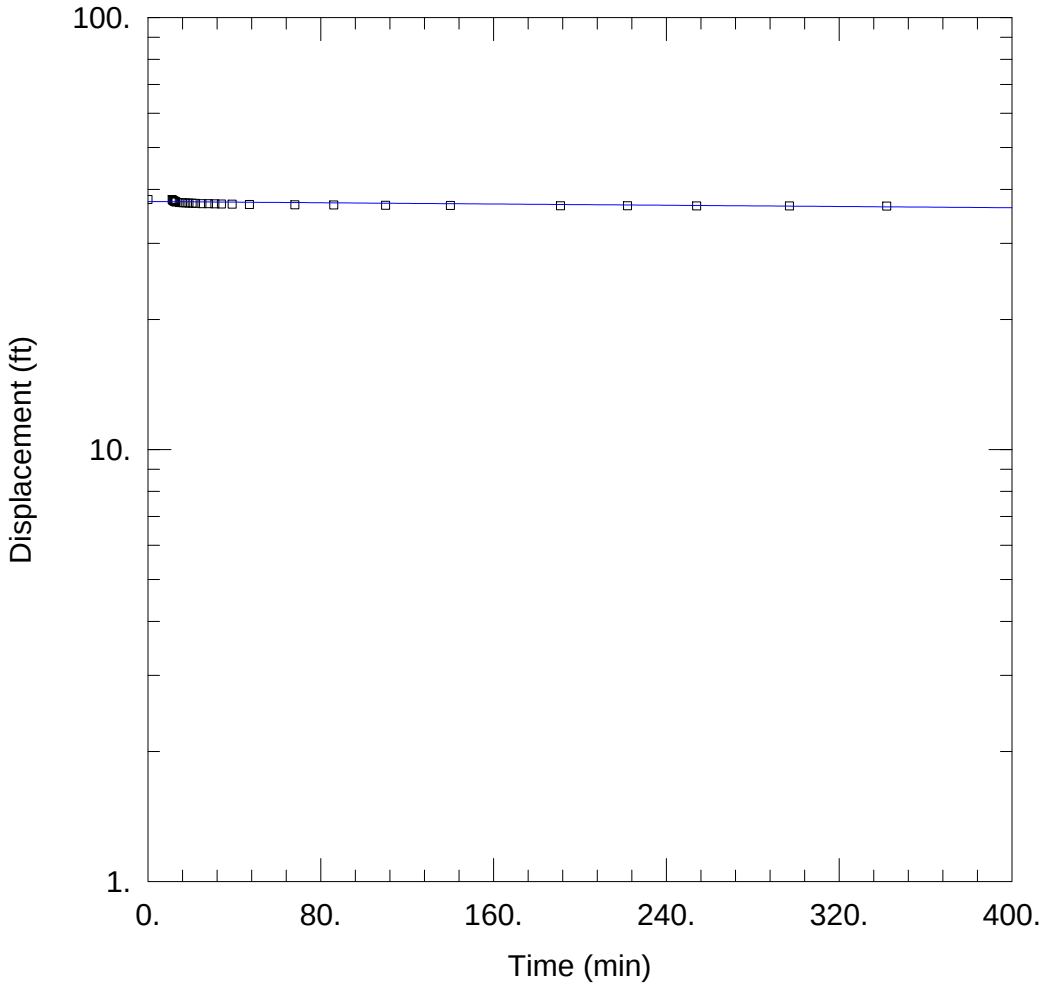
Saturated Thickness: 35. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-35B)

Initial Displacement: 2. ft
Total Well Penetration Depth: 15. ft
Casing Radius: 0.083 ft
Static Water Column Height: 38.48 ft
Screen Length: 10. ft
Well Radius: 0.354 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0001929 cm/sec
y0 = 1.728 ft



MW-36B BAIL DOWN TEST

Data Set: J:\...\MW36B_baildown_full_thickness.aqt
Date: 08/29/14 Time: 10:38:12

PROJECT INFORMATION

Company: PBW, LLC
Client: UPRR
Project: 1358
Location: HWPW, Houston, TX
Test Well: MW-36B
Test Date: 7/22/10

AQUIFER DATA

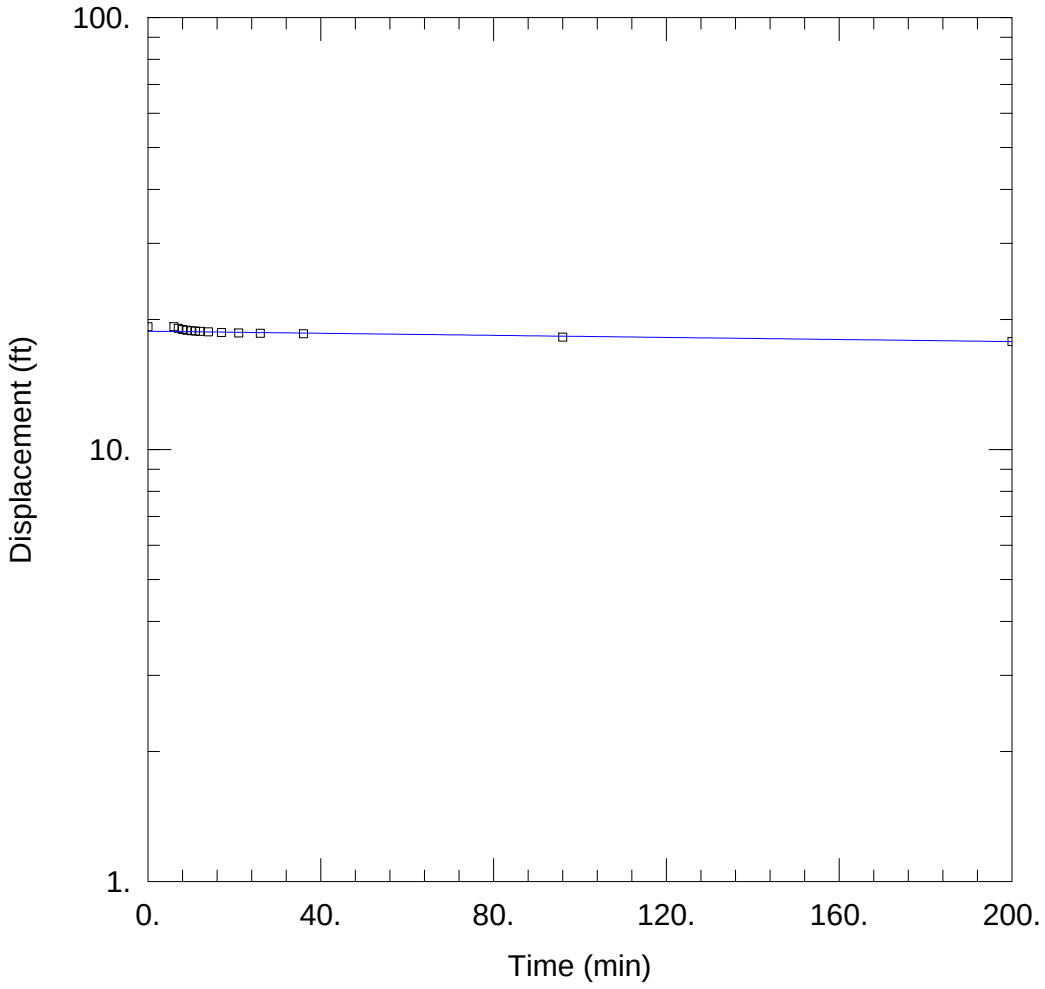
Saturated Thickness: 31.5 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-36B)

Initial Displacement: 37.92 ft
Total Well Penetration Depth: 15.5 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 38.62 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 9.426E-8 cm/sec
y0 = 37.5 ft



MW-49B BAIL DOWN TEST

Data Set: J:\...\MW49B_baildown_full_thickness.aqt
Date: 08/29/14 Time: 14:26:41

PROJECT INFORMATION

Company: Pastor, Behling & Wheeler, LLC
Client: UPRR
Project: 1358
Location: HWPW, Houston, TX
Test Well: MW-49B

AQUIFER DATA

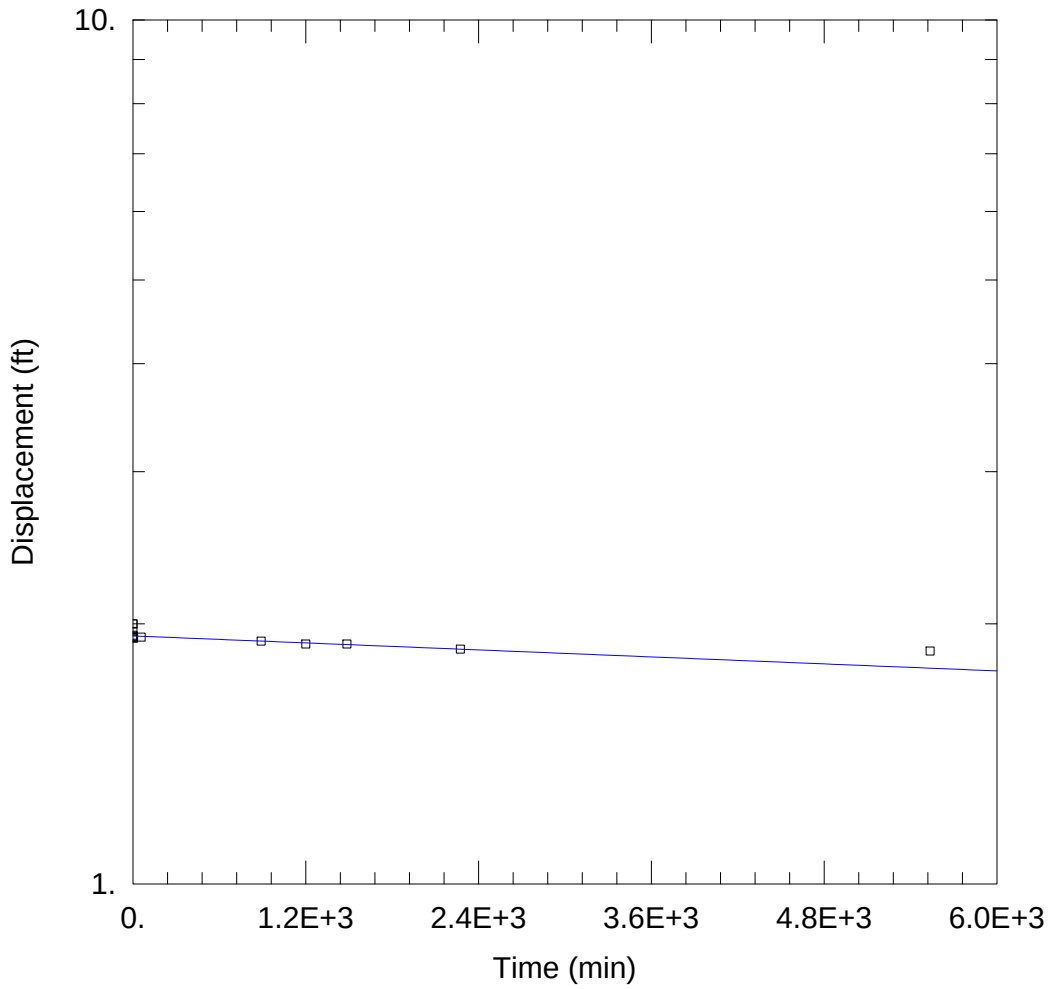
Saturated Thickness: 35. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-49B)

Initial Displacement: 19.25 ft
Total Well Penetration Depth: 9.5 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 21.1 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 2.901E-7 cm/sec
y0 = 18.79 ft



SLUG IN TEST - MW-55B

Data Set: J:\...\MW55B_slug_in_full_thickness.aqt
Date: 09/17/14 Time: 16:14:40

PROJECT INFORMATION

Company: Pastor, Behling & Wheeler, LLC
Client: UPRR
Project: 1358
Location: HWPW
Test Well: MW-55B
Test Date: 07/25/12

AQUIFER DATA

Saturated Thickness: 40. ft Anisotropy Ratio (Kz/Kr): 0.1

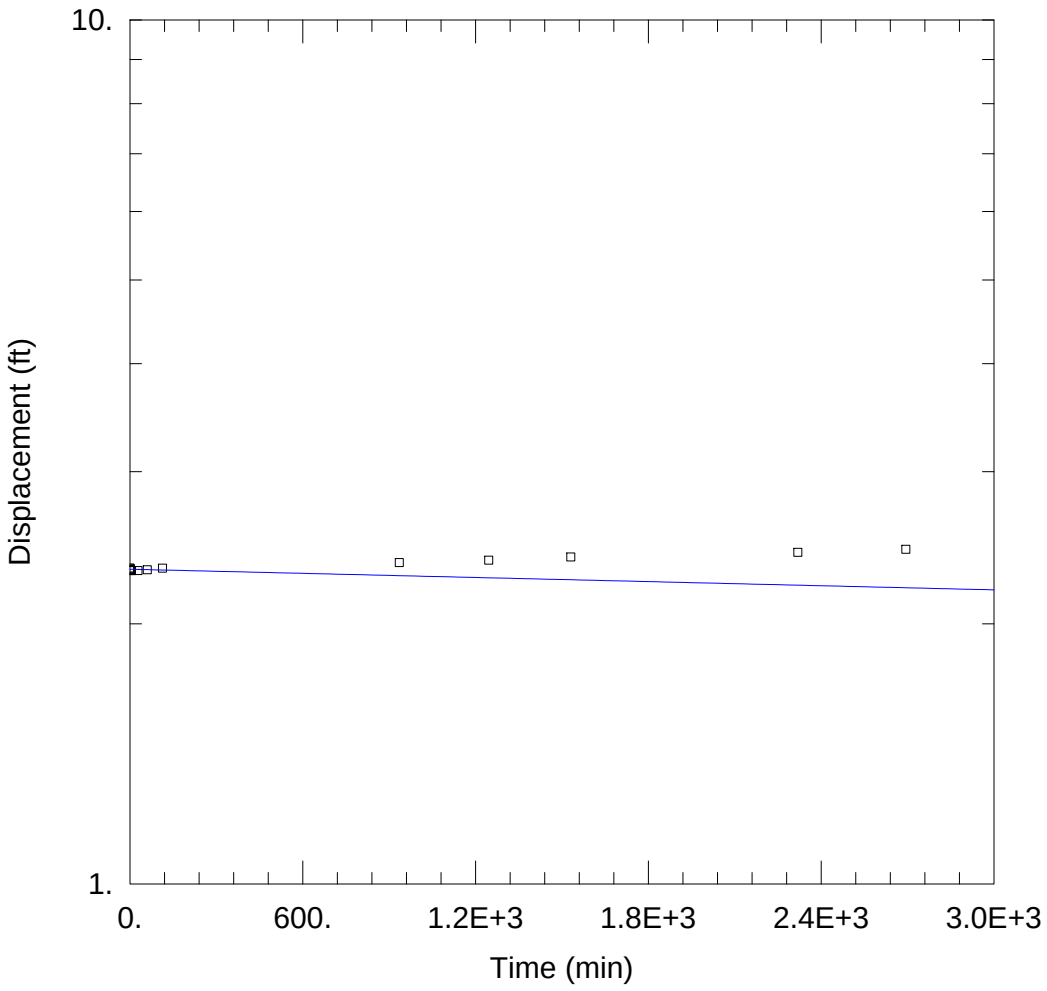
WELL DATA (MW-55B)

Initial Displacement: 2. ft
Total Well Penetration Depth: 13.2 ft
Casing Radius: 0.083 ft
Static Water Column Height: 23.62 ft
Screen Length: 5. ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 1.777E-8 cm/sec y0 = 1.937 ft



SLUG IN TEST - MW-57B

Data Set: J:\...\MW57B_slug_in_full_thickness.aqt
Date: 09/17/14 Time: 16:12:59

PROJECT INFORMATION

Company: Pastor, Behling & Wheeler, LLC
Client: UPRR
Project: 1358
Location: HWPW
Test Well: MW-57B
Test Date: 07/25/12

AQUIFER DATA

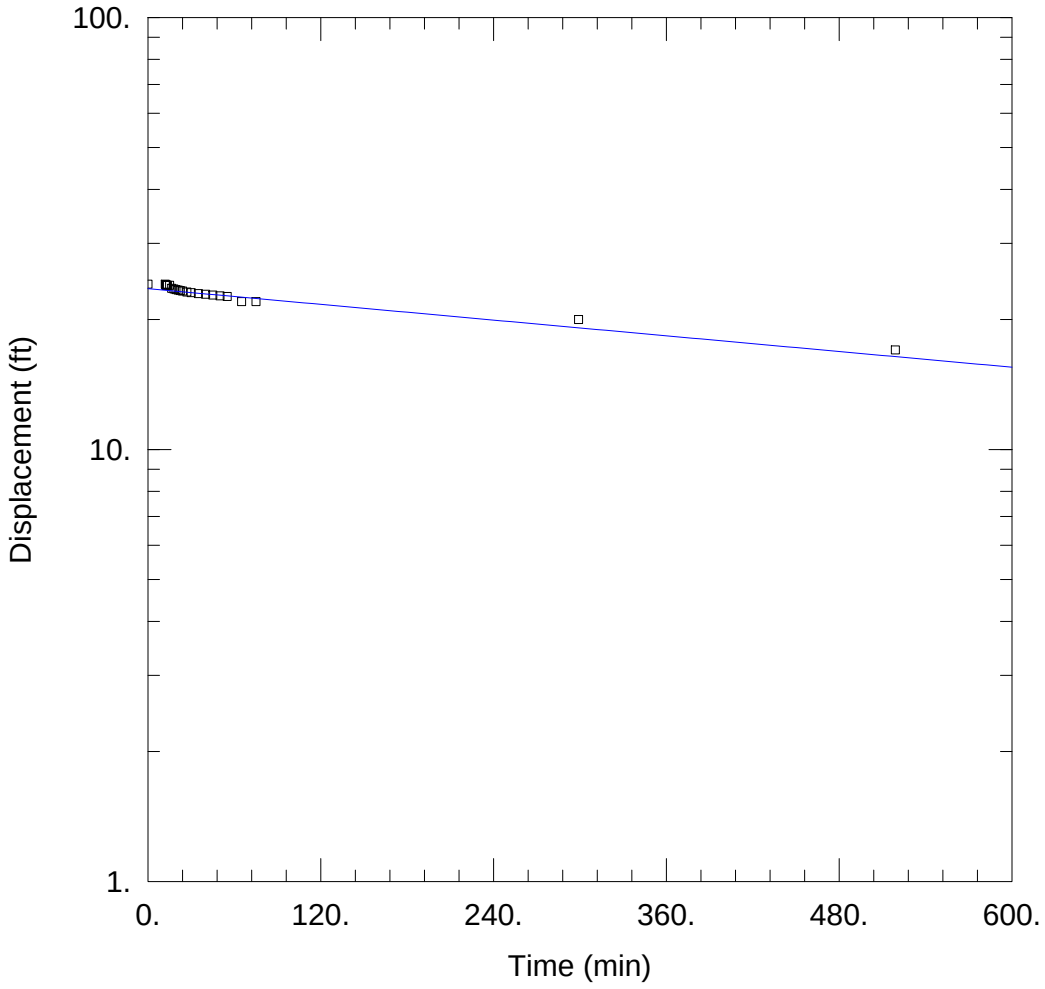
Saturated Thickness: 40. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-57B)

Initial Displacement: 2.32 ft
Total Well Penetration Depth: 12.8 ft
Casing Radius: 0.083 ft
Static Water Column Height: 18.77 ft
Screen Length: 5. ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 2.089E-8 cm/sec
y0 = 2.313 ft



MW-59B BAIL DOWN TEST

Data Set: J:\...\MW59B_baildown_full_thickness.aqt
Date: 08/29/14 Time: 10:56:00

PROJECT INFORMATION

Company: PBW, LLC
Client: UPRR
Project: 1358
Location: HWPW, Houston, TX
Test Well: MW-59B
Test Date: 7/22/10

AQUIFER DATA

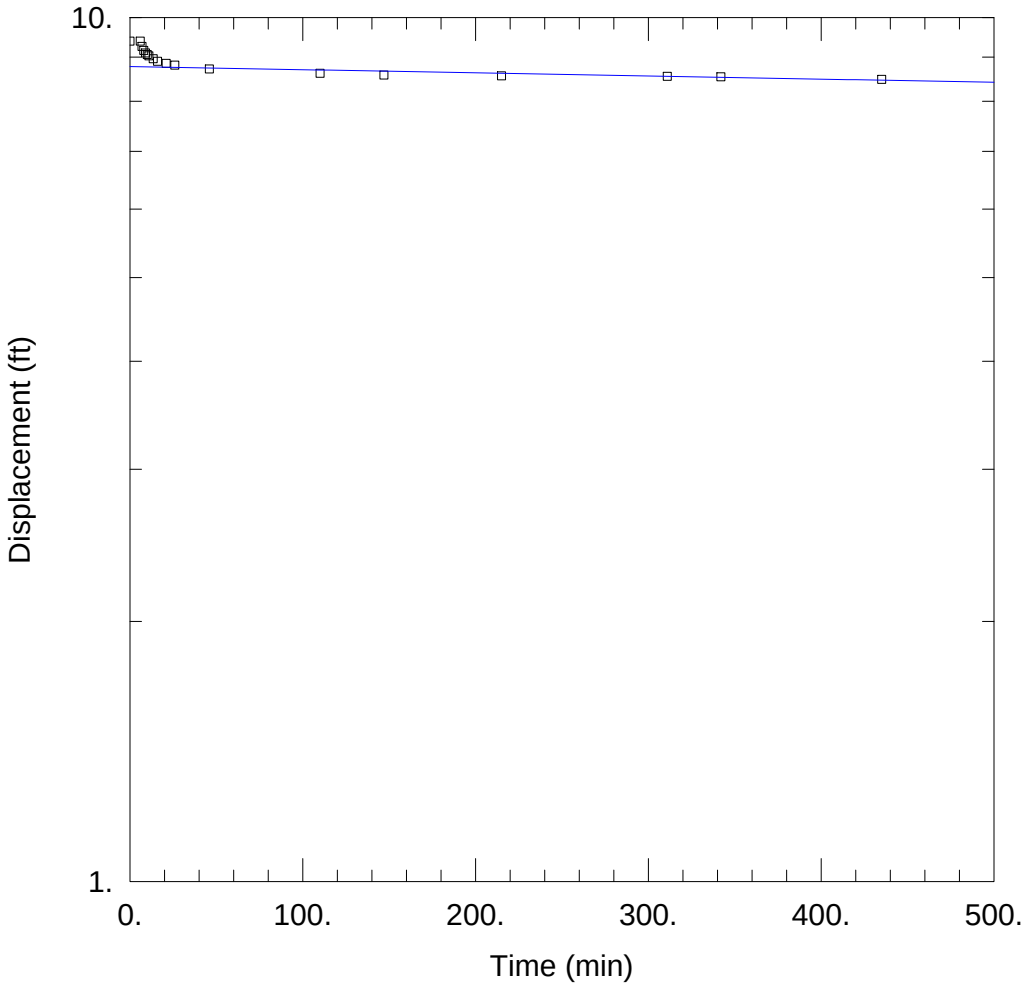
Saturated Thickness: 34.5 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-59B)

Initial Displacement: 24.15 ft
Total Well Penetration Depth: 12. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 24.69 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 7.607E-7 cm/sec
y0 = 23.57 ft



MW-63B BAIL DOWN TEST

Data Set: J:\...\MW-63B_full_thickness.aqt
Date: 08/29/14 Time: 11:35:28

PROJECT INFORMATION

Company: Pastor, Behling & Wheeler, LLC
Client: UPRR
Project: 1358
Location: HWPW, Houston, TX
Test Well: MW-63B
Test Date: 2/25/2009

AQUIFER DATA

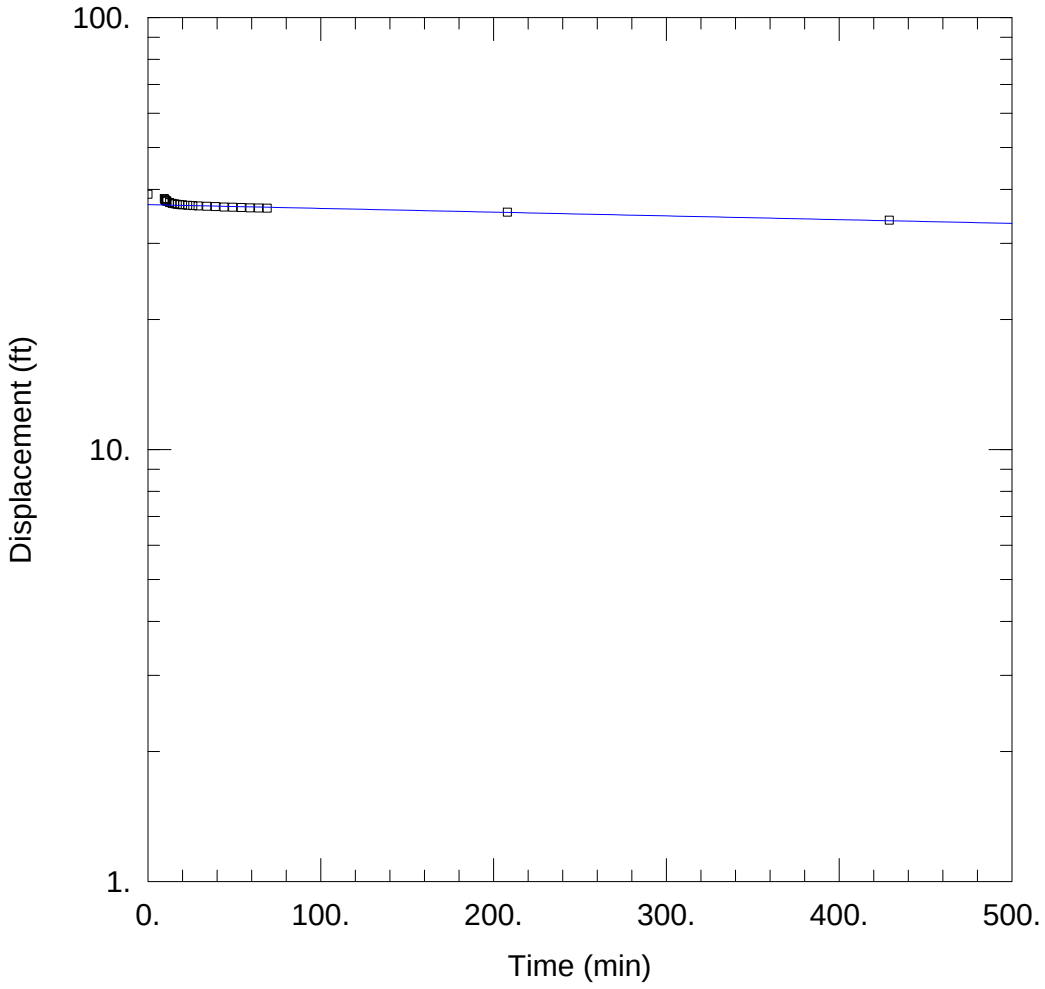
Saturated Thickness: 37. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-63B)

Initial Displacement: 9.39 ft
Total Well Penetration Depth: 12.5 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 10.42 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 9.174E-8 cm/sec
y0 = 8.775 ft



MW-67B BAIL DOWN TEST

Data Set: J:\...\MW-67B_baildown_full_thickness.aqt
Date: 08/29/14 Time: 11:15:24

PROJECT INFORMATION

Company: PBW, LLC
Client: UPRR
Project: 1358
Location: HWPW, Houston, TX
Test Well: MW-67B
Test Date: 7/22/10

AQUIFER DATA

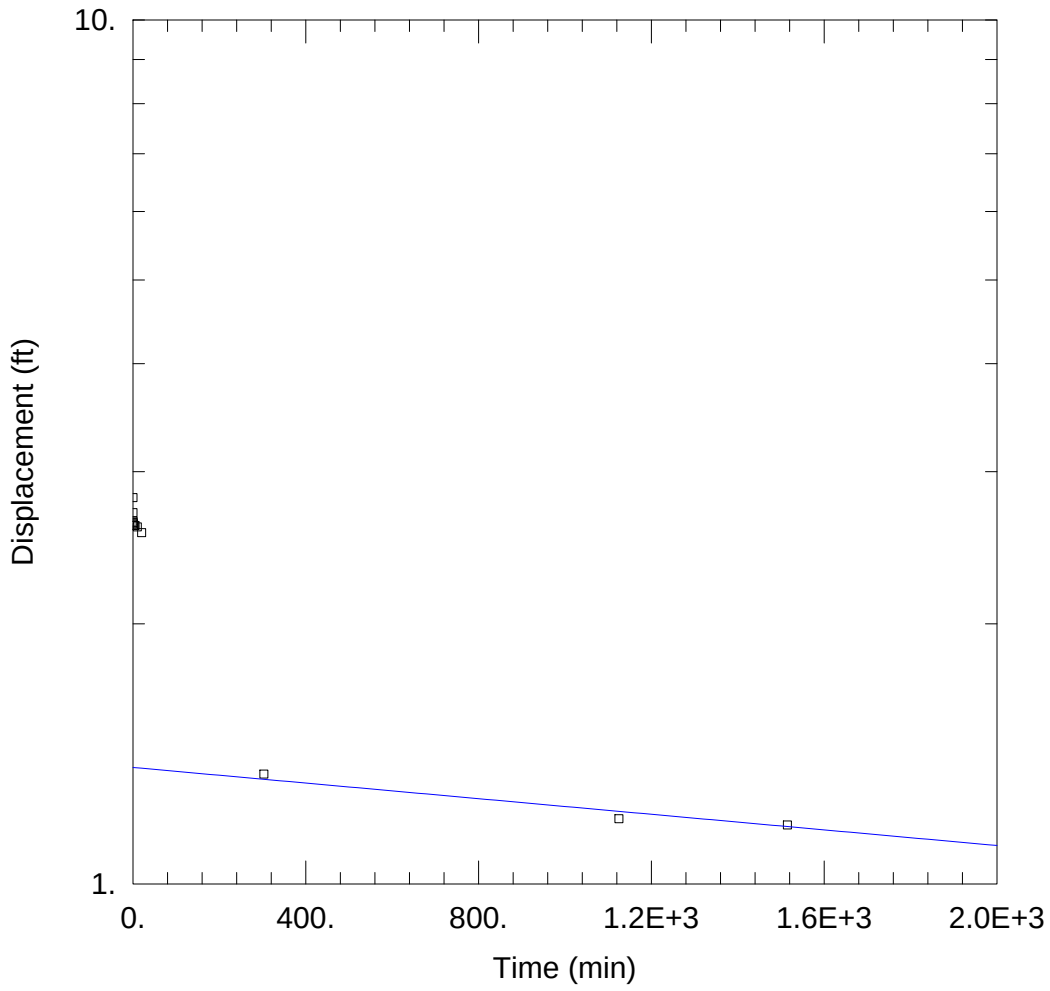
Saturated Thickness: 35. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-67B)

Initial Displacement: 39. ft
Total Well Penetration Depth: 8.5 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 37.37 ft
Screen Length: 5. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 2.067E-7 cm/sec
y0 = 36.88 ft



SLUG IN TEST - MW-70B

Data Set: J:\...\MW70B_Slugin_Mar12_full_thickness.aqt
Date: 08/29/14 Time: 14:09:01

PROJECT INFORMATION

Company: Pastor, Behling & Wheeler, LLC
Client: UPRR
Project: 1358
Location: HWPW
Test Well: MW-70B
Test Date: 03/06/12

AQUIFER DATA

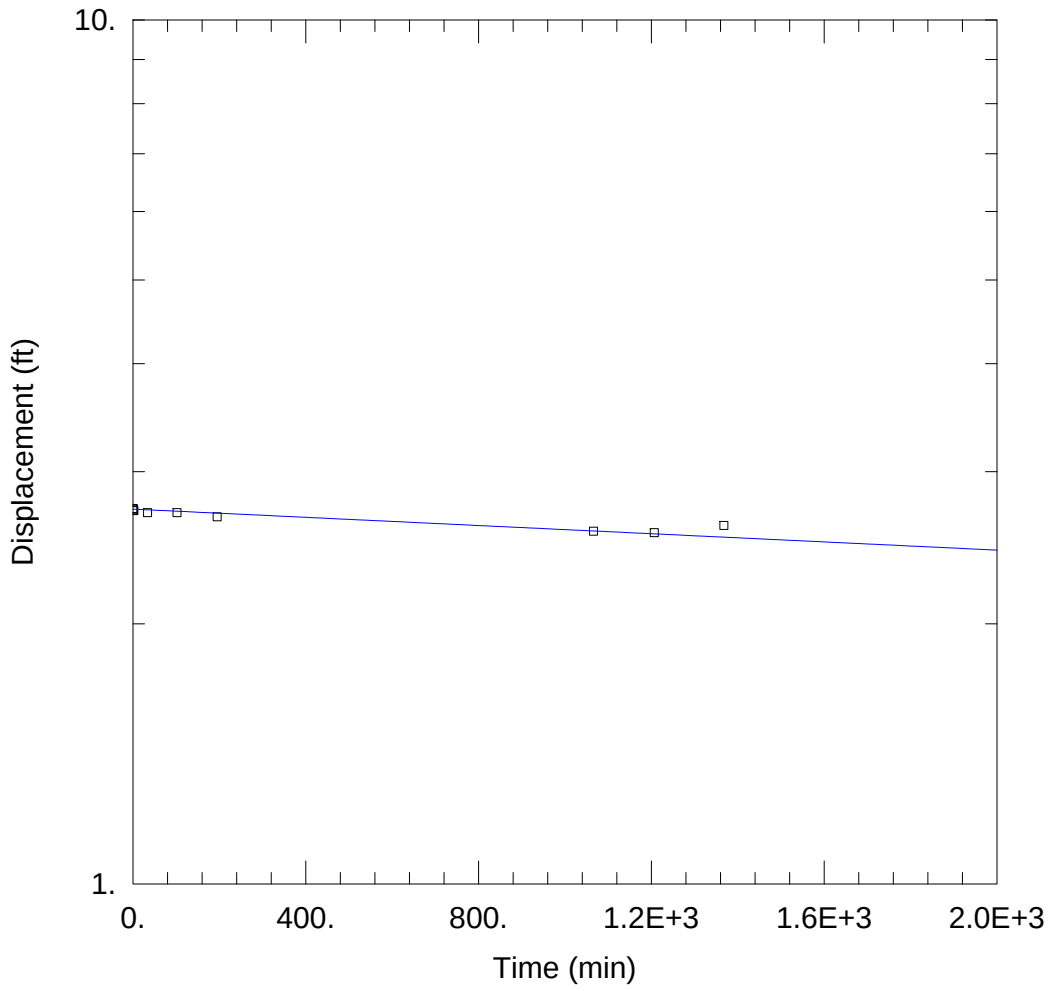
Saturated Thickness: 40. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-70B)

Initial Displacement: 2.8 ft
Total Well Penetration Depth: 13.2 ft
Casing Radius: 0.083 ft
Static Water Column Height: 29.51 ft
Screen Length: 10. ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 6.483E-8 cm/sec
y0 = 1.364 ft



SLUG OUT TEST - MW-70B

Data Set: J:\...\MW70B_Slugout_Mar12_full_thickness.aqt
Date: 08/29/14 Time: 13:52:42

PROJECT INFORMATION

Company: Pastor, Behling & Wheeler, LLC
Client: UPRR
Project: 1358
Location: HWPW
Test Well: MW-70B
Test Date: 03/06/12

AQUIFER DATA

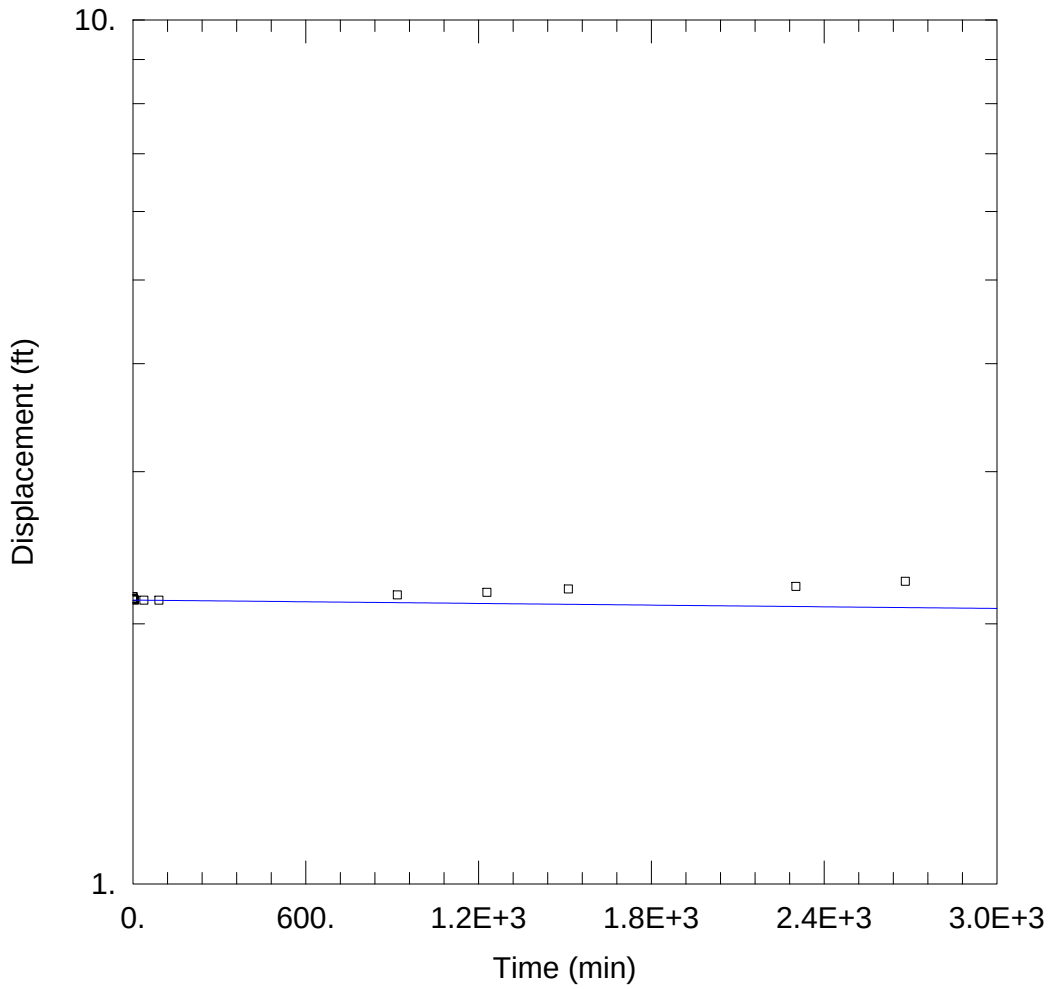
Saturated Thickness: 40. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-70B)

Initial Displacement: 2.72 ft
Total Well Penetration Depth: 13.2 ft
Casing Radius: 0.083 ft
Static Water Column Height: 29.51 ft
Screen Length: 10. ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 3.405E-8 cm/sec
y0 = 2.715 ft



SLUG IN TEST - MW-72B

Data Set: J:\...\MW72B_slug_in_full_thickness.aqt
Date: 09/17/14 Time: 16:10:48

PROJECT INFORMATION

Company: Pastor, Behling & Wheeler, LLC
Client: UPRR
Project: 1358
Location: HWPW
Test Well: MW-72B
Test Date: 07/25/12

AQUIFER DATA

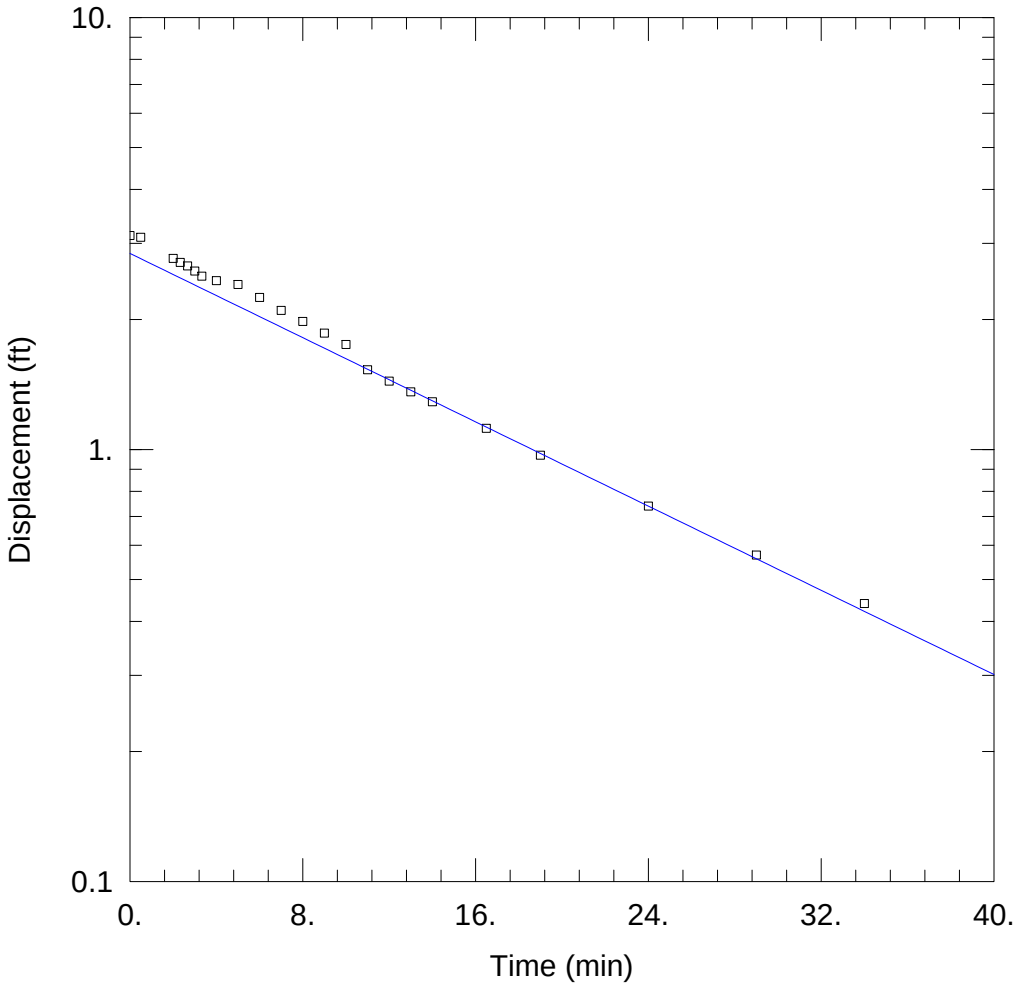
Saturated Thickness: 40. ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-72B)

Initial Displacement: 2.15 ft
Total Well Penetration Depth: 8.3 ft
Casing Radius: 0.083 ft
Static Water Column Height: 7.76 ft
Screen Length: 5. ft
Well Radius: 0.208 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 8.002E-9 cm/sec
y0 = 2.131 ft



MW-36D SLUG IN 1

Data Set: J:\...\MW-36D_In_1_full_thickness.aqt
Date: 09/15/14 Time: 10:28:42

PROJECT INFORMATION

Company: PBW, LLC
Client: UPRR
Project: 1358
Location: HWPW, Houston, TX
Test Well: MW-36D
Test Date: 7/22/10

AQUIFER DATA

Saturated Thickness: 35. ft Anisotropy Ratio (Kz/Kr): 0.1

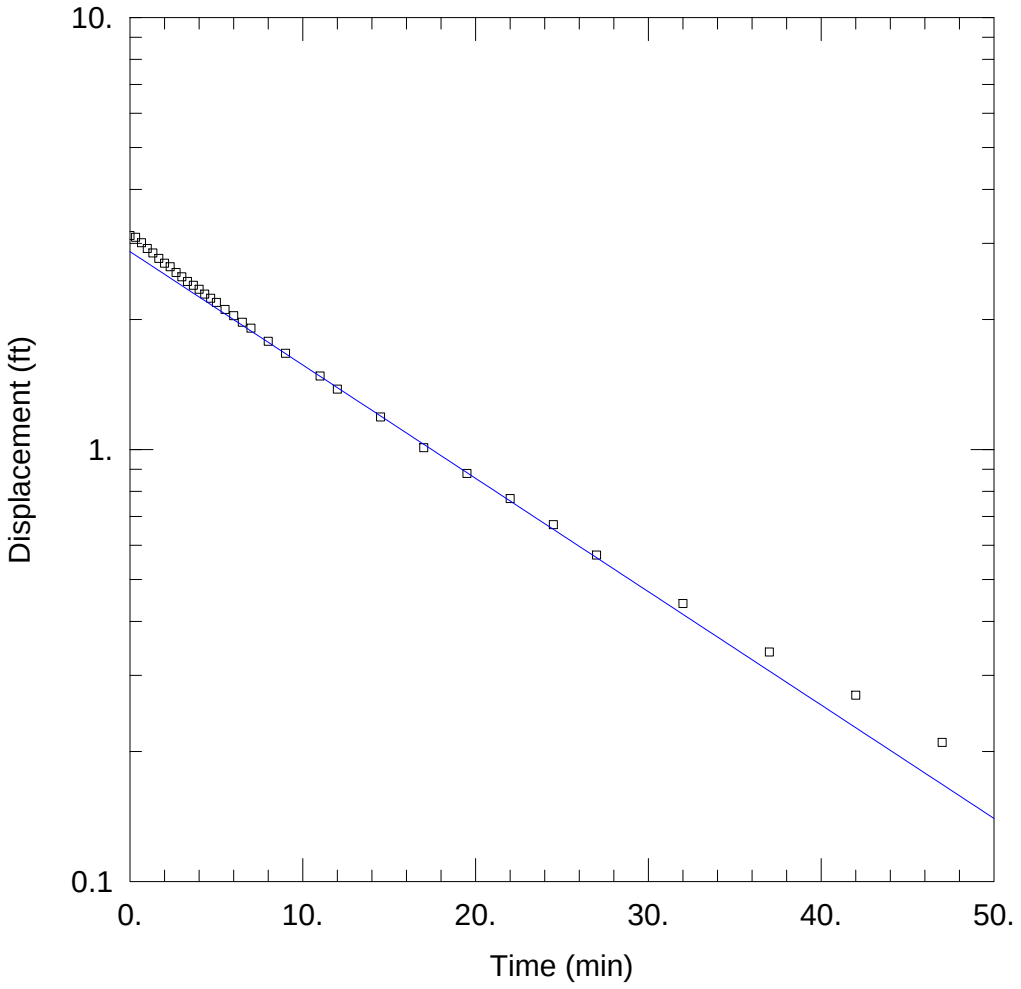
WELL DATA (MW-36D)

Initial Displacement: 3.13 ft
Total Well Penetration Depth: 24.53 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 24.53 ft
Screen Length: 10. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 3.753E-5 cm/sec y0 = 2.844 ft



MW-36D SLUG IN 2

Data Set: J:\...\MW-36D_In_2_full_thickness.aqt
Date: 09/15/14 Time: 10:30:12

PROJECT INFORMATION

Company: PBW, LLC
Client: UPRR
Project: 1358
Location: HWPW, Houston, TX
Test Well: MW-36D
Test Date: 7/22/10

AQUIFER DATA

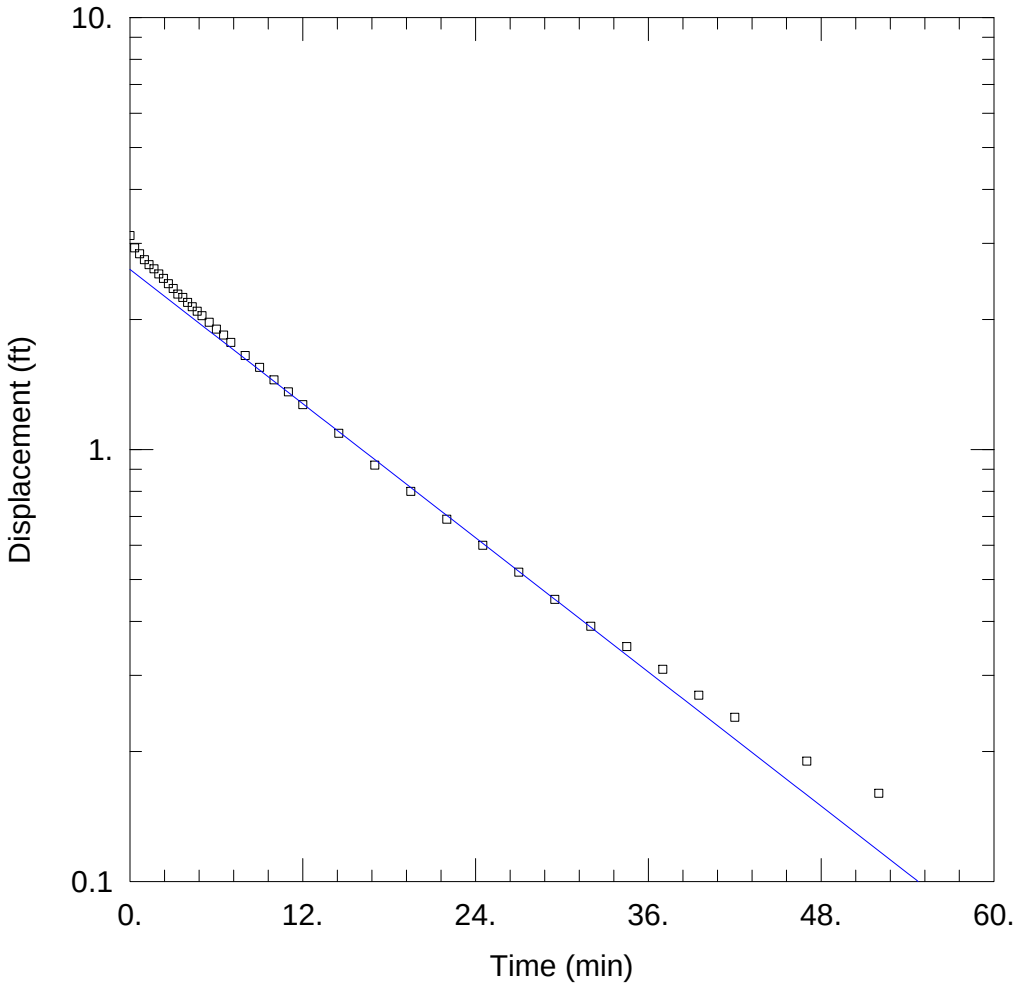
Saturated Thickness: 35. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-36D)

Initial Displacement: 3.13 ft
Total Well Penetration Depth: 24.53 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 24.53 ft
Screen Length: 10. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 4.043E-5 cm/sec
y0 = 2.871 ft



MW-36D SLUG IN 3

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Date: 09/15/14 Time: 10:30:25

PROJECT INFORMATION

Company: PBW, LLC
Client: UPRR
Project: 1358
Location: HWPW, Houston, TX
Test Well: MW-36D
Test Date: 7/22/10

AQUIFER DATA

Saturated Thickness: 35. ft Anisotropy Ratio (Kz/Kr): 0.1

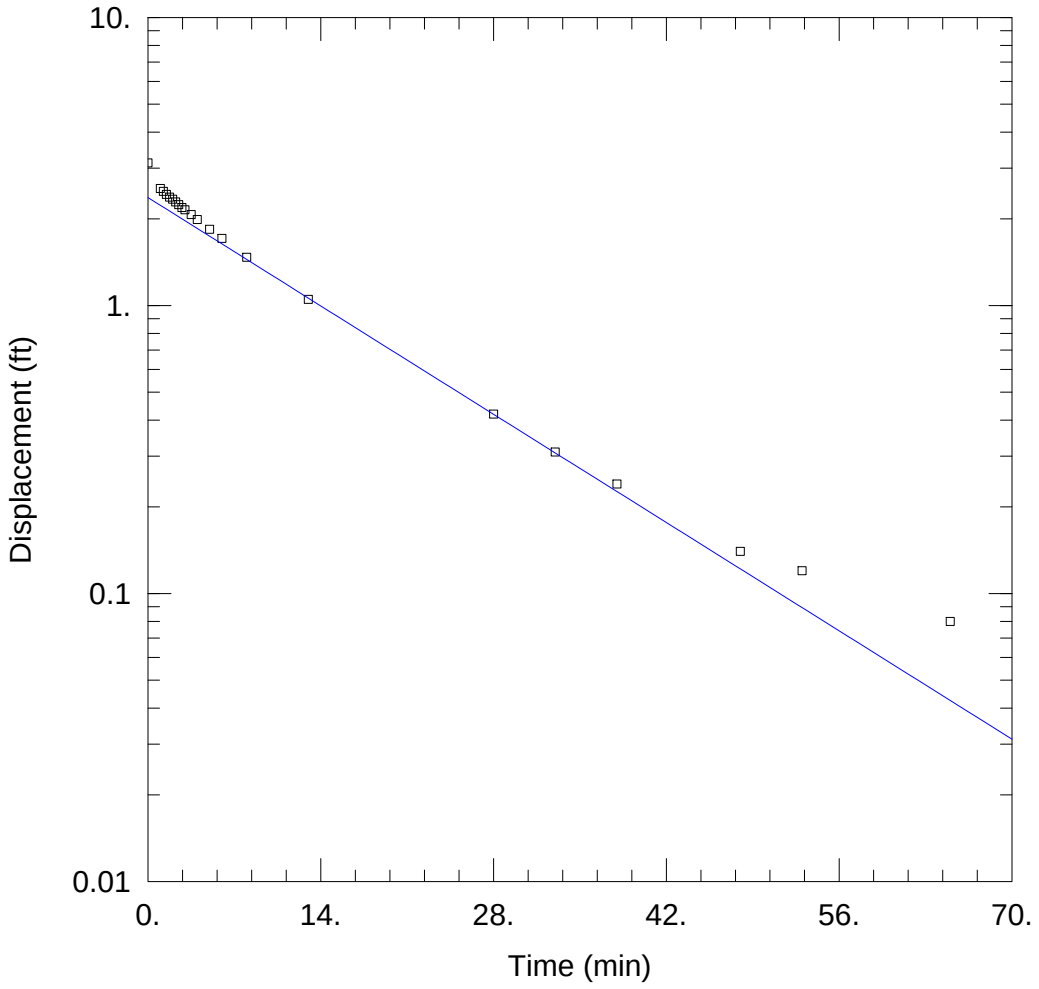
WELL DATA (MW-36D)

Initial Displacement: 3.13 ft Static Water Column Height: 24.53 ft
Total Well Penetration Depth: 24.53 ft Screen Length: 10. ft
Casing Radius: 0.0833 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 3.987E-5 cm/sec y0 = 2.611 ft



MW-36D SLUG OUT 1

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PROJECT INFORMATION

Company: PBW, LLC
Client: UPRR
Project: 1358
Location: HWPW, Houston, TX
Test Well: MW-36D
Test Date: 7/22/10

AQUIFER DATA

Saturated Thickness: 35. ft Anisotropy Ratio (Kz/Kr): 0.1

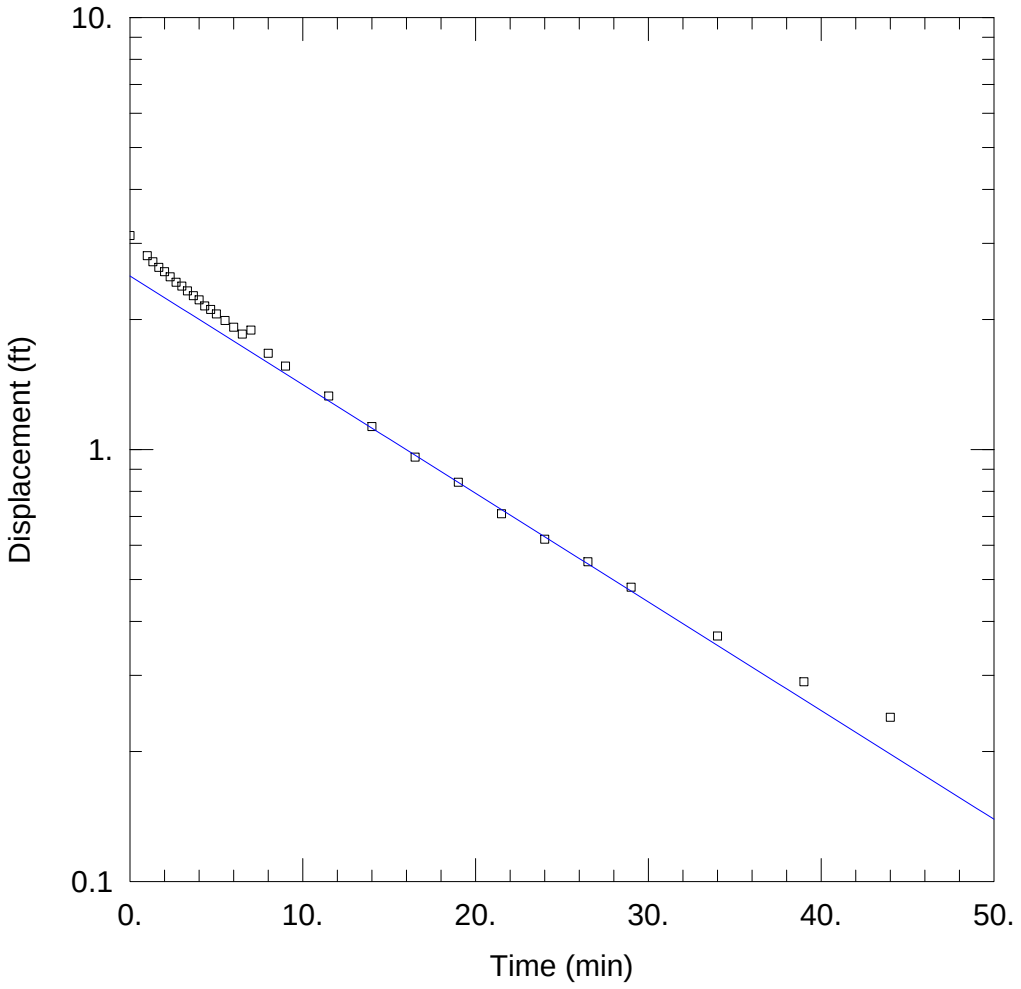
WELL DATA (MW-36D)

Initial Displacement: 3.13 ft
Total Well Penetration Depth: 24.53 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 24.53 ft
Screen Length: 10. ft
Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 4.139E-5 cm/sec y0 = 2.371 ft



MW-36D SLUG OUT 2

Data Set: J:\...\MW-36D_Out_2_full_thickness.aqt
Date: 09/15/14 Time: 10:29:20

PROJECT INFORMATION

Company: PBW, LLC
Client: UPRR
Project: 1358
Location: HWPW, Houston, TX
Test Well: MW-36D
Test Date: 7/22/10

AQUIFER DATA

Saturated Thickness: 35. ft Anisotropy Ratio (Kz/Kr): 0.1

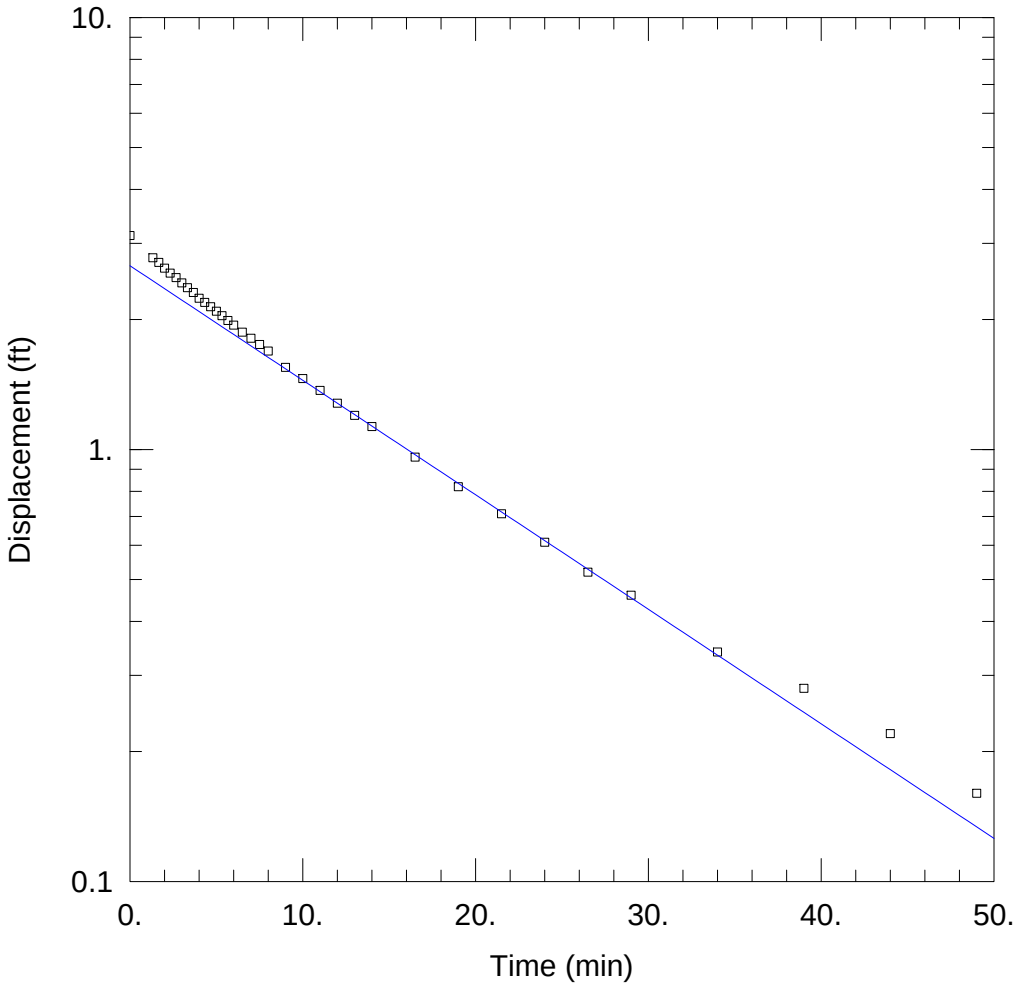
WELL DATA (MW-36D)

Initial Displacement: 3.13 ft Static Water Column Height: 24.53 ft
Total Well Penetration Depth: 24.53 ft Screen Length: 10. ft
Casing Radius: 0.0833 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 3.875E-5 cm/sec y0 = 2.522 ft



MW-36D SLUG OUT 3

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PROJECT INFORMATION

Company: PBW, LLC
Client: UPRR
Project: 1358
Location: HWPW, Houston, TX
Test Well: MW-36D
Test Date: 7/22/10

AQUIFER DATA

Saturated Thickness: 35. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-36D)

Initial Displacement: 3.13 ft Static Water Column Height: 24.53 ft
Total Well Penetration Depth: 24.53 ft Screen Length: 10. ft
Casing Radius: 0.0833 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice
K = 4.084E-5 cm/sec y0 = 2.663 ft

VII. Closure and Post-Closure Plans

Submit a full closure plan and post-closure plan, if applicable, which contains all the information required by 30 TAC 335.8, 335.169, 335.172, 335.174, 335.177-335.178, 335.551-335.569, 30 TAC Chapter 350, 40 CFR 264.112, 264.118, 264.178, 264.197, 264.228, 264.258, 264.280, 264.310, 264.351, 264.575, 264.601, 264.603, 264.1102, 270.14(b)(13), 270.17(f), 270.18(h), 270.20(f), 270.21(e), 270.23(a)(2) & (3), and 270.26(c)(16) where applicable. The owner of property on which an existing disposal facility is located must also submit documentation that a notation has been placed in the deed to the facility that will in perpetuity notify any potential purchasers of the property that the land has been used to manage hazardous wastes and its use is restricted (see 30 TAC 335.5). For hazardous waste disposal units that were closed before submission of the application, the applicant should submit documentation to show that plats and notices required under 40 CFR 264.116 and 264.119 have been filed.

A. Closure

Not Applicable. The surface impoundment has been clean closed.

This section applies to the owners and operators of all hazardous waste management facilities to be permitted. The applicant must close the facility in a manner that minimizes need for further maintenance and controls, or eliminates, to the extent necessary to protect human health and the environment, the post-closure release of hazardous waste, hazardous constituents, leachate, contaminated rainfall, or waste decomposition products to the groundwater, surface waters, or to the atmosphere.

The facility type and type of unit to be closed can determine the level of detail sufficient for a closure plan.

For each unit to be permitted, complete Table VII.A. - Unit Closure and list the facility components to be decontaminated, possible methods of decontamination, and possible methods of disposal of wastes and waste residues generated during unit closure.

Additionally, if the applicant plans to close a surface impoundment in accordance with 30 TAC 335.169(a)(1) and the impoundment does not comply with the liner requirements of 30 TAC Section 335.168(a) then the closure plan for the impoundment must include both a plan for complying with 30 TAC 335.169(a)(1) and a contingent plan for complying with 30 TAC 335.169(a)(2).

Guidance on design of a closure cap and final cover for landfills is given in TCEQ Technical Guideline No. 3, and EPA publication 530-SW-85-014 presents guidance on construction quality assurance of liner construction.

If a waste pile does not comply with the liner requirements of 30 TAC Section 335.170(a)(1) then the closure plan for the waste pile must include both a plan for complying with 40 CFR 264.258(a) and a contingent plan for complying with 40 CFR 264.258(b).

The final certification of closure of a land treatment unit may be prepared by an independent qualified soil scientist in lieu of an independent licensed Professional Engineer.

B. Closure Cost Estimate (including contingent closure) [30 TAC 335.178, 40 CFR 264.142]

Not Applicable. The surface impoundment has been clean closed.

This section applies to owners or operators of all hazardous waste facilities, except state and federal agencies. A detailed estimate, in current dollars, of the cost of closing the facility should be included in the report. The cost estimate must include the cost of closure at the point in the facilities operating life when the extent and manner of its operation would make closure the most expensive. The TCEQ has published Technical Guideline No. 10, Closure and Post-Closure Cost Estimates, for calculating closure costs which should be consulted. Closure costs should be developed on the basis of abandonment of the

site at full capacity and closure activities to be conducted by a third party with no operable on-site equipment. The costs for closing each unit must be detailed.

1. If closure costs are based on contractor bids, the applicant should submit a copy of the bid specification and each contractor's response.

2. If closure costs are based on a detailed analysis, the applicant should submit details of item costs and number of each item, and details of costs for equipment rental, third party labor and supervision, transportation, analytical costs, etc. Provide an itemized cost on Table VII.B. - Unit Closure Cost Estimate for a complete, third party permitted facility closure.

   As units are added or deleted from these tables through future permit amendments or modifications, the remaining itemized unit costs should be updated for inflation when re-calculating the revised total cost in current dollars.

3. The closure plan may propose on-site disposal of wastes, residues, etc. during closure of a unit, and this may be executed if on-site capacity exists in other units during closure of a unit. However, the cost estimate for closure must be based on off-site shipment and disposal during closure of all wastes, waste residues, wastes generated by decontamination, contaminated stormwater, and leachate.

4. For each surface impoundment, waste pile, or tank system required to have a contingent closure plan, the cost for closure under the contingent closure plan should be detailed, as well as the cost of proposed closure. The more expensive of the cost of the proposed closure of a unit versus the cost of the contingent closure of the unit should be used in the total facility closure cost estimate.

C. Post-closure

The attached report provides a post-closure care plan for the regulated unit.

This section applies to owners or operators of all hazardous waste disposal facilities. This section also applies to certain waste piles, tanks and surface impoundments from which the owner or operator intends to remove wastes at closure but which are required to have contingent post-closure plans.

Post-closure care of each hazardous waste management unit must continue for 30 years after the date of completing closure of the unit and must consist of monitoring and reporting of the groundwater monitoring systems in addition to the maintenance and monitoring of waste containment systems. Continuation of certain security requirements may be necessary after the date of closure. Post-closure use of property on or in which hazardous waste remains after closure must never be allowed to disrupt the integrity of the containment system. In addition, submit the following information.

1. The post-closure care plan for a landfill or of a surface impoundment, waste pile, miscellaneous unit, or tank system closed with wastes or waste constituents left in place, or closed under a contingent closure plan, must demonstrate compliance with 30 TAC 335.174(b).

2. The name, address, and phone number of the person or office to contact about the disposal facility during the post-closure period; and

3. A discussion of the future use of the land associated with each unit.

4. For landfills, surface impoundments, waste piles, and land treatment areas closed under interim status, submit the required documentation of 40 CFR 270.14(b)(14).

Not Applicable. The surface impoundment is not closed under interim status.

5. Landfills, surface impoundments, waste piles and land treatment areas that received hazardous wastes after July 26, 1982 or for which closure was certified after January 26, 1983 must be included in post-closure care plans unless they have been determined to have closed by removal equivalent to the closure standards in 40 CFR 264 Subpart G. If such a demonstration has been made pursuant to 40 CFR 270.1(c)(5), but an equivalency determination has not been made, please submit a copy of the demonstration documentation. If an equivalency determination has been made pursuant to 40 CFR 270.1(c)(6), applicant should submit a copy of the determination. Complete Table VII.C.5. - Land-Based Units Closed Under Interim Status for all land based units closed under interim status.

D. Post-closure Cost Estimate [40 CFR 264.144]

The attached report provides a post-closure care plan for the regulated unit.

This section regarding post-closure cost estimate applies to owners or operators of all hazardous waste disposal facilities, except state and federal agencies, and certain waste piles, tank systems, and surface impoundments from which the owner or operator intends to remove wastes at closure, but which are required to have contingent closure and post-closure plans. A detailed estimate, in current dollars, of the annual cost of monitoring and maintenance of the facility in accordance with the applicable post-closure regulations must be included in the report. The TCEQ has published Technical Guideline No. 10 for calculating post-closure costs, which should be consulted. Costs should be developed in detail for 30 years of post-closure care activities to be conducted by a third party, for each applicable unit.

1. The applicant should submit details of item costs and number of each item for off-site disposal of leachate and bailed monitor well water, labor and supervision, monitor well sampling and analyses, inspection and repair of the cap(s), mowing and re-seeding of the vegetative cover, maintaining site security, etc. Provide an itemized cost estimate on Table VII.D. - Unit Post-Closure Cost Estimate for complete, third party permitted facility post-closure care.

   As units are added or deleted from these tables through future permit amendments or modifications, the remaining itemized unit costs should be updated for inflation when re-calculating the revised total cost in current dollars.

2. Total annual cost of post-closure care for the facility including costs of contingent post-closure care should be multiplied by 30 years.[3]

E. Closure and Post-Closure Cost Summary

Please complete Table VII.E.1 - Permitted Unit Closure Cost Summary. – **Not Applicable. The surface impoundment has been clean closed.**

Please complete Table VII.E.2 - Permitted Unit Post-Closure Cost Summary. – **Table VII.E.2 is attached.**

[3] or the remainder of 30 years from the date of closure certification for each unit if the unit has been previously certified closed.

Table VII.A. - Unit Closure
Not Applicable

For each unit to be permitted, list the facility components to be decontaminated, the possible methods of decontamination, and the possible methods of disposal of wastes and waste residues generated during unit closure:

Equipment of HWM Unit	Possible Methods of Decontamination[1]	Possible Methods of Disposal[1]

[1]Applicants may list more than one appropriate method.

Table VII.B. - Unit Closure Cost Estimate
Not Applicable

Task	Cost
(Name of permitted unit, e.g.,. Tank TK-1)	
Verbal description of task *(waste amount generated x disposal cost/unit amount)*	$$,$$$
Verbal description of task *(waste amount generated x disposal cost/unit amount)*	$$,$$$
Verbal description of task *(waste amount generated x disposal cost/unit amount)*	$$,$$$
Verbal description of task *(waste amount generated x disposal cost/unit amount)*	$$,$$$
Other tasks *(such as labor, lab analysis, transportation, certifications, etc.)*	$$,$$$
Other tasks	$$,$$$
subtotal	**$$$,$$$**
Contingency (10% minimum)	**$$,$$$**
Total Unit Closure Cost	**$$$,$$$ (20__)**
(Name of permitted unit, e.g.,. Surface Impoundment West)	
Verbal description of task *(waste amount generated x disposal cost/unit amount)*	$$,$$$
Verbal description of task *(waste amount generated x disposal cost/unit amount)*	$$,$$$
Verbal description of task *(waste amount generated x disposal cost/unit amount)*	$$,$$$
Verbal description of task *(waste amount generated x disposal cost/unit amount)*	$$,$$$
Other tasks *(such as labor, lab analysis, transportation, certifications, etc.)*	$$,$$$
Other tasks	$$,$$$
subtotal	**$$$,$$$**
Contingency (10% minimum)	**$$,$$$**
Total Unit Closure Cost	**$$$,$$$ (20__)**

Total Permitted Facility Closure Cost *(all unit costs combined)*	**$,$$$,$$$ (20__)**

Table VII.C.5. - Land-Based Units Closed Under Interim Status Not Applicable

N.O.R. Unit #	Unit Description[1,2]	Date of Receipt of Last Waste[3]	Date of Closure Certification[3]

[1]Indicates a unit for which a 40 CFR 264 closure equivalency determination has been requested pursuant to 40 CFR 270.1(c)(5).

[2]Indicates a unit for which a 40 CFR 264 closure equivalency determination has been made pursuant to 40 CFR 270.1(c)(6).

[3]Give month, day, and year.

Table VII.D. - Unit Post-Closure Cost Estimate

Task	Cost
SWMU No. 1	
Task 1 – Post-Closure Care Inspections and Maintenance	**$11,016**
Task 2 – Sample Collection and Analysis	**$12,401**
Task 3 – Annual Groundwater Monitoring Report	**$5,322**
subtotal	**$28,739**
Contingency (10% minimum)	**$2,873.90**
Total Unit Post-Closure Care Cost x 10 yrs.	**$316,129 (2019) (10 years)**
SWMU No. 1	
Task 4 – Well Casing Surveys (occurs every 5 years)	**$10,877**
Task 5 – Groundwater POC plugging	**$13,108**
subtotal	**$23,985**
Contingency (10% minimum)	**$2,399**
Total Unit Post-Closure Care Cost (one time cost+	**$26,384 (2019) (one time cost)**

Total Permitted Facility Post-Closure Cost (all unit costs combined)	**$342,513 (2019)**

Table VII.E.1. - Permitted Unit Closure Cost Summary
Not Applicable

Existing Unit Closure Cost Estimate	
Unit	Cost

Total Existing Unit Closure Cost Estimate	(200_)[4]

Proposed Unit Closure Cost Estimate	
Unit	Cost

[4]As units are added or deleted from these tables through future permit amendments or modifications, the remaining itemized unit costs should be updated for inflation when re-calculating the revised total cost in current dollars.

Table VII.E.2. - Permitted Unit Post-Closure Cost Summary

Existing Unit Post-Closure Cost Estimate	
Unit	Cost
SWMU No. 1	**$342,513 (2019)**
Total Existing Unit Post-Closure Cost Estimate	**$342,513 (in 2019 Dollars)[1]**

Proposed Unit Post-Closure Cost Estimate	
Unit	Cost

[1]As units are added or deleted from these tables through future permit amendments or modifications, the remaining itemized unit costs should be updated for inflation when re-calculating the revised total cost in current dollars.

VII. CLOSURE AND POST-CLOSURE CARE PLANS

CLOSURE AND POST-CLOSURE CARE PLANS
PART B PERMIT APPLICATION
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

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LIST OF PART B APPLICATION FORM TABLES

LIST OF ATTACHMENTS

VII.C. POST-CLOSURE

Background

This Post-Closure Care Plan was prepared to describe maintenance, monitoring, and response activities for the Houston Wood Preserving Works facility at 4910 Liberty Road, Houston, Texas. Currently, post-closure care includes the semi-annual monitoring of the two uppermost groundwater bearing units, the A-Transmissive Zone (A-TZ) and the B-Transmissive Zone (B-TZ).

Solid Waste Management Unit (SWMU) No. 1 is an inactive surface impoundment and is a grass-covered section of land located at the southwest comer of the facility property (Figure VI.A). SWMU No. 1 was built in 1979 for the disposal of contaminated surface soils remediated from an adjacent low-lying ponding area (AOC 6). Surface soils from the ponding area were remediated in response to a fire in 1979 and the discovery of contaminated soils. Installation of SWMU No. 1 was based on an agreement with the Texas Department of Water Resources (TDWR) for disposal of the soils.

SWMU No. 1 is bordered on the southern side by an earthen berm, which is about 2 feet by 3 feet by about 80 to 100 feet long. The berm extends about 100 feet south of the southwest corner of the SWMU No. 1. A chain-link security fence is located along the northern and western margins of SWMU No. 1. The original dimensions of the unit were about 180 feet by 106 feet at the surface, extending to a depth of about 7 feet bgs (SPTCo, 1991). Based on these dimensions, SWMU No. 1 would have a capacity of 133,560 cubic feet (about 4,950 cubic yards). According to Southern Pacific Transportation Company (SPTCo) facility representatives, a clay liner was installed during the original construction of SWMU No. 1. No information was available concerning the thickness and engineering properties of the liner.

In 1984, SPTCo closed SWMU No. 1 by excavating the soils and materials contained within the unit. The visual hazardous material was removed along with apparent contaminated soil. An additional 3-inches of soil was then removed. The area was then divided into 50-foot grids which were randomly selected for sampling. Between 10 and 15 grab samples not more than 6-inches deep were homogenized and analyzed for K001 listed waste parameters and polycyclic aromatic hydrocarbons (PAHs). When soil confirmation sample concentrations were lower than those of background samples, the excavated area was backfilled with compacted clay and a groundwater monitoring system was installed (Rollins, 1984).

In 1991, a series of six soil borings were drilled within the same six grid areas that were sampled during the 1984 closure operations (Geo Associates, 1991). Four samples were collected from each of the borings

from the following zones: the surficial clay fill, between the clay fill and the uppermost sand, the uppermost sand, and below the uppermost sand unit. These samples were analyzed for benzene, toluene, ethylbenzene and xylene (BTEX), total petroleum hydrocarbons (TPH) and semi-volatiles.

Bis (2-ethylhexyl) phthalate was detected in two samples at concentrations well below the TCEQ Texas Risk Reduction Program (TRRP) Protective Concentration Limits (PCL). Xylene, ethylbenzene and toluene were also detected, but at concentrations well below the PCL. The 1991 soil sampling results indicated that the source of contamination had been removed by the 1984 closure activities (SPTCo, 1991).

In 1984, the facility then began investigating and monitoring the shallow ground water in the vicinity of SWMU No. 1. Between 1984 and 1991, nine groundwater monitoring wells were installed in the upper zone, and three piezometers were installed in the lower permeable zone. Hydrogeological data collected from these wells and piezometers indicate hydraulic conductivity between the zones. Analytical data compiled from 1984 until 1991 indicated that benzene, toluene, naphthalene, 2,4-dimethylphenol, and phenol were the most frequently detected parameters and that naphthalene was the parameter detected at the highest concentrations. Even though the SWMU was clean closed in 1984, a groundwater release was identified and the facility entered into post-closure care in 1994, updated in 2005, and groundwater monitoring has taken place on a semi-annual basis since that time.

Constituent concentrations in groundwater were below their respective groundwater protective standards (GWPS) between 2006 and 2019, compliant with the TCEQ Remedy Standard A requirements for groundwater protection. Naphthalene was detected above the GWPS at one of the point of compliance (POC) wells in July 2019 and verified in October 2019, but returned to below GWPS in January 2020. RCRA-Regulated Waste Management Unit 001 (SWMU 1) will remain in the corrective action program until concentrations in the POC wells are below respective GWPS for three consecutive years in accordance with Section IV.F.3 of the Compliance Plan (Section IX).

VII.C.1. Post-Closure Care

The primary components for post-closure care for SWMU No. 1 include the following items:

- Maintain vegetative cover;
- Maintain the perimeter security fences, gates and warning signs;
- Maintain the integrity of the groundwater monitoring wells; and
- Monitor the quality of groundwater.

VII.C.1.a. Inspection Schedule

Site inspections will be performed to document site conditions during the pose-closure care period. The inspections are scheduled semi-annually and will coincide with the semi-annual sampling events, with additional inspections to be conducted after major storm events and flood conditions. The schedule of inspections is included in Attachment VII.C.1. The Post-Closure Inspection Schedule Record Form (Attachment VII.C.2) will be completed as a record of each inspection.

VII.C.1.b. Security

Security controls will be evaluated at each inspection. The integrity of the entire perimeter fence for the closed area will be inspected. The base of the fence area will be inspected for erosion which may result in space beneath the fence large enough for passage of animals or people. Hinges and locks on gates will be checked for signs of wear or breakage. Surveyed benchmarks will be inspected for damage and replaced as necessary.

VII.C.1.c. Monitoring Wells

Monitoring wells will be inspected for signs of damage, including well pads, casing, locks and protective covers.

VII.C.1.d Vegetative Cover

The vegetative cover on the closed SWMU No. 1 will be inspected for proper drainage, signs of erosion and loss of vegetative cover. Repairs to the vegetative cover will be made as necessary to correct the effects of settling, subsidence, erosion, or other events. Vegetation may require periodic application of fertilizer, mulch or seed. Mowing will be performed as needed and only periodically to promote the growth of desired vegetation and to block the growth of trees or shrubs.

VII.C.1.e. Corrective Action

VII.C.1.e. Corrective Action

Corrective action will be taken within 30 days of discovering a problem at the site, facility unit and/or monitoring wells.

VII.C.2. Facility Contact

The facility contact is:

Kevin Peterburs
Manager, Environmental Site Remediation
Union Pacific Railroad Company
4823 N 119th Street
Milwaukee, WI 53225
Phone: 414-267-4164
kjpeterb@up.com

VII.C.2.a. Facility Records

All plans, reports, financial assurance information, correspondence, and related records will be maintained at the following location:

Union Pacific Railroad Company
1400 Douglas St., STOP 1030
Omaha, NE 68179
Phone: 402-544-5000

In accordance with 40 CFR 264.15(b)(2) and (d), copies of all inspection records will be maintained for at least three years from the date of inspection.

VII.C.2.b. Amendment of Plan

In accordance with 40 CFR 264.118(d), a written notification of or a request for a permit modification will be submitted to authorize a change in the post-closure plan. The request will be submitted at least 60 days prior to the proposed change in design or operation, or no later than 60 days after an unexpected event has occurred which has affected the post-closure plan. A copy of the amended post-closure plan will be included in the notification or request.

VII.C.2.c. Certification of Completion of Post-closure Care

The Site is currently in year 26 (2020) of the 30 years required for post-closure care. In accordance with 40 CFR 264.120, no later than 60 days after completion of the established post-closure care period for the closed hazardous waste disposal unit, UPRR will submit, by registered mail, a certification that the post-

closure care period was performed in accordance with the post-closure care plan. The certification will be signed by UPRR and an independent registered professional engineer.

VII.C.3. Proposed Post-Closure Use of Property

UPRR intends to maintain the Site as an open vegetated area with restricted access. The regulated unit will be part of the on-site Plume Management Zone (PMZ) discussed in detail in Section XI – Compliance Plan Attachment D of this Permit application. Any future use of the site would be contingent upon approval of the TCEQ.

VII.C.4. Closure Under Interim Status

The surface impoundment is not closed under interim status.

VII.D. POST-CLOSURE COST ESTIMATE

A detailed cost estimate for post-closure care is summarized in Table VII.D of the Part B renewal application form included with the post-closure care plan. These costs cover semi-annual sampling and mowing for the ten years left for the post-closure care period.

TABLES

TABLE VII.A.1
SWMU NO. 1 A-TZ UNIT GROUNDWATER MONITORING DATA
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well ID	Constituent	2-Methyl naphthalene	Acenaphthene	Acenaphthylene	Anthracene	bis(2-Ethylhexyl) phthalate	Dibenzofuran	Fluoranthene	Fluorene	Naphthalene	Phenanthrene	Pyrene
	PCL (mg/L)	0.098	1.5	1.5	7.3	0.006	0.098	0.98	0.98	0.49	0.73	0.73
MW-01A	3/27/2000	0.022	0.24	0.005	0.009	0.0007 JB	**0.12**	0.01	0.14	0.13	0.068	0.005
MW-01A	9/25/2000	**0.36**	0.46	0.005	0.024	0.002 J	**0.33**	0.022	0.32	0.068	0.23	0.011
MW-01A	4/27/2001	0.012	0.17	0.004	0.005	0.0005 U	0.091	0.007	0.092	0.24	0.042	0.003
MW-01A	9/28/2001	0.0003 U	0.36	0.005	0.007	0.0005 U	**0.18**	0.01	0.17	0.065	0.1	0.006
MW-01A	3/19/2002	0.033	0.12	0.003	0.004	0.0006 J	0.065	0.006	0.07	0.11	0.028	0.003
MW-01A	9/25/2002	0.002	0.26	0.002	0.008	0.0004 U	**0.17**	0.01	0.17	0.005	0.033	0.005
MW-01A	3/17/2004	0.005221	0.04226	0.000785	0.001854	0.000973	0.0194	0.003337	0.02334	0.000919	0.002194	0.00117
MW-01A	3/4/2005	0.0882	0.224	0.00326	0.00754	0.00035 U	**0.101**	0.00935	0.124	0.12	0.0182	0.00362
MW-01A	7/19/2005	**0.1036**	0.245	0.00221	0.0101	0.000356 U	**0.11**	0.0139	0.137	0.0216	0.0233	0.00593
MW-01A	9/8/2005						**0.133**					
MW-01A	1/6/2006	0.00169	0.0937	0.00387	0.0021	0.000356 U	0.0143	0.00557	0.0221	0.000519	0.00065	0.0025
MW-01A	7/28/2006	0.0205	0.163	0.00182	0.00613	0.00009 U	0.0639	0.0079	0.0792	0.00292	0.00698	0.00376
MW-01A	1/23/2007	0.000262	0.0509	0.00137	0.00226	0.00009 U	0.00839	0.00251	0.0155	0.000302	0.000229	0.00105
MW-01A	7/18/2007	0.00133 U	0.11	0.00114 U	0.000952 U	0.00352 U	0.00849 J	0.00696 J	0.0514	0.00124 U	0.00336 J	0.00304 J
MW-01A	1/28/2008	0.00044 U	0.0415	0.00099	0.00129	0.00022 U	0.00129	0.00234	0.0162	0.00044 U	0.00022 U	0.00107
MW-01A	7/16/2008	0.0109	0.126	0.00143	0.00267	0.00137 J	0.00774	0.00923	0.0659	0.0168	0.00177	0.00417
MW-01A	1/22/2009	0.0069	0.054	0.0007 U	0.0012 J	0.0012 U	0.0058	0.0024 J	0.028	0.0008 U	0.001 J	0.001 J
MW-01A	7/22/2009	0.0017 J	0.085	0.0005 U	0.0011 J	0.0033 U	0.0037 J	0.0037 J	0.04	0.0029 J	0.0005 U	0.0019 J
MW-01A	1/22/2010	0.0019 J	0.04	0.0005 U	0.0006 U	0.0033 U	0.0016 J	0.0017 J	0.022	0.0043 J	0.0005 U	0.0005 U
MW-01A	7/14/2010	0.0009 U	0.068	0.0005 U	0.0017 J	0.0033 U	0.0044 J	0.004 J	0.04	0.0006 U	0.0011 J	0.0021 J
MW-01A	1/11/2011	0.0009 U	0.07	0.0011 J	0.0021 J	0.0033 U	0.0007 U	0.0025 J	0.039	0.0006 U	0.0005 U	0.0011 J
MW-01A	7/13/2011	0.0068	0.1	0.0011 J	0.0029 J	0.003 J	0.0054	0.0062	0.056	0.0005 U	0.002 J	0.0028 J
MW-01A	1/31/2012	0.0005 U	0.029	0.0005 U	0.0005 U	0.0005 U	0.0045 J	0.0012 J	0.0013 J	0.0005 U	0.0005 U	0.0005 U
MW-01A	7/11/2012	0.012	0.084	0.0017 J	0.003 J	0.0005 U	0.025	0.0047 J	0.041	0.0005 U	0.0033 J	0.0021 J
MW-01A	1/9/2013	0.00125	0.117	0.00222	0.000285 J	0.00163	0.0141	0.00602	0.0564	0.00219	0.00388	0.00261
MW-01A	7/11/2013	0.00193	0.098	0.00122	0.0022	0.000356 U	0.00264	0.00399	0.0323	0.0169	0.00109	0.00165
MW-01A	1/8/2014	0.00222	0.0895	0.00093	0.003	0.000838 J	0.00951	0.00257	0.0369	7.41E-05 U	0.00175	0.0013
MW-01A	7/2/2014	0.00865	0.0848	0.00138	0.00326	0.000349 U	0.0132	0.0043	0.0369	0.074	0.00537	0.00204
MW-01A	1/15/2015	0.00007 U	0.0594	0.00104	0.00139	0.00533	0.000541	0.00246	0.0209	0.000121 J	0.000335 J	0.00105
MW-01A	7/8/2015	0.00063	0.086	0.0009	0.0018	0.0002	0.0032	0.0034	0.038	0.00083	0.0012	0.0015

TABLE VII.A.1
SWMU NO. 1 A-TZ UNIT GROUNDWATER MONITORING DATA
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well ID	Constituent	2-Methyl naphthalene	Acenaphthene	Acenaphthylene	Anthracene	bis(2-Ethylhexyl) phthalate	Dibenzofuran	Fluoranthene	Fluorene	Naphthalene	Phenanthrene	Pyrene
	PCL (mg/L)	0.098	1.5	1.5	7.3	0.006	0.098	0.98	0.98	0.49	0.73	0.73
MW-02	3/27/2000	0.0004 J	0.022	0.0006 J	0.002	0.0006 JB	0.017	0.002 J	0.016	0.011	0.001 J	0.0007 J
MW-02	9/25/2000	0.005	0.033	0.001 J	0.002	0.0005 U	0.033	0.003	0.031	0.24	0.002	0.001 J
MW-02	4/26/2001	0.0009 J	0.01	0.0003 J	0.002 J	0.0005 U	0.008	0.003	0.009	0.028	0.002	0.002 J
MW-02	9/28/2001	0.001 J	0.012	0.0005 J	0.002 J	0.0005 U	0.01	0.002 J	0.01	0.034	0.003	0.001 J
MW-02	3/13/2002	0.0006 J	0.015	0.0004 J	0.001 J	0.0005 U	0.012	0.001 J	0.013	0.006	0.001 J	0.0007 J
MW-02	9/24/2002	0.0004 J	0.02	0.0004 J	0.001 J	0.0004 U	0.014	0.001 J	0.014	0.013	0.001 J	0.0007 J
MW-02	3/17/2004	0.001694	0.03018	0.000418 J	0.001494	0.000172 U	0.01945	0.001861	0.02035	0.000604	0.002468	0.00088
MW-02	3/4/2005	0.00008 J	0.0394	0.0004 J	0.00114	0.00035 U	0.0152	0.00421	0.0268	0.00161	0.00024 J	0.00183
MW-02	7/19/2005	0.00007 U	0.0031	0.00006 U	0.00032 J	0.000352 U	0.00245	0.000796	0.00268	0.00006 U	0.00036 J	0.00042 J
MW-02	1/5/2006	0.00046 J	0.0142	0.00128	0.000857	0.00037 U	0.0152	0.00113	0.0148	0.0053	0.00024 J	0.00041 J
MW-02	7/28/2006	0.000622	0.0098	0.0002	0.000783	0.00018 J	0.00767	0.00123	0.00604	0.0106	0.00103	0.00063
MW-02	1/23/2007	0.00008 U	0.00675	0.00015 J	0.000542	0.00009 U	0.00488	0.000625	0.00479	0.000406	0.00005 J	0.0003
MW-02	7/18/2007	0.0024 J	0.0256	0.00114 U	0.00138 J	0.00352 U	0.0174	0.00165 J	0.0157	0.0188	0.00167 J	0.00095 U
MW-02	1/28/2008	0.00038 U	0.017	0.00028 U	0.000922	0.00049 J	0.0106	0.0015	0.0119	0.000827	0.000532	0.00082
MW-02	7/16/2008	0.00039 U	0.0218	0.0003 J	0.00042 J	0.00019 U	0.00673	0.000961	0.0103	0.00118	0.00019 U	0.00045 J
MW-02	1/22/2009	0.0008 U	0.014	0.0007 U	0.0007 U	0.0012 U	0.0007 U	0.0006 U	0.0039 J	0.0008 U	0.0007 U	0.0009 U
MW-02	7/22/2009	0.0025 J	0.032	0.0005 U	0.0006 U	0.0033 U	0.0042 J	0.0011 J	0.015	0.012	0.0005 U	0.0005 U
MW-02	1/22/2010	0.0009 U	0.0073	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0037 J	0.0006 U	0.0005 U	0.0005 U
MW-02	7/14/2010	0.0009 U	0.018	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.011	0.0006 U	0.0005 U	0.0005 U
MW-02	1/11/2011	0.0009 U	0.0078	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0049 J	0.0006 U	0.0005 U	0.0005 U
MW-02	7/13/2011	0.0021 J	0.026	0.0005 U	0.0005 U	0.0021 J	0.0038 J	0.0012 J	0.015	0.0037 J	0.0005 U	0.0005 U
MW-02	1/30/2012	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
MW-02	7/10/2012	0.0005 U	0.0088	0.0005 U	0.0005 U	0.0005 U	0.0043 J	0.0005 U	0.0043 J	0.0033 J	0.0005 U	0.0005 U
MW-02	1/9/2013	0.00318	0.0384	0.00057	0.00129	0.000874	0.0178	0.00147	0.0201	0.0211	0.00241	0.00087
MW-02	7/11/2013	0.000897	0.0179	0.000335 J	0.0013	0.000356 U	0.00734	0.00069	0.00986	0.00754	0.000776	0.00034 J
MW-02	1/8/2014	6.48E-05 U	0.000445 J	0.000101 J	0.00131	0.000343 U	0.000147 J	0.000307 J	0.00026 J	7.41E-05 U	0.000122 J	0.00018 J
MW-02	7/2/2014	0.000509	0.00452	0.0000979 J	0.000596	0.000349 U	0.00301	0.000368 J	0.00357	0.00653	0.000594	0.0002 J
MW-02	1/15/2015	0.000105 J	0.0026	0.0000892 J	0.000153 J	0.000426 J	0.000377 J	0.00007 U	0.00068	0.000472 J	0.000162 J	0.00011 U
MW-02	7/8/2015	0.00013	0.001	0.000015	0.000078	0.00013	0.00075	0.00001	0.00067	0.0013	0.00011	1.9E-05

TABLE VII.A.1
SWMU NO. 1 A-TZ UNIT GROUNDWATER MONITORING DATA
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well ID	Constituent	2-Methyl naphthalene	Acenaphthene	Acenaphthylene	Anthracene	bis(2-Ethylhexyl) phthalate	Dibenzofuran	Fluoranthene	Fluorene	Naphthalene	Phenanthrene	Pyrene
	PCL (mg/L)	0.098	1.5	1.5	7.3	0.006	0.098	0.98	0.98	0.49	0.73	0.73
MW-07	3/29/2000	0.0004 U	0.0002 J	0.0009 U	0.0006 J	0.0007 JB	0.0006 U	0.0004 U	0.0005 U	0.0001 J	0.00007 J	0.0003 U
MW-07	9/26/2000	0.0003 U	0.017	0.0002 J	0.0005 J	0.001 J	0.001 J	0.0008 J	0.0004 J	0.0003 J	0.0003 U	0.001 J
MW-07	4/25/2001	0.0003 U	0.0003 U	0.0002 U	0.001 J	0.0005 U	0.0003 U	0.0004 U	0.0003 U	0.0003 U	0.0003 U	0.0003 U
MW-07	9/27/2001	0.0003 U	0.006	0.0002 U	0.002 J	0.0006 J	0.0003 U	0.001 J	0.0003 U	0.0003 U	0.0004 J	0.0009 J
MW-07	3/11/2002	0.0003 U	0.0005 J	0.0002 U	0.0008 J	0.001 J	0.0003 U	0.0004 U	0.0003 U	0.0003 U	0.0003 U	0.0003 U
MW-07	9/25/2002	0.00007 U	0.0009 J	0.00006 U	0.0007 J	0.0004 U	0.00008 J	0.0004 J	0.0001 J	0.0005 J	0.00009 U	0.0006 J
MW-07	3/16/2004	0.000067 U	0.000285 J	0.000076 U	0.000219 J	0.000172 U	0.000076 U	0.000093 U	6.8E-05 U	0.000067 U	0.000077 U	8.4E-05 U
MW-07	3/1/2005	0.00007 U	0.0001 J	0.00006 U	0.0004 J	0.000791	0.00008 U	0.00008 U	0.00007 U	0.00006 U	0.00009 U	0.00009 U
MW-07	7/19/2005	0.00007 U	0.0015	0.00006 U	0.000653	0.000352 U	0.00015 J	0.00017 J	0.00007 U	0.00006 U	0.00009 U	0.00026 J
MW-07	1/5/2006	0.00007 U	0.00286	0.00008 J	0.000537	0.000422 J	0.00009 J	0.00008 U	0.00038 J	0.00019 J	0.00009 U	0.00009 U
MW-07	7/28/2006	0.00008 U	0.00362	0.00008 U	0.000417	0.00009 U	0.00006 U	0.000275	0.00018 J	0.00007 U	0.00004 U	0.00053
MW-07	1/23/2007	0.00008 U	0.00004 U	0.00008 U	0.000353	0.00009 U	0.00006 U	0.00004 U	0.00004 U	0.000637	0.00004 U	0.00004 U
MW-07	7/17/2007	0.00133 U	0.00114 U	0.00114 U	0.000952 U	0.00352 U	0.0041 U	0.000952 U	0.00095 U	0.00124 U	0.000952 U	0.00095 U
MW-07	1/28/2008	0.00038 U	0.00028 U	0.00028 U	0.000516	0.00019 U	0.00028 U	0.00019 U	0.00019 U	0.00038 U	0.00019 U	0.00019 U
MW-07	7/16/2008	0.00039 U	0.00029 U	0.00044 J	0.000982	0.00019 U	0.00029 U	0.00019 U	0.00019 U	0.000675	0.00036 J	0.00019 U
MW-07	1/22/2009	0.0008 U	0.0008 U	0.0007 U	0.0007 U	0.0012 U	0.0007 U	0.0006 U	0.0008 U	0.0008 U	0.0007 U	0.0009 U
MW-07	7/22/2009	0.0009 U	0.0009 U	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
MW-07	1/22/2010	0.0009 U	0.0009 U	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
MW-07	7/14/2010	0.0009 U	0.0009 U	0.0005 U	0.0006 U	0.0049 J	0.0007 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
MW-07	1/12/2011	0.0009 U	0.0009 U	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
MW-07	7/12/2011	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
MW-07	1/31/2012	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
MW-07	7/11/2012	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
MW-07	1/10/2013	0.000066 U	0.00181	0.00011 J	0.000833	0.000349 U	0.0000755 U	0.000066 U	0.00014 J	7.55E-05 U	0.0000566 U	0.0001 U
MW-07	7/11/2013	7.04E-05 U	0.0000804 U	0.0000603 U	0.000749	0.000372 U	0.0000804 U	0.0000704 U	7E-05 U	0.000111 J	0.0000603 U	0.00011 U
MW-07	1/9/2014	6.48E-05 U	0.0000741 U	0.0000556 U	4.63E-05 U	0.000343 U	0.0000741 U	0.0000648 U	6.5E-05 U	7.41E-05 U	0.0000556 U	0.0001 U
MW-07	7/3/2014	0.000066 U	0.0000755 U	0.0000566 U	0.000696	0.000349 U	0.0000755 U	0.000066 U	6.6E-05 U	7.55E-05 U	0.0000566 U	0.0001 U
MW-07	1/15/2015	0.00007 U	0.00008	0.00006 U	0.000271 J	0.000944	0.00008 U	0.000189 J	7.9E-05 J	0.00008 U	0.00006 U	0.00014 J
MW-07	7/8/2015	0.000019	0.000027	0.000015	0.00014	0.00024	0.00002	0.00001	0.00003	0.00002	0.000021	1.9E-05

TABLE VII.A.1
SWMU NO. 1 A-TZ UNIT GROUNDWATER MONITORING DATA
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well ID	Constituent	2-Methyl naphthalene	Acenaphthene	Acenaphthylene	Anthracene	bis(2-Ethylhexyl) phthalate	Dibenzofuran	Fluoranthene	Fluorene	Naphthalene	Phenanthrene	Pyrene
	PCL (mg/L)	0.098	1.5	1.5	7.3	0.006	0.098	0.98	0.98	0.49	0.73	0.73
MW-08	3/27/2000	0.0004 U	0.0007 U	0.0009 U	0.0003 J	0.0006 JB	0.0006 U	0.00005 J	0.0005 U	0.0002 J	0.0001 J	0.00004 J
MW-08	9/25/2000	0.0003 U	0.0003 U	0.0002 U	0.0004 U	0.001 J	0.0003 U	0.0004 U	0.0003 U	0.0003 U	0.0003 U	0.0003 J
MW-08	4/25/2001	0.0003 U	0.002	0.0002 U	0.0006 J	0.0005 U	0.001 J	0.0004 U	0.001 J	0.013	0.0003 U	0.0003 U
MW-08	9/27/2001	0.0003 U	0.0003 U	0.0002 U	0.0008 J	0.0007 J	0.0003 U	0.0005 J	0.0003 U	0.0003 U	0.0003 U	0.0004 J
MW-08	3/12/2002	0.0002 U	0.0003 J	0.0002 U	0.0005 J	0.0005 U	0.0003 U	0.0004 U	0.0003 U	0.0003 U	0.0003 U	0.0003 U
MW-08	9/25/2002	0.00007 U	0.00007 U	0.00006 U	0.0002 J	0.0004 U	0.00007 U	0.00009 U	0.00007 U	0.0001 U	0.00009 U	0.0002 J
MW-08	3/16/2004	0.000067 U	0.000074 U	0.000076 U	0.000124 U	0.000172 U	0.000076 U	0.000093 U	6.8E-05 U	0.000067 U	0.000077 U	8.4E-05 U
MW-08	3/1/2005	0.00007 U	0.00012 J	0.00006 U	0.00015 J	0.00035 U	0.00008 U	0.00008 U	0.00007 U	0.00006 U	0.00009 U	0.00009 U
MW-08	7/18/2005	0.00007 U	0.00007 U	0.00006 U	0.00026 J	0.000356 J	0.00008 U	0.00008 U	0.00007 U	0.00006 U	0.00009 U	0.00012 J
MW-08	1/6/2006	0.00007 U	0.00007 U	0.00006 U	0.00011 J	0.000363 U	0.00008 U	0.00008 U	0.00007 U	0.00006 U	0.00009 U	0.00009 U
MW-08	7/28/2006	0.00008 U	0.00004 U	0.00008 U	0.00018 J	0.00012 J	0.00006 U	0.00004 U	0.00004 U	0.00007 U	0.00004 U	0.00004 U
MW-08	1/22/2007	0.00008 U	0.00004 U	0.00008 U	0.00004 U	0.00009 U	0.00006 U	0.00004 U	0.00004 U	0.00007 U	0.00004 U	0.00004 U
MW-08	7/17/2007	0.00133 U	0.00114 U	0.00114 U	0.00135 J	0.00352 U	0.0041 U	0.000952 U	0.00095 U	0.00124 U	0.000952 U	0.00095 U
MW-08	1/29/2008	0.00044 U	0.00033 U	0.00033 U	0.00031 J	0.00022 U	0.00033 U	0.00022 U	0.00022 U	0.00044 U	0.00022 U	0.00022 U
MW-08	7/16/2008	0.0004 U	0.0003 U	0.00044 J	0.000669	0.0002 U	0.0003 U	0.0002 U	0.0002 U	0.000654	0.00036 J	0.0002 U
MW-08	1/22/2009	0.0008 U	0.0008 U	0.0007 U	0.0007 U	0.0012 U	0.0007 U	0.0006 U	0.0008 U	0.0008 U	0.0007 U	0.0009 U
MW-08	7/22/2009	0.0009 U	0.0009 U	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
MW-08	1/22/2010	0.0009 U	0.0009 U	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
MW-08	7/14/2010	0.0009 U	0.0009 U	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
MW-08	1/12/2011	0.0009 U	0.0009 U	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
MW-08	7/12/2011	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
MW-08	1/31/2012	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
MW-08	7/11/2012	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
MW-08	1/10/2013	0.000066 U	0.0000755 U	0.0000566 U	0.000439 J	0.000349 U	0.0000755 U	0.000066 U	6.6E-05 U	7.55E-05 U	0.0000566 U	0.0001 U
MW-08	7/11/2013	6.86E-05 U	0.0000784 U	0.0000588 U	0.000101 J	0.000363 U	0.0000784 U	0.0000686 U	6.9E-05 U	7.84E-05 U	0.0000588 U	0.00011 U
MW-08	1/9/2014	6.48E-05 U	0.0000741 U	0.0000556 U	0.000494	0.000343 U	0.0000741 U	0.0000648 U	6.5E-05 U	7.41E-05 U	0.0000637 J	0.0001 U
MW-08	7/3/2014	0.000066 U	0.0000755 U	0.0000566 U	4.72E-05 U	0.000349 U	0.0000755 U	0.000066 U	6.6E-05 U	7.55E-05 U	0.0000566 U	0.0001 U
MW-08	1/15/2015	0.00007 U	0.00008	0.00006 U	0.000056 J	0.00037 U	0.00008 U	0.00007 U	0.00007 U	0.00008 U	0.00006 U	0.00011 U
MW-08	7/8/2015	0.000019	0.000027	0.000015	0.000014	0.00013	0.00002	0.00001	0.00003	0.00002	0.000021	1.9E-05

TABLE VII.A.1
SWMU NO. 1 A-TZ UNIT GROUNDWATER MONITORING DATA
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well ID	Constituent	2-Methyl naphthalene	Acenaphthene	Acenaphthylene	Anthracene	bis(2-Ethylhexyl) phthalate	Dibenzofuran	Fluoranthene	Fluorene	Naphthalene	Phenanthrene	Pyrene
	PCL (mg/L)	0.098	1.5	1.5	7.3	0.006	0.098	0.98	0.98	0.49	0.73	0.73
MW-10A	3/28/2000	0.0002 J	0.0869	0 U	0.003	0.0006 JB	0.0019	0.008	0.0353	0.0929	0.0025	0.0053
MW-10A	9/25/2000	0.0003 U	0.004	0.0002 U	0.0004 J	0.001 J	0.0006 J	0.0004 U	0.0006 J	0.0005 J	0.0004 J	0.0003 J
MW-10A	4/27/2001	0.0003 U	0.003	0.0002 U	0.0006 J	0.0007 J	0.0003 U	0.0004 U	0.0003 U	0.0003 U	0.0003 U	0.0003 U
MW-10A	9/28/2001	0.0003 U	0.0006 J	0.0002 U	0.0005 J	0.0005 U	0.0004 J	0.0004 U	0.0004 J	0.0003 U	0.0003 J	0.0003 U
MW-10A	3/12/2002	0.0003 U	0.001 J	0.0002 U	0.0005 J	0.0005 U	0.0003 U	0.0004 U	0.0003 U	0.0003 U	0.0003 U	0.0003 U
MW-10A	9/24/2002	0.00007 U	0.00007 U	0.00006 U	0.00009 U	0.0004 U	0.00007 U	0.00009 U	0.00007 U	0.0001 U	0.00009 U	0.00009 U
MW-10A	3/16/2004	0.000067 U	0.000074 U	0.000076 U	0.000124 U	0.000916	0.000076 U	0.000093 U	6.8E-05 U	0.000067 U	0.000077 U	8.4E-05 U
MW-10A	3/1/2005	0.00007 U	0.00007 U	0.00006 U	0.00013 J	0.00035 U	0.00008 U	0.00008 U	0.00007 U	0.00006 U	0.00009 U	0.00009 U
MW-10A	7/19/2005	0.00007 U	0.00011 J	0.00006 U	0.00007 U	0.000352 U	0.00008 U	0.00008 U	0.00007 U	0.00006 U	0.00009 U	0.00009 U
MW-10A	1/5/2006	0.00007 U	0.00007 U	0.00006 U	0.00011 J	0.000359 U	0.00008 U	0.00008 U	0.00007 U	0.00006 U	0.00009 U	0.00009 U
MW-10A	7/28/2006	0.00008 U	0.000327	0.00008 U	0.00004 U	0.00009 U	0.00017 J	0.00004 U	0.00004 U	0.00007 U	0.00004 U	0.00004 U
MW-10A	1/23/2007	0.00008 U	0.000714	0.00008 U	0.000273	0.00009 U	0.00009 J	0.00004 U	0.00015 J	0.00007 U	0.00004 U	0.00004 U
MW-10A	7/17/2007	0.00133 U	0.00114 U	0.00114 U	0.000952 U	0.00352 U	0.0041 U	0.000952 U	0.00095 U	0.00124 U	0.000952 U	0.00095 U
MW-10A	1/28/2008	0.0004 U	0.0003 U	0.0003 U	0.0002 U	0.0002 U	0.0003 U	0.0002 U	0.0002 U	0.0004 U	0.0002 U	0.0002 U
MW-10A	7/16/2008	0.00038 U	0.00029 U	0.00029 U	0.00019 U	0.0002 J	0.00029 U	0.00019 U	0.00019 U	0.00038 U	0.00019 U	0.00019 U
MW-10A	1/22/2009	0.0008 U	0.0008 U	0.0007 U	0.0007 U	0.0012 U	0.0007 U	0.0006 U	0.0008 U	0.0008 U	0.0007 U	0.0009 U
MW-10A	7/22/2009	0.0009 U	0.0009 U	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
MW-10A	1/21/2010	0.0009 U	0.0009 U	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
MW-10A	7/13/2010	0.0018 J	0.0018 J	0.001 J	0.0012 J	0.0033 U	0.0014 J	0.001 J	0.0012 J	0.0012 J	0.001 J	0.001 J
MW-10A	1/11/2011	0.0009 U	0.0017 J	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
MW-10A	7/13/2011	0.0005 U	0.0545 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
MW-10A	1/30/2012	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
MW-10A	7/10/2012	0.0005 U	0.0016 J	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
MW-10A	1/9/2013	6.67E-05 U	0.0000762 U	0.0000571 U	0.000468 J	0.00171	0.0000762 U	0.0000667 U	6.7E-05 U	7.62E-05 U	0.0000571 U	0.00011 U
MW-10A	7/11/2013	0.00178	0.0306	0.000385 J	0.00036 J	0.000356 U	0.00866	0.000186 J	0.00631	0.199	0.00221	0.00011 U
MW-10A	1/8/2014	6.48E-05 U	0.0000741 U	0.0000556 U	4.63E-05 U	0.000343 U	0.0000741 U	0.0000648 U	6.5E-05 U	7.41E-05 U	0.0000556 U	0.0001 U
MW-10A	7/15/2014	0.00262 J	0.0306	0.000566 U	0.000472 U	0.00349 U	0.00862	0.00066 U	0.0111	0.199	0.00442 J	0.00104 U
MW-10A	1/15/2015	0.00007 U	0.00272	0.000126 J	0.000191 J	0.00037 U	0.000349 J	0.00007 U	0.00069	0.000322 J	0.000126 J	0.00011 U
MW-10A	7/8/2015	0.000019	0.000027	0.000015	0.000069	0.000088	0.00002	0.00001	0.00003	0.00002	0.000021	1.9E-05

TABLE VII.A.1
SWMU NO. 1 A-TZ UNIT GROUNDWATER MONITORING DATA
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well ID	Constituent	2-Methyl naphthalene	Acenaphthene	Acenaphthylene	Anthracene	bis(2-Ethylhexyl) phthalate	Dibenzofuran	Fluoranthene	Fluorene	Naphthalene	Phenanthrene	Pyrene
	PCL (mg/L)	0.098	1.5	1.5	7.3	0.006	0.098	0.98	0.98	0.49	0.73	0.73
MW-11A	3/28/2000	0.0021	0.232	0.00383	0.011	0.001 JB	**0.103**	0.016	0.179	0.0637	0.0694	0.0067
MW-11A	9/22/2000	0.001 J	0.31	0.003	0.01	0.0005 U	**0.12**	0.015	0.2	0.01	0.084	0.007
MW-11A	4/26/2001	0.014	0.28	0.004	0.014	0.0005 U	**0.14**	0.015	0.16	0.47	0.074	0.006
MW-11A	9/27/2001	**0.14**	0.31	0.004	0.008	0.0008 J	**0.13**	0.012	0.18	**2.4**	0.075	0.008
MW-11A	3/11/2002	0.027	0.4	0.005	0.013	0.0005 U	**0.19**	0.015	0.23	**0.68**	0.11	0.007
MW-11A	9/23/2002	0.073	0.27	0.003	0.009	0.0004 U	**0.099**	0.012	0.15	0.49	0.07	0.007
MW-11A	3/16/2004	0.00007 U	0.002777	0.00008 U	0.000321 J	0.001042	0.000463 J	0.000394 J	0.00035 J	0.002776	0.000081 U	8.8E-05 U
MW-11A	3/3/2005	0.00016 J	0.0139	0.00006 U	0.000833	0.000806	0.00451	0.000786	0.00663	0.011	0.00023 J	0.00016 J
MW-11A	7/19/2005	0.00019 J	0.0732	0.00074	0.00201	0.000352 U	0.00957	0.0064	0.0229	0.00482	0.00196	0.00308
MW-11A	1/5/2006	0.00007 U	0.00007 U	0.00006 U	0.00007 U	0.000363 U	0.00008 U	0.000516	0.00008 J	0.00006 U	0.00009 U	0.00011 J
MW-11A	7/28/2006	0.00008 U	0.0306	0.000263	0.000543	0.00014 J	0.000566	0.00362	0.00066	0.00012 J	0.00018 J	0.00186
MW-11A	1/23/2007	0.00008 U	0.00685	0.00008 U	0.000287	0.00009 U	0.0019	0.000292	0.00326	0.00481	0.000829	0.00016 J
MW-11A	7/17/2007	0.00133 U	0.0404	0.00114 U	0.000952 U	0.00352 U	0.0041 U	0.00297 J	0.00095 U	0.00124 U	0.0011 J	0.00148 J
MW-11A	1/28/2008	0.00038 U	0.0346	0.00029 U	0.000798	0.00028 J	0.00276	0.00338	0.0069	0.00038 U	0.00036 J	0.00191
MW-11A	7/16/2008	0.0004 U	0.02	0.0003 U	0.00054	0.0002 U	0.0003 U	0.00387	0.00089	0.0004 U	0.0002 U	0.00184
MW-11A	1/22/2009	0.0008 U	0.0076	0.0007 U	0.0007 U	0.0012 U	0.0007 U	0.0012 J	0.0008 U	0.0008 U	0.0007 U	0.0009 U
MW-11A	7/22/2009	0.0009 U	0.014	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0011 J	0.0006 U	0.0006 U	0.0005 U	0.0005 U
MW-11A	1/21/2010	0.0009 U	0.0009 U	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
MW-11A	7/13/2010	0.0018 J	0.0056 UJ	0.001 J	0.0012 J	0.0033 U	0.0014 J	0.001 J	0.0012 J	0.0012 J	0.001 J	0.001 J
MW-11A	1/11/2011	0.0009 U	0.0009 U	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
MW-11A	7/12/2011	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
MW-11A	1/30/2012	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
MW-11A	7/10/2012	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
MW-11A	1/9/2013	0.000066 U	0.00175	0.0000566 U	0.000499	0.000349 U	0.0000755 U	0.000066 U	6.6E-05 U	7.55E-05 U	0.0000566 U	0.0001 U
MW-11A	7/11/2013	6.73E-05 U	0.000878	0.0000577 U	0.00044 J	0.000356 U	0.0000769 U	0.000221 J	6.7E-05 U	7.69E-05 U	0.0000577 U	0.00012 J
MW-11A	1/8/2014	6.48E-05 U	0.0000741 U	0.0001 J	0.00125	0.00046 J	0.0000741 U	0.0000795 J	6.5E-05 U	7.41E-05 U	0.0000556 U	0.0001 U
MW-11A	7/2/2014	0.000066 U	0.00427	0.000185 J	0.00126	0.00516	0.000618	0.00215	0.00149	0.000343 J	0.000384 J	0.00194
MW-11A	1/15/2015	0.00007 U	0.000471	0.00006 U	0.000399 J	0.00037 U	0.00008 U	0.00007 U	0.00007 U	0.00008 U	0.00006 U	0.00011 U
MW-11A	7/8/2015	0.000019	0.00025	0.000015	0.00017	0.00068	0.00012	0.00028	0.00011	0.00002	0.000021	0.00023

Notes:
PCL = Protective Concentration Level
J = Estimated value between the SDL and the MQL
U = Value not detected greater than the MQL
Bolded concentrations exceed PCL.

TABLE VII.A.2
SWMU NO. 1 B-TZ UNIT GROUNDWATER MONITORING DATA
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well ID	Constituent	Acenaphthene	Acenaphthylene	Anthracene	bis(2-Ethylhexyl) phthalate	Dibenzofuran	Di-n-butyl phthalate	Fluoranthene	Fluorene	Naphthalene	Phenol	Pyrene
	PCL (mg/L)	1.5	1.5	7.3	0.006	0.098	2.4	0.98	0.98	0.49	7.3	0.73
MW-10B	3/28/2000	0.0072	0.0003 J	0.002 J	0.0007 JB	0.0149	0.0006 JB	0.001 J	0.0142	0.0231	0.0002 J	0.0005 J
MW-10B	9/25/2000	0.32	0.004	0.014	0.0005 U	**0.2**	0.0009 J	0.01	0.19	**1.2**	0.0003 J	0.005
MW-10B	4/26/2001	0.087	0.002	0.004	0.0005 U	0.036	0.0004 U	0.003	0.047	0.18	0.002	0.001 J
MW-10B	9/28/2001	0.072	0.001 J	0.002	0.0005 U	0.029	0.0004 U	0.002 J	0.036	0.001 J	0.0002 U	0.001 J
MW-10B	3/13/2002	0.073	0.001 J	0.004	0.0006 J	0.032	0.0004 U	0.003	0.044	0.075	0.0002 U	0.002 J
MW-10B	9/24/2002	0.15	0.002	0.006	0.0004 J	0.076	0.001 J	0.005	0.086	0.33	0.00006 U	0.003
MW-10B	3/16/2004	0.04421	0.000833	0.002478	0.000982	0.0171	0.0003 J	0.001567	0.02079	0.001853	9.53E-05 U	0.000718
MW-10B	3/1/2005	0.0164	0.00035 J	0.000995	0.00035 U	0.00482	0.00022 J	0.000941	0.00601	0.00171	0.00004 U	0.00041 J
MW-10B	7/19/2005	0.0739	0.000953	0.00413	0.000352 U	0.0286	0.00065	0.00288	0.0377	0.0789	0.00004 U	0.00125
MW-10B	1/5/2006	0.0113	0.000711	0.000556	0.000356 U	0.0002 J	0.00011 U	0.000649	0.00007 U	0.00006 U	0.00004 U	0.00038 J
MW-10B	7/28/2006	0.0802	0.00107	0.00491	0.00022	0.0323	0.0002	0.00273	0.0434	0.0904	0.00007 U	0.00128
MW-10B	1/23/2007	0.0279	0.00103	0.00126	0.00016 J	0.00312	0.0001 U	0.000745	0.00344	0.000242	0.00007 U	0.000283
MW-10B	7/17/2007	0.0961	0.00114 U	0.00437 J	0.0019 U	0.0325	0.00362 U	0.0028 J	0.0399	0.0252	0.00267 U	0.000952 U
MW-10B	1/28/2008	0.0743	0.00122	0.00432	0.00019 U	0.0255	0.00019 U	0.00371	0.0374	0.0185	0.00019 U	0.00146
MW-10B	7/16/2008	0.0975	0.00113	0.00484	0.0002 J	0.0392	0.0002 U	0.00397	0.0457	0.014	0.0002 U	0.00174
MW-10B	1/22/2009	0.096	0.0007 U	0.0043 J	0.0012 U	0.035	0.0007 U	0.0039 J	0.051	0.0028 J	0.0015 U	0.002 J
MW-10B	7/22/2009	0.067	0.0005 U	0.0029 J	0.0033 U	0.023	0.0005 U	0.0022 J	0.033	0.0082	0.0005 U	0.0013 J
MW-10B	1/21/2010	0.052	0.0005 U	0.0025 J	0.0033 U	0.018	0.0005 U	0.0017 J	0.031	0.0037 J	0.0005 U	0.0005 U
MW-10B	7/13/2010	0.138	0.001 J	0.0076 UJ	0.0033 U	0.05	0.001 J	0.0052 UJ	0.082	0.112	0.001 J	0.002 UJ
MW-10B	1/11/2011	0.096	0.0005 U	0.0068	0.0033 U	0.037	0.0005 U	0.0054	0.059	0.075	0.0005 U	0.0023 J
MW-10B	7/13/2011		0.0005 U	0.0033 J	0.0013 J	0.019	0.0005 U	0.0023 J	0.032	0.0018 J	0.0005 U	0.0011 J
MW-10B	1/30/2012	0.1	0.0011 J	0.0057	0.0005 U	0.038	0.0005 U	0.0046 J	0.06	0.084	0.0005 U	0.002 J
MW-10B	7/10/2012	0.054	0.0005 U	0.0032 J	0.0005 U	0.02	0.0005 U	0.0028 J	0.031	0.004 J	0.0005 U	0.0011 J
MW-10B	1/9/2013	0.12	0.00108	0.00546	0.000349 U	0.0401	0.0001 U	0.00427	0.0652	0.00399	3.77E-05 U	0.00146
MW-10B	7/11/2013	0.977	0.00986	0.0391	0.0037 U	**0.302**	0.011 U	0.0274	0.468	0.207	0.0004 U	0.0101
MW-10B	1/8/2014	0.021	0.000536	0.00107	0.000408 J	0.00493	0.00028 J	0.000117 J	0.00429	0.0646	0.000037 U	0.000102 U
MW-10B	7/15/2014	0.0777	0.000566 U	0.00352 J	0.00349 U	0.0258	0.00104 U	0.00211 J	0.0424	0.125	0.000377 U	0.00104 U
MW-10B	1/15/2015	0.166	0.00104	0.00702	0.00037 U	0.0727	0.00011 J	0.00711	0.0975	**0.556**	0.00004 U	0.00234
MW-10B	1/29/2015	0.0507	0.000597	0.00179	0.000366 U	0.0129	0.00011 U	0.00117	0.0202	0.0247	0.00004 U	0.000392
MW-10B	7/8/2015	0.084	0.00048	0.003	0.00014	0.032	7.8E-05	0.0023	0.047	0.077	0.000035 U	0.00095
MW-11B	3/29/2000	0.043	0.002	0.002 J	0.0006 JB	0.016	0.0008 JB	0.003	0.014	0.079	0.0007 U	0.001 J
MW-11B	9/22/2000	0.3	0.003	0.013	0.0005 U	**0.18**	0.001 J	0.011	0.16	**1.5**	0.0002 U	0.005
MW-11B	4/25/2001	0.2	0.003	0.011	0.0005 U	**0.1**	0.0004 U	0.011	0.11	0.47	0.0002 U	0.005
MW-11B	9/27/2001	0.14	0.003	0.005	0.0005 U	0.068	0.0004 U	0.004	0.072	**0.5**	0.0002 U	0.003
MW-11B	3/14/2002	0.15	0.004	0.007	0.0005 U	0.078	0.0005 J	0.007	0.087	0.22	0.0002 U	0.003
MW-11B	9/24/2002	0.21	0.003	0.009	0.0004 U	**0.12**	0.0008 J	0.008	0.12	**0.7**	0.00006 U	0.004
MW-11B	3/16/2004	0.0486	0.001163	0.000854	0.00018 U	0.01581	0.00035 J	0.001971	0.0112	0.01168	0.0001 U	0.000991
MW-11B	3/1/2005	0.0131	0.00031 J	0.00025 J	0.00037 U	0.00027 J	0.0003 J	0.000589	0.0001 J	0.00006 U	0.00004 U	0.00025 J
MW-11B	7/19/2005	0.0577	0.000799	0.0024	0.000352 U	0.0289	0.00036 J	0.00159	0.0261	0.186	0.00004 U	0.000745
MW-11B	1/5/2006	0.0537	0.000617	0.00269	0.000352 U	0.0261	0.00013 J	0.00189	0.0259	0.0025	0.00004 U	0.000873
MW-11B	7/31/2006	0.0707	0.00119	0.00345	0.00026	0.0359	0.00042	0.00245	0.0336	0.1	0.00007 U	0.00122
MW-11B	1/23/2007	0.0125	0.000315	0.000523	0.00009 U	0.00295	0.0001 U	0.000549	0.00231	0.00013 J	0.00007 U	0.000319
MW-11B	7/17/2007	0.088	0.00114 U	0.00396 J	0.0019 U	0.0411	0.00362 U	0.0029 J	0.0353	0.0901	0.00267 U	0.00146 J
MW-11B	1/28/2008	0.0649	0.00028 U	0.00236	0.00021 J	0.0273	0.00019 U	0.00175	0.0297	0.0354	0.00019 U	0.000848
MW-11B	7/16/2008	0.12	0.00126	0.00472	0.00021 U	0.0649	0.00021 U	0.00383	0.0578	0.0772	0.00021 U	0.00163

TABLE VII.A.2
SWMU NO. 1 B-TZ UNIT GROUNDWATER MONITORING DATA
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well ID	Constituent	Acenaphthene	Acenaphthylene	Anthracene	bis(2-Ethylhexyl) phthalate	Dibenzofuran	Di-n-butyl phthalate	Fluoranthene	Fluorene	Naphthalene	Phenol	Pyrene
	PCL (mg/L)	1.5	1.5	7.3	0.006	0.098	2.4	0.98	0.98	0.49	7.3	0.73
MW-11B	1/22/2009	0.072	0.0007 U	0.0022 J	0.0012 U	0.031	0.0007 U	0.0018 J	0.032	0.0008 U	0.0015 U	0.0009 U
MW-11B	7/22/2009	0.12	0.0015 J	0.0043 J	0.0033 U	0.054	0.0005 U	0.0036 J	0.053	0.048	0.0005 U	0.002 J
MW-11B	1/21/2010	0.048	0.0013 J	0.0011 J	0.0033 U	0.012	0.0005 U	0.0014 J	0.013	0.0006 U	0.0005 U	0.0005 U
MW-11B	7/13/2010	0.22	0.001 J	0.011	0.0033 U	0.096	0.001 J	0.0092 UJ	0.112	0.0136	0.001 J	0.0044 UJ
MW-11B	1/11/2011	0.039	0.0012 J	0.0006 U	0.0033 U	0.006	0.0005 U	0.0015 J	0.0038 J	0.0006 U	0.0005 U	0.0005 U
MW-11B	7/12/2011	0.084	0.0012 J	0.0054	0.0005 U	0.038	0.0005 U	0.0046 J	0.046	0.06	0.0005 U	0.0024 J
MW-11B	1/30/2012	0.025	0.0011 J	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0013 J	0.0005 U	0.0005 U	0.0005 U	0.0005 U
MW-11B	7/10/2012	0.1	0.0013 J	0.0055	0.0005 U	0.04	0.0005 U	0.0053	0.054	0.004 J	0.0005 U	0.0024 J
MW-11B	1/9/2013	0.0631	0.00136	0.000168 J	0.00195	0.00352	0.0001 U	0.00307	0.00205	0.0000755 U	3.77E-05 U	0.00154
MW-11B	7/11/2013	0.108	0.00119	0.00321	0.000356 U	0.0231	0.00011 U	0.00383	0.0388	0.00535	3.85E-05 U	0.00196
MW-11B	1/8/2014	0.0603	0.00102	0.00242	0.000493 J	0.0111	0.00032 J	0.00267	0.0195	0.000382 J	0.000037 U	0.00126
MW-11B	7/2/2014	0.0953	0.00166	0.00375	0.000349 U	0.0199	0.00011 J	0.00417	0.0339	0.0135	3.77E-05 U	0.00213
MW-11B	1/15/2015	0.0472	0.00113	0.000945	0.00037 U	0.00472	0.00011 U	0.00201	0.00867	0.00008 U	0.00004 U	0.000935
MW-11B	7/8/2015	0.057	0.00065	0.0025	0.00019 U	0.014	4.4E-05 U	0.0034	0.025	0.0021 U	0.000035 U	0.0017
P-10	3/28/2000	0.51	0.00176	0.022	0.0008 JB	**0.16**	0.0006 JB	0.014	0.28	**4.32**	0 U	0.006
P-10	9/26/2000	0.39	0.0002 U	0.024	0.0005 U	**0.16**	0.0007 J	0.017	0.23	**4.4**	0.0002 U	0.008
P-10	4/25/2001	0.32	0.0002 U	0.021	0.0005 U	**0.11**	0.0004 U	0.015	0.19	**3.8**	0.0002 U	0.006
P-10	9/27/2001	0.3	0.0002 U	0.013	0.0005 J	**0.13**	0.0004 U	0.01	0.17	**3.2**	0.0002 U	0.006
P-10	3/13/2002	0.36	0.002	0.012	0.001 J	**0.14**	0.0004 U	0.008	0.17	**2.3**	0.0002 U	0.003
P-10	9/25/2002	0.042	0.0004 J	0.001 J	0.0009 J	0.011	0.003	0.001 J	0.013	0.2	0.00006 U	0.0005 J
P-10	3/16/2004	0.000074 U	0.000076 U	0.000124 U	0.000172 U	0.000076 U	0.00038 J	0.000093 U	0.000068 U	0.000067 U	9.53E-05 U	0.000084 U
P-10	3/3/2005	0.00453	0.00008 J	0.00015 J	0.000836	0.000892	0.00028 J	0.00015 J	0.000723	0.0142	0.00004 U	0.00009 U
P-10	7/19/2005	0.0737	0.000476	0.00346	0.000352 U	0.0314	0.00048	0.0024	0.0364	0.464	0.00004 U	0.00102
P-10	1/5/2006	0.102	0.00006 U	0.0057	0.000359 U	0.0325	0.00011 U	0.00273	0.048	0.433	0.00004 U	0.00108
P-10	7/31/2006	0.0346	0.00016 J	0.000981	0.00016 J	0.00945	0.00032	0.000924	0.0115	0.062	0.00007 U	0.00046
P-10	1/23/2007	0.0165	0.00008 U	0.000437	0.00009 U	0.0044	0.0001 U	0.00004 U	0.00541	0.0204	0.00007 U	0.000215
P-10	7/17/2007	0.0688	0.00114 U	0.00319 J	0.0019 U	0.0272	0.00362 U	0.0021 J	0.0291	0.297	0.00267 U	0.001 J
P-10	1/28/2008	0.00373	0.00028 U	0.000703	0.00023 J	0.000713	0.00019 U	0.000506	0.000668	0.00038 U	0.00019 U	0.00039 J
P-10	7/16/2008	0.0106	0.00053	0.000747	0.00022 J	0.00176	0.00092 J	0.00022 J	0.00245	0.00079	0.00021 U	0.00021 U
P-10	1/22/2009	0.0008 U	0.0007 U	0.0007 U	0.0012 U	0.0007 U	0.0007 U	0.0006 U	0.0008 U	0.0008 U	0.0015 U	0.0009 U
P-10	7/22/2009	0.0044 J	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
P-10	1/22/2010	0.0009 U	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
P-10	7/14/2010	0.0009 U	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
P-10	1/12/2011	0.0009 U	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
P-10	7/12/2011	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
P-10	1/31/2012	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
P-10	7/11/2012	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
P-10	1/10/2013	0.0000755 U	0.0000566 U	4.72E-05 U	0.000906	7.55E-05 U	0.0001 U	0.000066 U	0.000066 U	0.0000755 U	3.77E-05 U	0.000104 U
P-10	7/11/2013	0.0000808 U	0.0000606 U	0.000133 J	0.000492 J	8.08E-05 U	0.00011 U	0.0000707 U	0.0000707 U	0.0000808 U	4.04E-05 U	0.000111 U
P-10	1/9/2014	0.000102 J	0.0000556 U	0.000323 J	0.000343 U	7.41E-05 U	0.00026 J	0.0000648 U	0.0000648 U	0.0000741 U	0.000037 U	0.000102 U
P-10	7/2/2014	0.01	0.0000588 U	0.000375 J	0.00127	0.00205	0.00011 U	0.00042 J	0.00393	0.0000784 U	3.92E-05 U	0.000318 J
P-10	1/15/2015	0.00008 U	0.00006 U	0.000122 J	0.000853	0.00008 U	0.00011 U	0.000114 J	0.00007 U	0.00008 U	0.00004 U	0.00011 U
P-10	7/8/2015	0.023	0.00012	0.00039	0.0006	0.0024	4.4E-05	0.0006	0.0046	0.019	0.000035 U	0.00038

TABLE VII.A.2
SWMU NO. 1 B-TZ UNIT GROUNDWATER MONITORING DATA
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TX

Well ID	Constituent	Acenaphthene	Acenaphthylene	Anthracene	bis(2-Ethylhexyl) phthalate	Dibenzofuran	Di-n-butyl phthalate	Fluoranthene	Fluorene	Naphthalene	Phenol	Pyrene
	PCL (mg/L)	1.5	1.5	7.3	0.006	0.098	2.4	0.98	0.98	0.49	7.3	0.73
P-12	3/28/2000	0 U	0 U	0 U	0.001 JB	0 U	0.0008 JB	0 U	0 U	0.0001 J	0.0001 J	0.01
P-12	9/25/2000	0.0003 U	0.0002 U	0.0004 U	0.001 J	0.0003 U	0.0006 J	0.0004 U	0.0003 U	0.0003 U	0.0002 U	0.013
P-12	4/24/2001	0.0003 U	0.0002 U	0.0004 U	0.0005 U	0.0003 U	0.0004 U	0.0004 U	0.0003 U	0.0003 U	0.0002 U	0.009
P-12	9/27/2001	0.0003 U	0.0002 U	0.0004 U	0.0007 J	0.0003 U	0.0006 J	0.0004 U	0.0003 U	0.0005 J	0.0002 U	0.01
P-12	3/14/2002	0.0003 U	0.0002 U	0.0004 U	0.0005 U	0.0003 U	0.0004 U	0.0004 U	0.0003 U	0.0003 U	0.0002 U	0.0003 U
P-12	9/25/2002	0.00007 U	0.00006 U	0.00009 U	0.0004 U	0.00007 U	0.001 J	0.00009 U	0.00007 U	0.0001 U	0.00006 U	0.006
P-12	3/17/2004	0.000074 U	0.000076 U	0.000124 U	0.001748	0.000076 U	0.00092	0.000093 U	0.000068 U	0.000067 U	9.53E-05 U	0.007348
P-12	3/3/2005	0.00007 U	0.00006 U	0.00007 U	0.00035 U	0.00008 U	0.00013 J	0.00008 U	0.00007 U	0.00006 U	0.00004 U	0.00592
P-12	7/18/2005	0.00007 U	0.00006 U	0.00007 U	0.000431 J	0.00008 U	0.00053	0.00008 U	0.00007 U	0.00006 U	0.00004 U	0.00767
P-12	1/6/2006	0.00007 U	0.00006 U	0.00007 U	0.000352 U	0.00008 U	0.00011 U	0.00008 U	0.00007 U	0.00006 U	0.00004 U	0.00615
P-12	7/28/2006	0.00004 U	0.00008 U	0.00004 U	0.00011 J	0.00006 U	0.00017 J	0.00004 U	0.00004 U	0.00007 U	0.00007 U	0.00545
P-12	1/22/2007	0.00004 U	0.00008 U	0.00004 U	0.00009 U	0.00006 U	0.0001 U	0.00004 U	0.00004 U	0.00007 U	0.00007 U	0.00312
P-12	7/17/2007	0.00114 U	0.00114 U	0.000952 U	0.0019 U	0.0041 U	0.00362 U	0.000952 U	0.000952 U	0.00124 U	0.00267 U	0.0075 J
P-12	1/29/2008	0.00029 U	0.00029 U	0.000645	0.00019 U	0.00029 U	0.00019 U	0.00019 U	0.00019 U	0.00038 U	0.00019 U	0.00932
P-12	7/16/2008	0.0003 U	0.0003 U	0.000552	0.00034 J	0.0003 U	0.00085 J	0.0002 U	0.0002 U	0.000626	0.0002 U	0.00211
P-12	1/22/2009	0.0008 U	0.0007 U	0.0007 U	0.0012 U	0.0007 U	0.0007 U	0.0006 U	0.0008 U	0.0008 U	0.0015 U	0.0026 J
P-12	7/22/2009	0.0009 U	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
P-12	1/22/2010	0.0009 U	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
P-12	7/14/2010	0.0009 U	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
P-12	1/12/2011	0.0009 U	0.0005 U	0.0006 U	0.0033 U	0.0007 U	0.0005 U	0.0005 U	0.0006 U	0.0006 U	0.0005 U	0.0005 U
P-12	7/12/2011	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
P-12	1/31/2012	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
P-12	7/11/2012	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
P-12	1/9/2013	0.0000755 U	0.0000566 U	4.72E-05 U	0.00142	7.55E-05 U	0.0001 U	0.000066 U	0.000066 U	0.0000755 U	3.77E-05 U	0.000104 U
P-12	7/11/2013	0.00008 U	0.00006 U	0.00005 U	0.00039 J	0.00008 U	0.00011 U	0.00007 U	0.00007 U	0.00008 U	0.00004 U	0.00011 U
P-12	1/9/2014	0.0000741 U	0.0000556 U	0.0002 J	0.000515 J	7.41E-05 U	0.00042 J	0.0000648 U	0.0000648 U	0.0000741 U	0.000037 U	0.000102 U
P-12	1/15/2015	0.00008 U	0.00006 U	0.00005 J	0.00037 J	0.00008 U	0.00011 J	0.00007 U	0.00007 U	0.00008 U	0.00004 U	0.00152
P-12	7/2/2014	0.0000755 U	0.0000566 U	0.000189 J	0.000439 J	7.55E-05 U	0.00014 J	0.000066 U	0.000066 U	0.0000755 U	3.77E-05 U	0.00189
P-12	7/8/2015	0.000027 U	0.000015 U	0.000014 U	0.00055 J	0.00002 U	0.00002 U	0.00001 U	0.00003 U	0.00002 U	0.000035 U	0.000019 U

Notes:

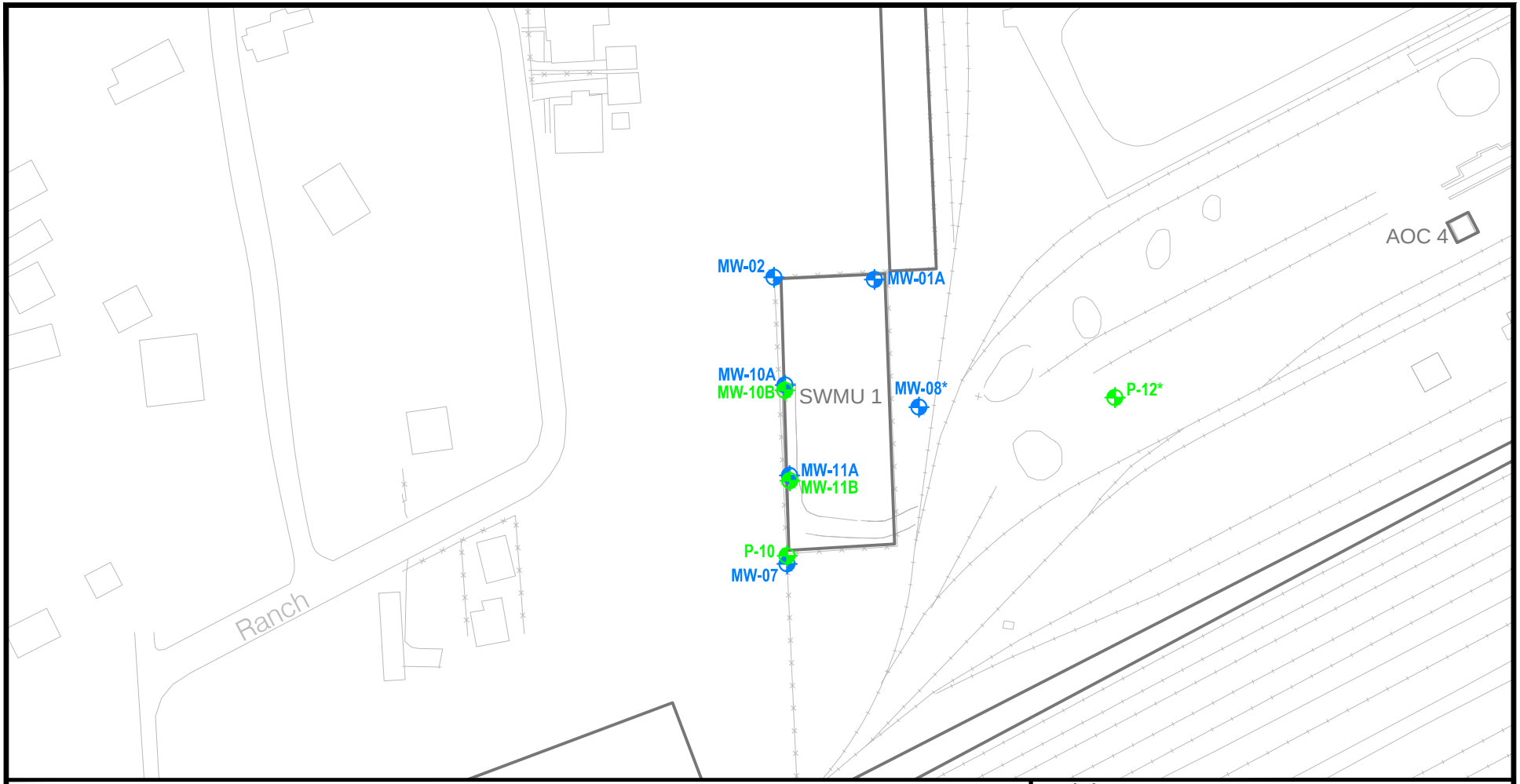
PCL = Protective Concentration Level

J = Estimated value between the SDL and the MQL

U = Value not detected greater than the MQL

Bolded concentrations exceed PCL.

FIGURES



EXPLANATION

- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- A-TZ Monitoring Well Location
- B-TZ Monitoring Well Location

Note:
* Background well.

N

Approx. Scale in Feet

0 60 120

Source:
Base map from ERM-Southwest, Inc 0014419a310.dwg, 6/19/2006.

UNION PACIFIC RAILROAD CO.

HOUSTON WOOD PRESERVING WORKS

Figure VII.A

SITE MAP
SWMU No. 1

PROJECT: 1358	BY: AJD	REVISIONS
DATE: NOV., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Figure VII.B
2-Methylnaphthalene Concentrations vs Time - A-TZ Unit
UPRR HWPW Facility - RCRA SWMU No. 1

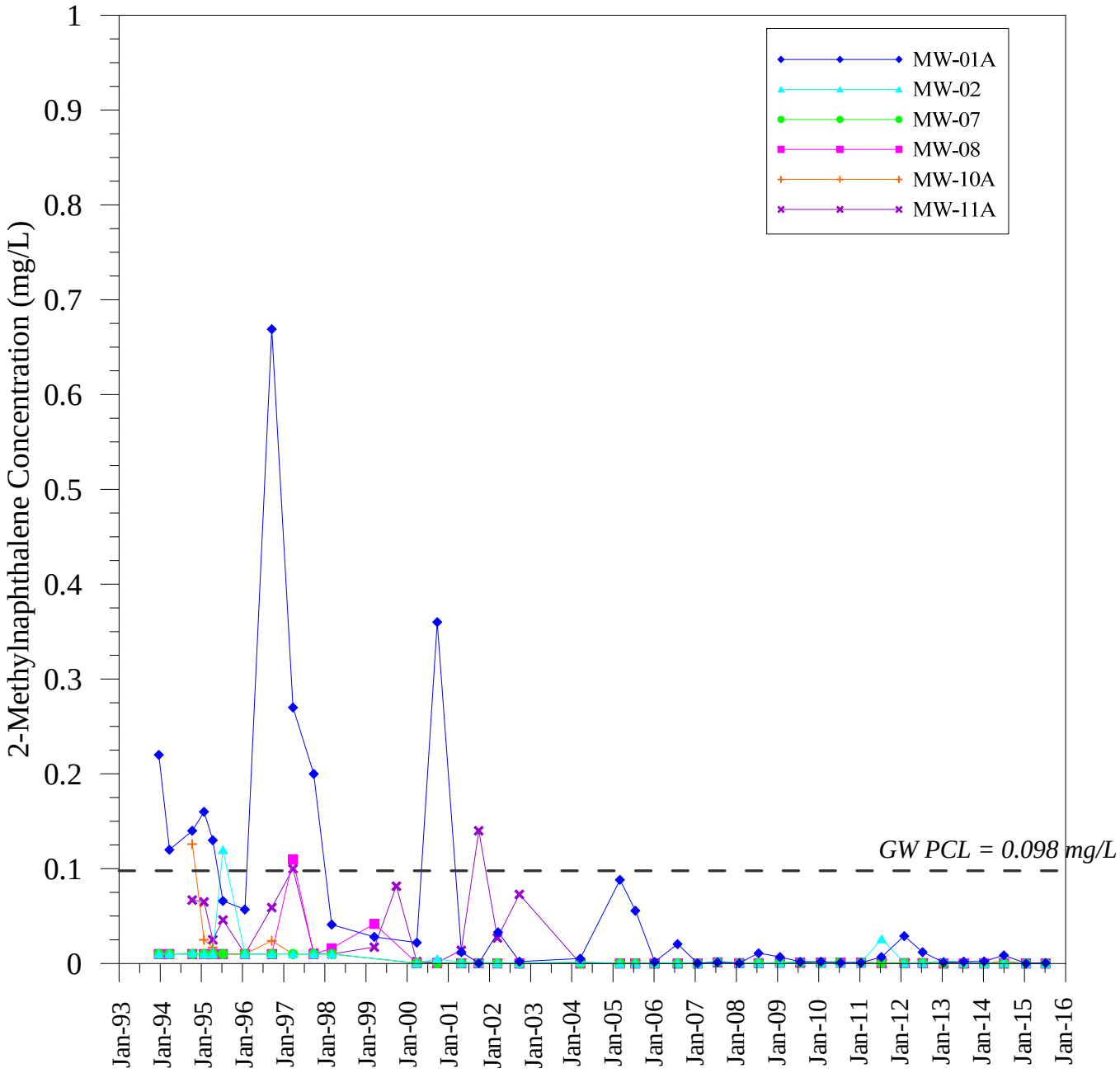


Figure VII.C
Dibenzofuran Concentrations vs Time - A-TZ Unit
UPRR HWPW Facility - RCRA SWMU No. 1

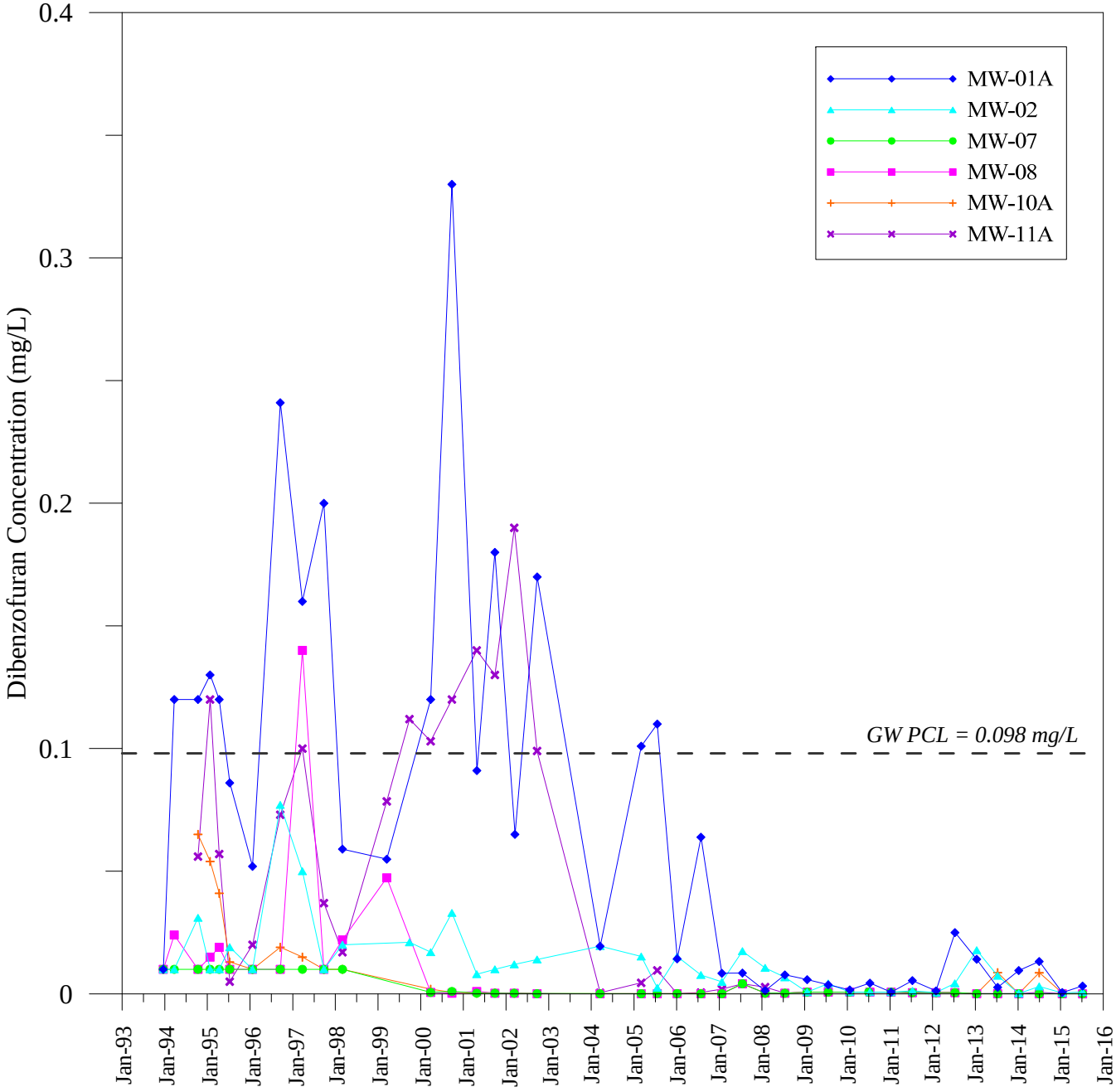


Figure VII.D
Naphthalene Concentrations vs Time - A-TZ Unit
UPRR HWPW Facility - RCRA SWMU No. 1

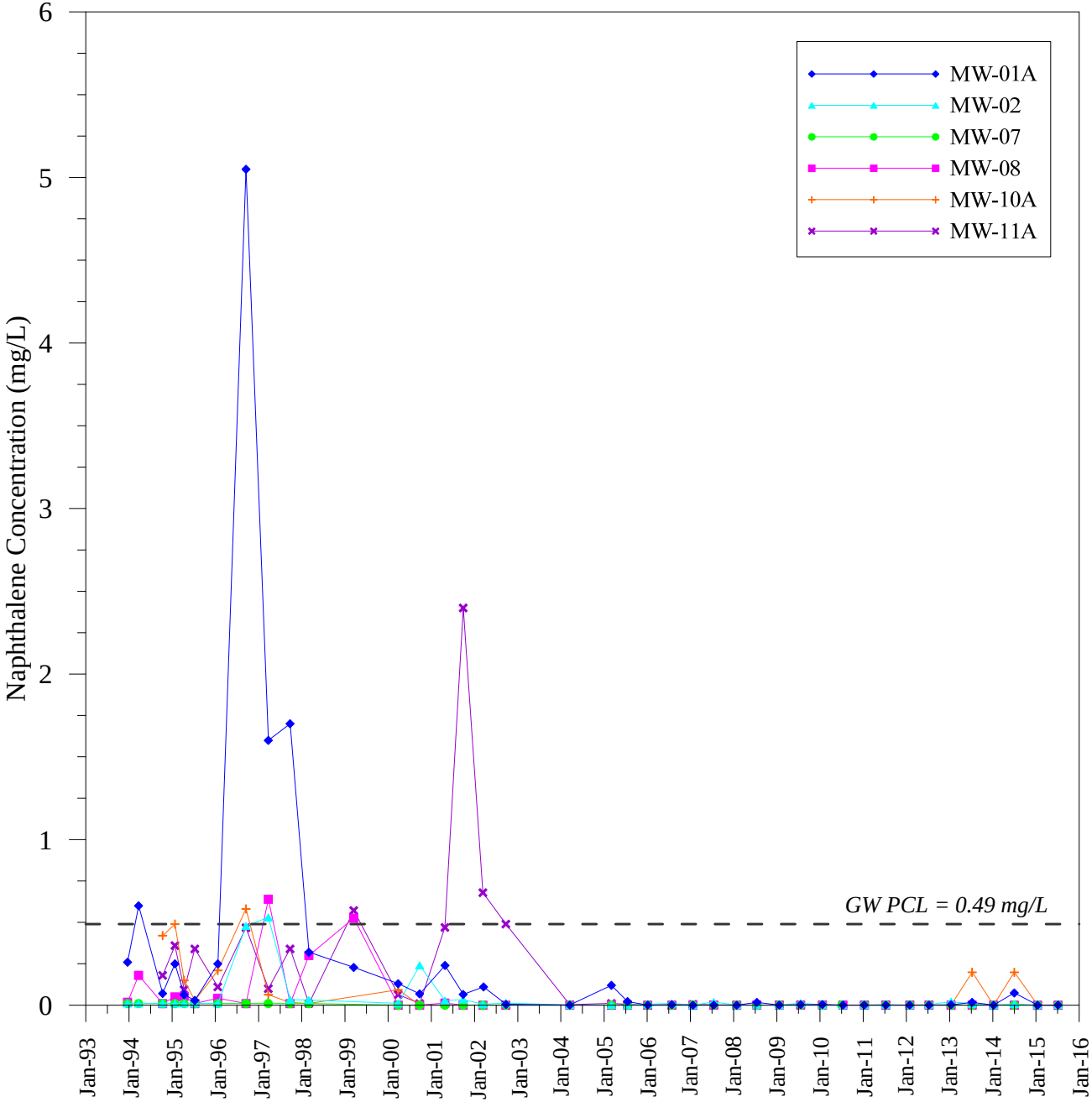
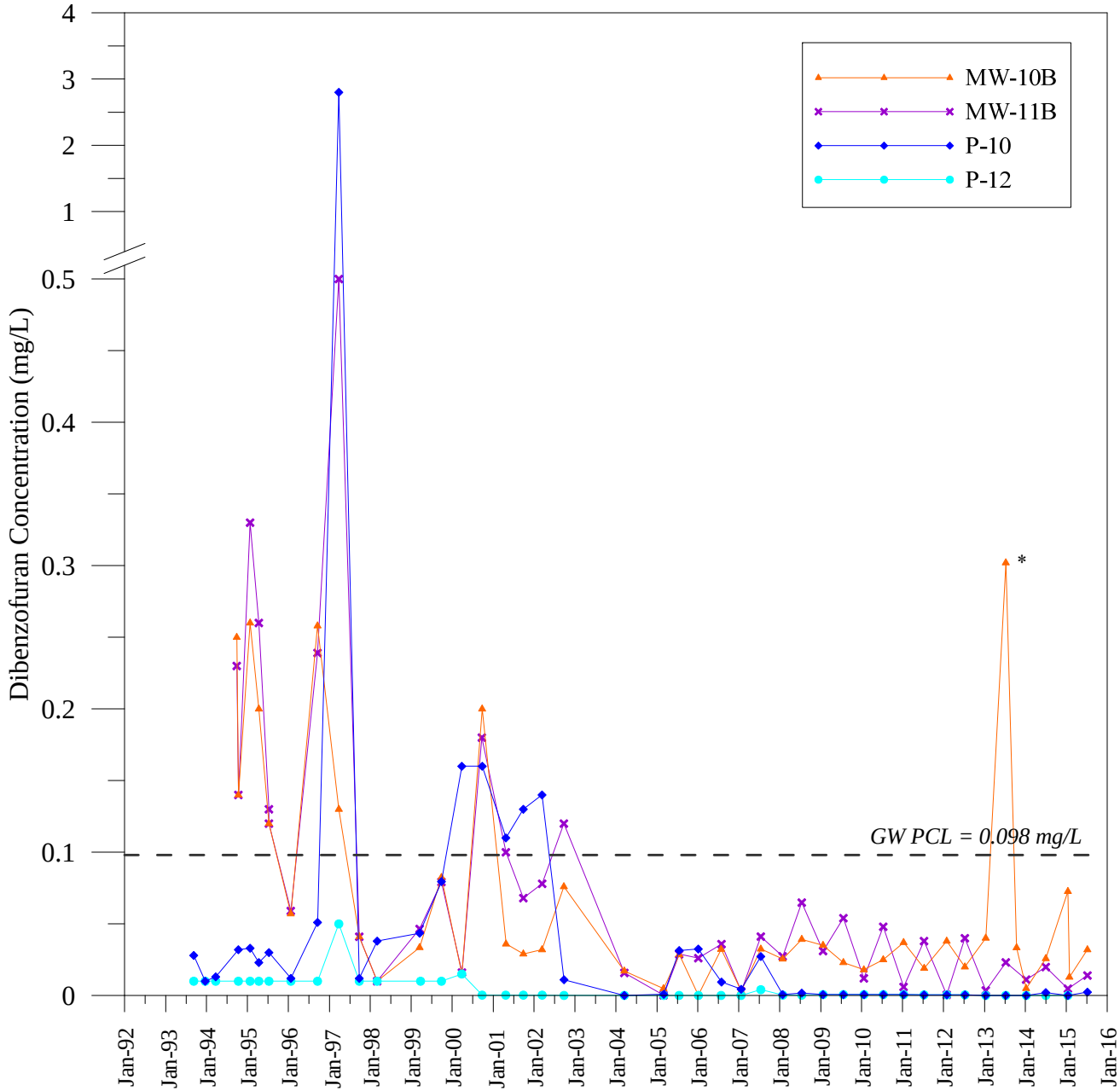
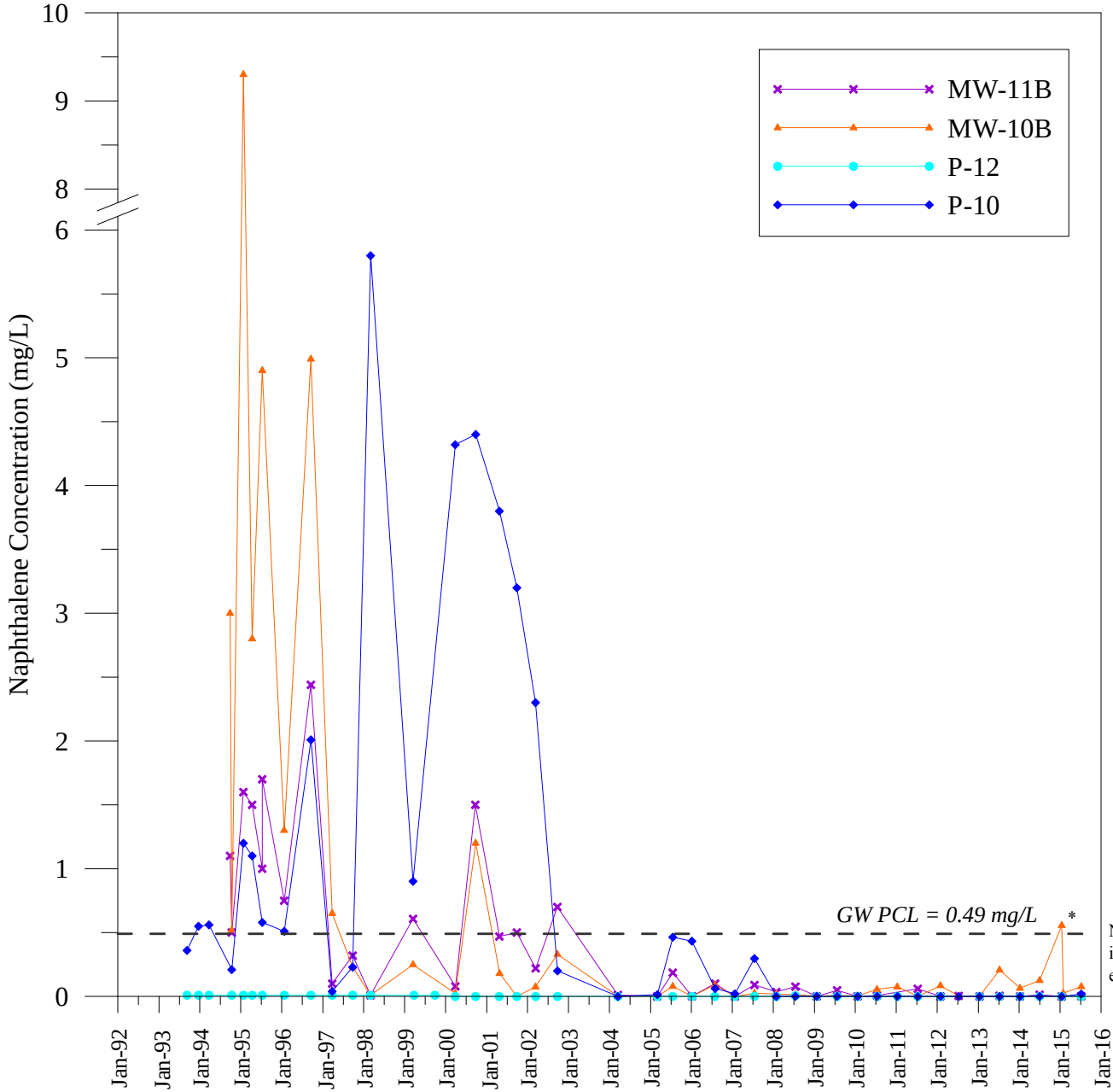


Figure VII.E
Dibenzofuran Concentrations vs Time - B-TZ Unit
UPRR HWPW Facility - RCRA SWMU No. 1



Note: * Resample of dibenzofuran at MW-10B in July 2013 did not verify the initial PCL exceedance.

Figure VII.F
Naphthalene Concentrations vs Time - B-TZ Unit
UPRR HWPW Facility - RCRA SWMU No. 1



Note: * Resample of napthalene at MW-10B in January 2015 did not verify the initial PCL exceedance.

ATTACHMENTS

ATTACHMENT VII.C.1
POST·CLOSURE INSPECTION SCHEDULE RECORD FORM
UNION PACIFIC RAILROAD HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS SWR NO. 31547, EPA ID TXD000820266

Inspection Date and Time: _____

Inspector's Name: _____

Inspector's Signature: _____

Facility Units(s) and Basic Elements	Possible Error, Malfunction, or Deterioration	Frequency of Inspection	Status	
			Acceptable	Unacceptable
Security Fencing	Damaged, broken/loose fencepost	Semi-annually & after storm/flood event		
	Loose or broken barbed wire			
	Damaged fence			
	Damaged gate			
	Inoperable gate locks			
Warning Signs	Missing, damaged or illegible signs	Same as above		
Surveyed Benchmarks	Benchmarks missing or damaged	Same as above		
Groundwater Monitor Wells	Well cap condition poor, broken, poor seal	Same as above		
	Lock function sticks, inoperable			
	Casing condition bent, torn, missing			
	Concrete pad cracked, broken, missing			
Final Cover	Settlement or subsidence	Same as above		
	Damage or erosion to cover			
	Erosion/undercutting at perimeters			
	Shrubs/trees with long root systems present			
Drainage Structures	Grass requires mowing, treatment or repairs	Same as above		
	Debris or sediment restrict flow			
	Erosion or undercutting			
	Inadequate drainage away from cover			
Comments:				

Note: In accordance with 40 CFR 264.15(b) and (d), copies of the inspetion records will be maintained for at least three years from the date of inspection.

ATTACHMENT VII.C.2
INSPECTION SCHEDULE
UNION PACIFIC RAILROAD HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS SWR NO. 31547, EPA ID TXD000820266

Facility Unit(s) and Basic Elements	Possible Error, Malfunction, or Deterioration	Frequency of Inspection
Security Fencing	Damaged, broken/loose fencepost	Semi-annually & after major storm/flood event
Security Fencing	Loose or broken barbed wire	Semi-annually & after major storm/flood event
Security Fencing	Damaged fence	Semi-annually & after major storm/flood event
Security Fencing	Damaged gate	Semi-annually & after major storm/flood event
Security Fencing	Inoperable gate locks	Semi-annually & after major storm/flood event
Warning Signs	Missing, damaged or illegible signs	Semi-annually & after major storm/flood event
Surveyed Benchmarks	Benchmarks missing or damaged	Semi-annually & after major storm/flood event
Groundwater Monitor Wells	Well cap condition poor, broken, poor seal	Semi-annually & after major storm/flood event
Groundwater Monitor Wells	Lock function sticks, inoperable	Semi-annually & after major storm/flood event
Groundwater Monitor Wells	Casing condition bent, torn, missing	Semi-annually & after major storm/flood event
Groundwater Monitor Wells	Concrete pad cracked, broken, missing	Semi-annually & after major storm/flood event
Final Cover	Settlement or subsidence	Semi-annually & after major storm/flood event
Final Cover	Damage or erosion to cover	Semi-annually & after major storm/flood event
Final Cover	Erosion/undercutting at perimeters	Semi-annually & after major storm/flood event
Final Cover	Shrubs/trees with long root systems present	Semi-annually & after major storm/flood event
Drainage Structures	Grass requires mowing, treatment or repairs	Semi-annually & after major storm/flood event
Drainage Structures	Debris or sediment restrict flow	Semi-annually & after major storm/flood event
Drainage Structures	Erosion or undercutting	Semi-annually & after major storm/flood event
Drainage Structures	Inadequate drainage away from clay cap	Semi-annually & after major storm/flood event

Table VII.G. - Post-Closure Period

Unit Name	Date Certified Closed	Permitted Post Closure Period (Yrs)	Earliest Date Post Closure Ends (See Note 1)
Closed Surface Impoundment	6/20/1994	20 years	6/20/2024

Note 1 – Post-Closure Care shall continue beyond the specified date until the Executive Director has approved the permittee's request to reduce or terminate the post-closure period, consistent with 40 CFR Section 264.117 and 30 TAC Section 335.152(a)(5). However, since the unit was clean closed n 1984 and groundwater at the unit has achieved Remedy Standard A response objectives, UPRR requests NFA for post-closure care for the unit (See Section VII and Section XI (Response Action Plan)).

VIII. Financial Assurance

A. Financial Assurance Information Requirements for all Applicants (30 TAC Chapter 37, Subchapter P, 305.50(a)(4)(A-E), 335.152(a)(6) and 335.179)

1. Financial Assurance for Closure

   An owner or operator must establish financial assurance for the closure of the facility no later than 60 days prior to the first receipt of hazardous waste. Please refer to 30 TAC Chapter 37, Subchapter P, for the financial assurance requirements for closure and provide a signed statement from an authorized signatory per 30 TAC 305.44 regarding how the owner or operator will comply with this provision.

   If the financial mechanism(s) has been obtained, provide a copy of the mechanism(s)

   See the attached for the Financial Disclosure Letter for Union Pacific Railroad Company.

2. Financial Assurance for Post-Closure Care (applicable to disposal facilities and contingent post-closure care facilities only)

   An owner or operator subject to post-closure monitoring or maintenance requirements must establish financial assurance for the post-closure care of the facility no later than 60 days prior to the first receipt of hazardous waste. Please refer to 30 TAC Chapter 37, Subchapter P for the financial assurance requirements for post-closure and provide a signed statement from an authorized signatory per 30 TAC 305.44 regarding how the owner or operator will comply with this provision.

   If the financial mechanism(s) has been obtained, provide a copy of the mechanism(s)

   See the attached for the Financial Disclosure Letter for Union Pacific Railroad Company.

3. Liability Requirements (not required for post-closure care)

   All owners or operators must establish financial assurance for third party sudden liability coverage of the facility no later than 60 days prior to the first receipt of hazardous waste. Owners or operators of disposal facilities must establish financial assurance for third party sudden and nonsudden liability coverage of the facility no later than 60 days prior to the first receipt of hazardous waste. Please refer to 30 TAC Chapter 37, Subchapter P, for the financial assurance requirements for liability coverage, and provide a signed statement from an authorized signatory per 30 TAC 305.44 regarding how the owner or operator will comply with this provision.

   If the financial mechanism(s) has been obtained, provide a copy of the mechanism(s).

   Not Applicable

4. State's Assumption of Responsibility

   If the State of Texas assumption of responsibility is found to be acceptable, the owner or operator may satisfy the financial assurance requirements by use of both the State's assurance and additional financial mechanisms specified in 30 TAC Chapter 37. The amount of funds available through the State and owner or operator's mechanisms must at least equal the required amount. (30 TAC 37.6041)

Not Applicable

B. Applicant Financial Disclosure Statements for a permit, permit amendment, or permit modification (30 TAC 305.50(a)(4))

1. A statement signed by an authorized signatory per 30 TAC 305.44 explaining in detail how the applicant demonstrates sufficient financial resources to construct, safely operate, properly close, and provide adequate liability coverage for the facility.

2. Audited financial statements for the last two years and the most current quarterly financial statement prepared according to generally accepted accounting principles. If audited statements have not been prepared for the applicant, copies of the applicant's last two years of financial statements and tax returns shall be submitted. The copies of the tax returns shall be certified by original signature of an authorized officer or owner as being a "true and correct copy of the return filed with the Internal Revenue Service." Additionally, an audited financial statement shall be prepared and submitted for the most recent fiscal year. All financial statements shall include a balance sheet, income statement, cash flow statement, notes to the financial statements, and the accountant's opinion letter.

3. For publicly traded companies, copies of Securities and Exchange Commission Form 10-K for the last two years and the most current Form 10-Q.

4. For privately-held companies, written disclosure of the information that would normally be found in Form 10-K including, but not limited to, the following:
   a. descriptions of the business and its operations;
   b. identification of any affiliated relationships;
   c. credit agreements and terms;
   d. any legal proceedings involving the applicant;
   e. contingent liabilities; and
   f. significant accounting policies.

See the attached for the Financial Disclosure Letter for Union Pacific Railroad Company.

C. Applicants Requesting Facility Expansion, Capacity Expansion, or New Construction

Not Applicable.

Provide the following information as applicable to the particular financial circumstances:

1. Estimate of capital costs for expansion and/or construction. Complete Table VIII.C. - Estimated Capital Costs.

2. Evidence of financial resources to construct, operate safely, close, and provide liability coverage for the facility.
   a. Applicants demonstrating through financial statements or existing credit arrangements sufficient financial resources to construct, operate, and close the facility may address this requirement with the signed statement submitted to satisfy Section VIII.B.1.

b. Applicants that must obtain additional financing through a new stock offering or new debt issuance for construction or expansion as requested in this application shall submit the following information:

(1) financial plan sufficiently detailed to clearly demonstrate that the applicant will be in a position to readily secure financing for construction, operation, and closure if the permit is issued. The submitted financial plan must be accompanied by original letters of opinion from two financial experts, not otherwise employed by the applicant, who have the demonstrated ability to either finance the facility or place the required financing. The opinion letters must certify that the financial plan is reasonable, certify that financing is obtainable within 180 days of issuance of the permit, and include the time schedule contingent upon permit issuance for securing the financing. Only one opinion letter from a financial expert, not otherwise employed by the applicant, is required if the letter renders a firm commitment to provide all the necessary financing; and

(2) a written detail of the annual operating costs of the facility and a projected cash flow statement including the period of construction and first two years of operation. The cash flow statement must demonstrate the financial resources to meet operating costs, debt service, and financial assurance for closure, post closure, and liability coverage requirements. A list of the assumptions made to forecast cash flow shall also be provided.

3. For new commercial hazardous waste management facility applications, a written statement signed by an authorized signatory per 30 TAC 305.44 explaining how the applicant intends to provide emergency response financial assurance per 30 TAC 305.50(a)(12)(C) or (D).

Table VIII.C - Estimated Capital Costs

Not Applicable

	Estimated Capital Costs
Site preparation, fencing, paving, curbing, lighting, roadways	$ _____
Foundations, buildings, other structures, utilities and connections, drainage system, HVAC system, Electrical system, wastewater system	$ _____
Process and control equipment	$ _____
Auxiliary equipment, including but not limited to exhaust hoods, fans, ducting, pumps, piping, conveyors, stacks, storage tanks, process tanks, waste disposal facilities, pollution control equipment, and fire protection system	$ _____
Process integration and instrumentation	$ _____
Emergency response equipment	$ _____
Transportation equipment	$ _____
Office equipment	$ _____
Engineering design, supervision, overhead	$ _____
Construction expenses including permits, insurance, temporary facilities, and clean-up	$ _____
Contractor's fees and overhead	$ _____
Contingency	$ _____
Total	$ _____

The estimates listed above were derived from the following sources:

VIII. FINANCIAL ASSURANCE

March 24, 2016

Executive Director
Texas Commission on Environmental Quality
Financial Assurance Section, MC 184
P.O. Box 13087
Austin, TX 78711-3087

Re: Union Pacific Railroad Company, SWR #31547
Financial Assurance Demonstration, Houston - Wood Preserving Works Site

Dear Executive Director:

In accordance with our requirement of the above permit, I am enclosing the following information as a financial assurance demonstration for the Union Pacific Railroad Company:

1) Letter from the Chief Financial Officer, with wording as specified in 30 TAC §37.351.
2) A copy of the independently audited year-end financial statements.
3) A special report from an independent certified public accountant.
4) A written verification of the current bond rating.
5) A schedule identifying intangible assets used to calculate tangible net worth.
6) A Corporate Guarantee.

The total amount of financial assurance is the amount approved in the permit, $322,000, and the compliance plan, $231,000.

If you have any questions relating to this submittal please contact me at (402) 544-3675.

Sincerely,

Jeffrey D. McDermott

Jeffrey D. McDermott, P.E.
Manager Environmental Site Remediation
Union Pacific Railroad Company
1400 Douglas Street – Stop 1030
Omaha, NE 68179

Enclosures

C: Geoffrey Reeder, UP
TCEQ, Industrial and Hazardous Waste Division - Permits Section
Donna Phillips, TCEQ, Region 12 Office, Houston, TX
U. S. EPA Region VI, Director, Hazardous Waste Management Division

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549

FORM 10-K

(Mark One)

[X] ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the fiscal year ended December 31, 2015

OR

[ ] TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the transition period from _____ to _____

Commission File Number 1-6075

UNION PACIFIC CORPORATION

(Exact name of registrant as specified in its charter)

UTAH	**13-2626465**
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)

1400 DOUGLAS STREET, OMAHA, NEBRASKA
(Address of principal executive offices)

68179
(Zip Code)

(402) 544-5000
(Registrant's telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Act:

Title of each Class	**Name of each exchange on which registered**
Common Stock (Par Value $2.50 per share)	**New York Stock Exchange, Inc.**

- Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act.

  ☑ Yes ☐ No
- Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act.

  ☐ Yes ☑ No
- Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days.

  ☑ Yes ☐ No
- Indicate by check mark whether the registrant has submitted electronically and posted on its corporate Website, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files).

  ☑ Yes ☐ No
- Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§229.405 of this chapter) is not contained herein, and will not be contained, to the best of the registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K.

  ☑
- Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or a smaller reporting company. See the definitions of "large accelerated filer," "accelerated filer" and "smaller reporting company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer ☑ Accelerated filer ☐ Non-accelerated filer ☐ Smaller reporting company ☐

- Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act).

  ☐ Yes ☑ No

As of June 30, 2015, the aggregate market value of the registrant's Common Stock held by non-affiliates (using the New York Stock Exchange closing price) was $82.7 billion.

The number of shares outstanding of the registrant's Common Stock as of January 29, 2016 was 846,414,350.

Documents Incorporated by Reference – Portions of the registrant's definitive Proxy Statement for the Annual Meeting of Shareholders to be held on May 12, 2016, are incorporated by reference into Part III of this report. The registrant's Proxy Statement will be filed with the Securities and Exchange Commission pursuant to Regulation 14A.

UNION PACIFIC CORPORATION
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February 5, 2016

Fellow Shareholders:

This past year was a difficult one in many respects, but our team did outstanding work in the face of dramatic declines in volumes and shifts in our business mix. Although our earnings per share of $5.49 fell short of last year's record of $5.75 per share, we were able to improve our operating ratio to a record low 63.1 percent, 0.4 points better than 2014. Our return on invested capital* of 14.3 percent also fell short of last year's all-time high of 16.2 percent. Despite these shortfalls, Union Pacific was able to increase the cash returned to shareholders in 2015. We increased our quarterly declared dividend per share by 10 percent, with total dividends declared per share for 2015 growing 15 percent compared to the full year 2014. We also repurchased $3.5 billion in Union Pacific shares, a 7 percent increase compared to 2014.

Union Pacific experienced a 6 percent decline in volume last year. Carloadings declined in five of our six commodity groups. Low natural gas prices and high coal inventory levels led to a significant reduction in our Coal volumes. Declines in shale drilling activity due to lower energy prices drove reductions in frac sand shipments. Steel shipments also declined due to lower drilling activity as well as from the strength of the U.S. dollar. Lower grain commodity prices, abundant worldwide inventories, and a strong U.S. Dollar negatively impacted grain shipments. International intermodal shipments declined as a result of the West Coast port work disruptions and higher than normal retail inventory levels. Crude oil shipments declined as a result of lower crude oil prices and unfavorable spreads, while fertilizer shipments also declined year-over-year due to the uncertainty of grain commodity prices. Increased auto production and vehicle sales drove strong growth in Automotive, our only business group which experienced volume growth in 2015.

As volumes began to decrease from 2014 levels, we were effective in aligning our resources to meet demand, while safely and efficiently serving our customers. Our operating metrics showed a step function improvement throughout last year. Average system velocity, as reported to the AAR, increased 6 percent and average terminal dwell decreased 3 percent when compared to 2014. By year end, our velocity was at an all-time best for that level of demand, and we continue to drive toward further network improvement.

2015 was a strong year for employee safety performance. Our reportable personal injury rate of 0.87 declined 11 percent from last year, and was an all-time record low. As we move forward, we continue to utilize our safety strategy to yield record results on our way toward achieving our ultimate goal of an incident free environment. We have an unrelenting focus on risk reduction through internal programs such as Courage to Care and Total Safety Culture. This is the cornerstone of our safety strategy so that every employee returns home safely at the end of each day.

Our robust capital program helps ensure we have the resources and network capacity required to efficiently handle our current volumes and future growth, while improving our network fluidity and generating returns for our shareholders. We invested $4.3 billion in 2015 strengthening the franchise. This included $1.9 billion in replacement capital to harden our infrastructure, and to improve the safety and resiliency of our network. In addition, we spent $1.1 billion on locomotives and other equipment, and nearly $700 million on new capacity and commercial facilities. We also spent almost $400 million toward completing the federally mandated Positive Train Control project. The deadline for completing PTC was extended to December 31, 2018, and we will continue to work diligently to safely complete this mandate.

Overall economic conditions, uncertainty in the energy markets, commodity prices, and the strength of the U.S. dollar will continue to have a major impact on our business this year. We are well-positioned to serve customers in existing markets as they rebound. The strength and diversity of the Union Pacific franchise also will provide tremendous opportunities for new business development as both domestic and global markets evolve.

When combined with our unrelenting focus on safety, productivity, and service, these opportunities will translate into an excellent experience for our customers and strong value for our shareholders in the years ahead.

Chairman, President and Chief Executive Officer

*See Item 7 of this report for reconciliations to U.S. GAAP.

DIRECTORS AND SENIOR MANAGEMENT

BOARD OF DIRECTORS

Andrew H. Card, Jr.
President
Franklin Pierce University
Board Committees: Audit, Compensation and Benefits

Erroll B. Davis, Jr.
Former Chairman,
President & CEO
Alliant Energy Corporation
Board Committees: Compensation and Benefits (Chair), Corporate Governance and Nominating

David B. Dillon
Former Chairman
The Kroger Company
Board Committees: Audit, Compensation and Benefits

Lance M. Fritz
Chairman, President and
Chief Executive Officer
Union Pacific Corporation and
Union Pacific Railroad Company

Judith Richards Hope
Emerita Professor of Law and
Distinguished Visitor from Practice
Georgetown University Law Center
Board Committees: Corporate Governance and Nominating, Finance

Charles C. Krulak
General, USMC, Ret.
Board Committees: Audit, Finance

Michael R. McCarthy
Chairman
McCarthy Group, LLC
Board Committees: Corporate Governance and Nominating, Finance (Chair)

Michael W. McConnell
General Partner and
Former Managing Partner
Brown Brothers Harriman & Co.
Board Committees: Audit (Chair), Finance

Thomas F. McLarty III
President
McLarty Associates
Board Committees: Finance, Corporate Governance and Nominating

Steven R. Rogel
Former Chairman
Weyerhaeuser Company
Lead Independent Director
Board Committees: Compensation and Benefits, Corporate Governance and Nominating (Chair)

Jose H. Villarreal
Advisor
Akin, Gump, Strauss, Hauer &
Feld, LLP
Board Committees: Audit, Compensation and Benefits

SENIOR MANAGEMENT

Lance M. Fritz
Chairman, President and
Chief Executive Officer
Union Pacific Corporation and
Union Pacific Railroad Company

Eric L. Butler
Executive Vice President-
Marketing and Sales
Union Pacific Railroad Company

Diane K. Duren
Executive Vice President and
Corporate Secretary
Union Pacific Corporation

Mary Sanders Jones
Vice President and Treasurer
Union Pacific Corporation

D. Lynn Kelley
Senior Vice President–Supply and
Continuous Improvement
Union Pacific Railroad Company

Robert M. Knight, Jr.
Executive Vice President–Finance
and Chief Financial Officer
Union Pacific Corporation

Scott D. Moore
Senior Vice President–
Corporate Relations
Union Pacific Corporation

Joseph E. O'Connor, Jr.
Vice President–Labor Relations
Union Pacific Railroad Company

Patrick J. O'Malley
Vice President–Taxes and General
Tax Counsel
Union Pacific Corporation

Michael A. Rock
Vice President–External Relations
Union Pacific Corporation

Todd M. Rynaski
Vice President and Controller
Union Pacific Corporation

Cameron A. Scott
Executive Vice President –
Operations
Union Pacific Railroad Company

Lynden L. Tennison
Senior Vice President and
Chief Information Officer
Union Pacific Corporation

James J. Theisen, Jr.
Associate General Counsel and
Interim Chief of Legal Staff
Union Pacific Corporation

PART I

Item 1. Business

GENERAL

Union Pacific Railroad Company is the principal operating company of Union Pacific Corporation. One of America's most recognized companies, Union Pacific Railroad Company links 23 states in the western two-thirds of the country by rail, providing a critical link in the global supply chain. The Railroad's diversified business mix includes Agricultural Products, Automotive, Chemicals, Coal, Industrial Products and Intermodal. Union Pacific serves many of the fastest-growing U.S. population centers, operates from all major West Coast and Gulf Coast ports to eastern gateways, connects with Canada's rail systems and is the only railroad serving all six major Mexico gateways. Union Pacific provides value to its roughly 10,000 customers by delivering products in a safe, reliable, fuel-efficient and environmentally responsible manner.

Union Pacific Corporation was incorporated in Utah in 1969 and maintains its principal executive offices at 1400 Douglas Street, Omaha, NE 68179. The telephone number at that address is (402) 544-5000. The common stock of Union Pacific Corporation is listed on the New York Stock Exchange (NYSE) under the symbol "UNP".

For purposes of this report, unless the context otherwise requires, all references herein to "UPC", "Corporation", "Company", "we", "us", and "our" shall mean Union Pacific Corporation and its subsidiaries, including Union Pacific Railroad Company, which we separately refer to as "UPRR" or the "Railroad".

Available Information – Our Internet website is www.up.com. We make available free of charge on our website (under the "Investors" caption link) our Annual Reports on Form 10-K; our Quarterly Reports on Form 10-Q; eXtensible Business Reporting Language (XBRL) documents; our current reports on Form 8-K; our proxy statements; Forms 3, 4, and 5, filed on behalf of our directors and certain executive officers; and amendments to such reports filed or furnished pursuant to the Securities Exchange Act of 1934, as amended (the Exchange Act). We provide these reports and statements as soon as reasonably practicable after such material is electronically filed with, or furnished to, the Securities and Exchange Commission (SEC). We also make available on our website previously filed SEC reports and exhibits via a link to EDGAR on the SEC's Internet site at www.sec.gov. Additionally, our corporate governance materials, including By-Laws, Board Committee charters, governance guidelines and policies, and codes of conduct and ethics for directors, officers, and employees are available on our website. From time to time, the corporate governance materials on our website may be updated as necessary to comply with rules issued by the SEC and the NYSE or as desirable to promote the effective and efficient governance of our Company. Any security holder wishing to receive, without charge, a copy of any of our SEC filings or corporate governance materials should send a written request to: Secretary, Union Pacific Corporation, 1400 Douglas Street, Omaha, NE 68179.

We have included the Chief Executive Officer (CEO) and Chief Financial Officer (CFO) certifications regarding our public disclosure required by Section 302 of the Sarbanes-Oxley Act of 2002 as Exhibits 31(a) and (b) to this report.

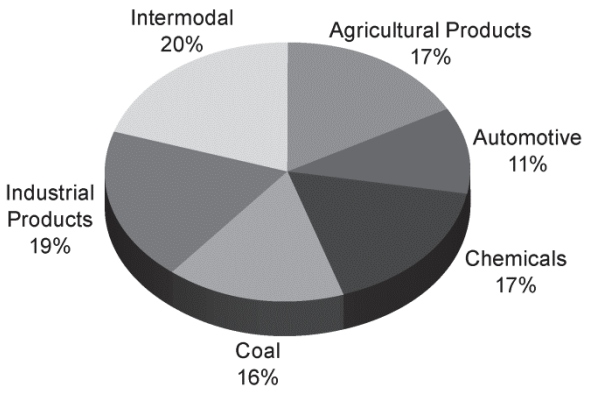
References to our website address in this report, including references in Management's Discussion and Analysis of Financial Condition and Results of Operations, Item 7, are provided as a convenience and do not constitute, and should not be deemed, an incorporation by reference of the information contained on, or available through, the website. Therefore, such information should not be considered part of this report.

OPERATIONS

The Railroad, along with its subsidiaries and rail affiliates, is our one reportable operating segment. Although we provide revenue by commodity group, we analyze the net financial results of the Railroad as one segment due to the integrated nature of our rail network. Additional information regarding our business and operations, including revenue and financial information and data and other information regarding environmental matters, is presented in Risk Factors, Item 1A; Legal Proceedings, Item 3; Selected Financial Data, Item 6; Management's Discussion and Analysis of Financial Condition and Results of Operations, Item 7; and the Financial Statements and Supplementary Data, Item 8 (which include information regarding revenues, statements of income, and total assets).

Operations – UPRR is a Class I railroad operating in the U.S. We have 32,084 route miles, linking Pacific Coast and Gulf Coast ports with the Midwest and eastern U.S. gateways and providing several corridors to key Mexican gateways. We serve the Western two-thirds of the country and maintain coordinated schedules with other rail carriers to move freight to and from the Atlantic Coast, the Pacific Coast, the Southeast, the Southwest, Canada, and Mexico. Export and import traffic moves through Gulf Coast and Pacific Coast ports and across the Mexican and Canadian borders. Our freight traffic consists of bulk, manifest, and premium business. Bulk traffic primarily consists of coal, grain, soda ash, ethanol, rock and crude oil shipped in unit trains – trains transporting a single commodity from one source to one destination. Manifest traffic includes individual carload or less than train-load business involving commodities such as lumber, steel, paper, food and chemicals. The transportation of finished vehicles, auto parts, intermodal containers and truck trailers are included as part of our premium business. In 2015, we generated freight revenues totaling $20.4 billion from the following six commodity groups:

2015 Freight Revenue



Agricultural Products – Transportation of grains, commodities produced from these grains, and food and beverage products generated 17% of the Railroad's 2015 freight revenue. We access most major grain markets, linking the Midwest and Western U.S. producing areas to export terminals in the Pacific Northwest and Gulf Coast ports, as well as Mexico. We also serve significant domestic markets, including grain processors, animal feeders and ethanol producers in the Midwest, West, South and Rocky Mountain states. Unit trains, which transport a single commodity between producers and export terminals or domestic markets, represent approximately 40% of our agricultural shipments.

Automotive – We are the largest automotive carrier west of the Mississippi River and operate or access over 40 vehicle distribution centers. The Railroad's extensive franchise serves five vehicle assembly plants and connects to West Coast ports, Mexico gateways and the Gulf of Mexico to accommodate both import and export shipments. In addition to transporting finished vehicles, UPRR provides expedited handling of automotive parts in both boxcars and intermodal containers destined for Mexico, the U.S. and Canada. The automotive group generated 11% of Union Pacific's freight revenue in 2015.

Chemicals – Transporting chemicals generated 17% of our freight revenue in 2015. The Railroad's unique franchise serves the chemical producing areas along the Gulf Coast, where roughly 60% of the Company's chemical business originates, terminates or travels. Our chemical franchise also accesses chemical producers in the Rocky Mountains and on the West Coast. The Company's chemical shipments include six categories: industrial chemicals, plastics, fertilizer, petroleum and liquid petroleum gases, crude oil and soda ash. Currently, these products move primarily to and from the Gulf Coast region. Fertilizer movements originate in the Gulf Coast region, the western U.S. and Canada (through interline access) for delivery to major agricultural users in the Midwest, western U.S., as well as abroad. Soda ash originates in southwestern Wyoming and California, destined for chemical and glass producing markets in North America and abroad.

Coal – Shipments of coal and petroleum coke accounted for 16% of our freight revenue in 2015. The Railroad's network supports the transportation of coal and petroleum coke to independent and regulated power companies and industrial facilities throughout the U.S. Through interchange gateways and ports, UPRR's reach extends to eastern U.S. utilities, Mexico, Europe and Asia. Water terminals allow the Railroad to move western U.S. coal east via the Mississippi and Ohio Rivers, as well as the Great Lakes. Export coal moves through West Coast ports to Asia and through the Mississippi River and Houston to Europe. Coal traffic originating in the Southern Powder River Basin (SPRB) area of Wyoming is the largest segment of the Railroad's coal business.

Industrial Products – Our extensive network facilitates the movement of numerous commodities between thousands of origin and destination points throughout North America. The Industrial Products group consists of several categories, including construction products, minerals, consumer goods, metals, lumber, paper, and other miscellaneous products. In 2015, this group generated 19% of our total freight revenue. Commercial, residential and governmental infrastructure investments drive shipments of steel,

aggregates (cement components), cement and wood products. Oil and gas drilling generates demand for raw steel, finished pipe, frac sand, stone and drilling fluid commodities. Industrial and light manufacturing plants receive steel, nonferrous materials, minerals and other raw materials. Paper and packaging commodities, as well as appliances, move to major metropolitan areas for consumers. Lumber shipments originate primarily in the Pacific Northwest and western Canada and move throughout the U.S. for use in new home construction and repair and remodeling.

Intermodal – Our Intermodal business includes two segments: international and domestic. International business consists of import and export container traffic that mainly passes through West Coast ports served by UPRR's extensive terminal network. Domestic business includes container and trailer traffic picked up and delivered within North America for intermodal marketing companies (primarily shipper agents and logistics companies), as well as truckload carriers. Less-than-truckload and package carriers with time-sensitive business requirements are also an important part of domestic shipments. Together, our international and domestic Intermodal business generated 20% of our 2015 freight revenue.

Seasonality – Some of the commodities we carry have peak shipping seasons, reflecting either or both the nature of the commodity and the demand cycle for the commodity (such as certain agricultural and food products that have specific growing and harvesting seasons). The peak shipping seasons for these commodities can vary considerably each year depending upon various factors, including the strength of domestic and international economies and currencies and the strength of harvests and market prices for agricultural products. In response to an annual request from the Surface Transportation Board (STB) to all of the Class I railroads operating in the U.S., we submit a publicly available letter during the third quarter detailing our plans for handling traffic during the third and fourth quarters each year and provide other information requested by the STB.

Working Capital – At December 31, 2015 and 2014, we had a modest working capital surplus, which provides enhanced liquidity. In addition, we believe we have adequate access to capital markets to meet any foreseeable cash requirements, and we have sufficient financial capacity to satisfy our current liabilities.

Competition – We are subject to competition from other railroads, motor carriers, ship and barge operators, and pipelines. Our main railroad competitor is Burlington Northern Santa Fe LLC. Its primary subsidiary, BNSF Railway Company (BNSF), operates parallel routes in many of our main traffic corridors. In addition, we operate in corridors served by other railroads and motor carriers. Motor carrier competition exists for five of our six commodity groups (excluding most coal shipments). Because of the proximity of our routes to major inland and Gulf Coast waterways, barges can be particularly competitive, especially for grain and bulk commodities in certain areas where we operate. In addition to price competition, we face competition with respect to transit times, quality and reliability of service from motor carriers and other railroads. Motor carriers in particular can have an advantage over railroads with respect to transit times and timeliness of service. However, railroads are much more fuel-efficient than trucks, which reduces the impact of transporting goods on the environment and public infrastructure, and we have been making efforts to convert certain truck traffic to rail. Additionally, we must build or acquire and maintain our rail system; trucks and barges are able to use public rights-of-way maintained by public entities. Any of the following could also affect the competitiveness of our transportation services for some or all of our commodities: (i) improvements or expenditures materially increasing the quality or reducing the costs of these alternative modes of transportation, (ii) legislation that eliminates or significantly reduces the size or weight limitations applied to motor carriers, or (iii) legislation or regulatory changes that impose operating restrictions on railroads or that adversely affect the profitability of some or all railroad traffic. Finally, many movements face product or geographic competition where our customers can use different products (e.g. natural gas instead of coal, sorghum instead of corn) or commodities from different locations (e.g. grain from states or countries that we do not serve, crude oil from different regions). Sourcing different commodities or different locations allows shippers to substitute different carriers and such competition may reduce our volume or constrain prices. For more information regarding risks we face from competition, see the Risk Factors in Item 1A of this report.

Key Suppliers – We depend on two key domestic suppliers of high horsepower locomotives. Due to the capital intensive nature of the locomotive manufacturing business and sophistication of this equipment, potential new suppliers face high barriers of entry into this industry. Therefore, if one of these domestic suppliers discontinues manufacturing locomotives for any reason, including insolvency or bankruptcy, we could experience a significant cost increase and risk reduced availability of the locomotives that are necessary to our operations. Additionally, for a high percentage of our rail purchases, we utilize two steel producers (one domestic and one international) that meet our specifications. Rail is critical for

maintenance, replacement, improvement, and expansion of our network and facilities. Rail manufacturing also has high barriers of entry, and, if one of those suppliers discontinues operations for any reason, including insolvency or bankruptcy, we could experience cost increases and difficulty obtaining rail.

Employees – Approximately 85% of our 47,457 full-time-equivalent employees are represented by 14 major rail unions. On January 1, 2015, current labor agreements became subject to modification and we began the current round of negotiations with the unions. Existing agreements remain in effect until new agreements are reached or the Railway Labor Act's procedures (which include mediation, cooling-off periods, and the possibility of Presidential Emergency Boards and Congressional intervention) are exhausted. Contract negotiations historically continue for an extended period of time and we rarely experience work stoppages while negotiations are pending.

Railroad Security – Our security efforts consist of a wide variety of measures including employee training, engagement with our customers, training of emergency responders, and partnerships with numerous federal, state, and local government agencies. While federal law requires us to protect the confidentiality of our security plans designed to safeguard against terrorism and other security incidents, the following provides a general overview of our security initiatives.

UPRR Security Measures – We maintain a comprehensive security plan designed to both deter and respond to any potential or actual threats as they arise. The plan includes four levels of alert status, each with its own set of countermeasures. We employ our own police force, consisting of more than 250 commissioned and highly-trained officers. Our employees also undergo recurrent security and preparedness training, as well as federally-mandated hazardous materials and security training. We regularly review the sufficiency of our employee training programs. We maintain the capability to move critical operations to back-up facilities in different locations.

We operate an emergency response management center 24 hours a day. The center receives reports of emergencies, dangerous or potentially dangerous conditions, and other safety and security issues from our employees, the public, law enforcement and other government officials. In cooperation with government officials, we monitor both threats and public events, and, as necessary, we may alter rail traffic flow at times of concern to minimize risk to communities and our operations. We comply with the hazardous materials routing rules and other requirements imposed by federal law. We also design our operating plan to expedite the movement of hazardous material shipments to minimize the time rail cars remain idle at yards and terminals located in or near major population centers. Additionally, in compliance with Transportation Security Agency regulations, we deployed information systems and instructed employees in tracking and documenting the handoff of Rail Security Sensitive Materials with customers and interchange partners.

We also have established a number of our own innovative safety and security-oriented initiatives ranging from various investments in technology to The Officer on the Train program, which provides local law enforcement officers with the opportunity to ride with train crews to enhance their understanding of railroad operations and risks. Our staff of information security professionals continually assesses cyber security risks and implements mitigation programs that evolve with the changing technology threat environment. To date, we have not experienced any material disruption of our operations due to a cyber threat or attack directed at us.

Cooperation with Federal, State, and Local Government Agencies – We work closely on physical and cyber security initiatives with government agencies, including the DOT and the Department of Homeland Security (DHS) as well as local police departments, fire departments, and other first responders. In conjunction with the Association of American Railroads (AAR), we sponsor Ask Rail, a mobile application which provides first responders with secure links to electronic information, including commodity and emergency response information required by emergency personnel to respond to accidents and other situations. We also participate in the National Joint Terrorism Task Force, a multi-agency effort established by the U.S. Department of Justice and the Federal Bureau of Investigation to combat and prevent terrorism.

We work with the Coast Guard, U.S. Customs and Border Protection (CBP), and the Military Transport Management Command, which monitor shipments entering the UPRR rail network at U.S. border crossings and ports. We were the first railroad in the U.S. to be named a partner in CBP's Customs-Trade Partnership Against Terrorism, a partnership designed to develop, enhance, and maintain effective security processes throughout the global supply chain.

Cooperation with Customers and Trade Associations – Through TransCAER (Transportation Community Awareness and Emergency Response) we work with the AAR, the American Chemistry Council, the American Petroleum Institute, and other chemical trade groups to provide communities with preparedness tools, including the training of emergency responders. In cooperation with the Federal Railroad Administration (FRA) and other interested groups, we are also working to develop additional improvements to tank car design that will further limit the risk of releases of hazardous materials.

GOVERNMENTAL AND ENVIRONMENTAL REGULATION

Governmental Regulation – Our operations are subject to a variety of federal, state, and local regulations, generally applicable to all businesses. (See also the discussion of certain regulatory proceedings in Legal Proceedings, Item 3.)

The operations of the Railroad are also subject to the regulatory jurisdiction of the STB. The STB has jurisdiction over rates charged on certain regulated rail traffic; common carrier service of regulated traffic; freight car compensation; transfer, extension, or abandonment of rail lines; and acquisition of control of rail common carriers. In 2015, the STB continued its efforts to explore whether to expand rail regulation. The STB requested parties to discuss the STB's methodology for determining railroad revenue adequacy and the possible use of a revenue adequacy constraint in regulating railroad rates. The STB conducted a hearing on expanding and easing procedures for grain rate complaints.

The Surface Transportation Board Reauthorization Act of 2015 became law on December 18, 2015. The legislation increased the number of STB board members from three to five, requires the STB to post quarterly reports on rate reasonableness cases and maintain a database on service complaints, and grants the STB authority to initiate investigations, among other things.

The operations of the Railroad also are subject to the regulations of the FRA and other federal and state agencies. On January 12, 2010, the FRA issued initial rules governing installation of Positive Train Control (PTC) by the end of 2015. The final regulation was issued on August 8, 2014. Although still under further development, PTC is a collision avoidance technology intended to override engineer controlled locomotives and stop train-to-train and overspeed accidents, misaligned switch derailments, and unauthorized entry to work zones. Through 2015, we have invested approximately $2.0 billion in the ongoing development of PTC.

Following the issuance of the initial rules, the FRA acknowledged that projected costs will exceed projected benefits by a ratio of at least 22 to one, and we estimate that our final costs will be higher than those assumed by the FRA. On October 29, 2015, Congress extended the December 31, 2015 PTC implementation deadline until December 31, 2018. The PTC implementation deadline may be extended to December 31, 2020, provided certain other criteria are satisfied. We are planning to submit our required PTC safety plan to the FRA in the first half of 2016.

On May 1, 2015, the Pipeline and Hazardous Materials Safety Administration (PHMSA) issued final rules governing the transportation of flammable liquids. The final rule included provisions for improved tank car standards, braking system requirements, community notification, and operating restrictions for certain trains carrying flammable liquids. Subsequently, Congress enacted the Fixing America's Surface Transportation Act, which requires the Government Accountability Office (GAO) to conduct an independent study on the rule's proposed braking system requirements. Pending the outcome of the study, the braking system requirement may be eliminated or revised. We will participate in and monitor the progress of the GAO study.

DOT, the Occupational Safety and Health Administration, PHMSA and DHS, along with other federal agencies, have jurisdiction over certain aspects of safety, movement of hazardous materials and hazardous waste, emissions requirements, and equipment standards. Additionally, various state and local agencies have jurisdiction over disposal of hazardous waste and seek to regulate movement of hazardous materials in ways not preempted by federal law.

Environmental Regulation – We are subject to extensive federal and state environmental statutes and regulations pertaining to public health and the environment. The statutes and regulations are administered and monitored by the Environmental Protection Agency (EPA) and by various state environmental agencies. The primary laws affecting our operations are the Resource Conservation and Recovery Act, regulating the management and disposal of solid and hazardous wastes; the Comprehensive Environmental Response, Compensation, and Liability Act, regulating the cleanup of

contaminated properties; the Clean Air Act, regulating air emissions; and the Clean Water Act, regulating waste water discharges.

Information concerning environmental claims and contingencies and estimated remediation costs is set forth in Management's Discussion and Analysis of Financial Condition and Results of Operations – Critical Accounting Policies – Environmental, Item 7 and Note 18 to the Consolidated Financial Statements in Item 8, Financial Statements and Supplementary Data.

Item 1A. Risk Factors

The information set forth in this Item 1A should be read in conjunction with the rest of the information included in this report, including Management's Discussion and Analysis of Financial Condition and Results of Operations, Item 7, and Financial Statements and Supplementary Data, Item 8.

We Must Manage Fluctuating Demand for Our Services and Network Capacity – If there is significant demand for our services that exceeds the designed capacity of our network, we may experience network difficulties, including congestion and reduced velocity, that could compromise the level of service we provide to our customers. This level of demand may also compound the impact of weather and weather-related events on our operations and velocity. Although we continue to improve our transportation plan, add capacity, improve operations at our yards and other facilities, and improve our ability to address surges in demand for any reason with adequate resources, we cannot be sure that these measures will fully or adequately address any service shortcomings resulting from demand exceeding our planned capacity. We may experience other operational or service difficulties related to network capacity, dramatic and unplanned fluctuations in our customers' demand for rail service with respect to one or more commodities or operating regions, or other events that could negatively impact our operational efficiency, any of which could have a material adverse effect on our results of operations, financial condition, and liquidity. In the event that we experience significant reductions in demand for rail services with respect to one or more commodities or changes in consumer preferences that affect the businesses of our customers, we may experience increased costs associated with resizing our operations, including higher unit operating costs and costs for the storage of locomotives, rail cars, and other equipment; work-force adjustments; and other related activities, which could have a material adverse effect on our results of operations, financial condition, and liquidity.

We Transport Hazardous Materials – We transport certain hazardous materials and other materials, including crude oil, ethanol, and toxic inhalation hazard (TIH) materials, such as chlorine, that pose certain risks in the event of a release or combustion. Additionally, U.S. laws impose common carrier obligations on railroads that require us to transport certain hazardous materials regardless of risk or potential exposure to loss. A rail accident or other incident or accident on our network, at our facilities, or at the facilities of our customers involving the release or combustion of hazardous materials could involve significant costs and claims for personal injury, property damage, and environmental penalties and remediation in excess of our insurance coverage for these risks, which could have a material adverse effect on our results of operations, financial condition, and liquidity.

We Are Subject to Significant Governmental Regulation – We are subject to governmental regulation by a significant number of federal, state, and local authorities covering a variety of health, safety, labor, environmental, economic (as discussed below), and other matters. Many laws and regulations require us to obtain and maintain various licenses, permits, and other authorizations, and we cannot guarantee that we will continue to be able to do so. Our failure to comply with applicable laws and regulations could have a material adverse effect on us. Governments or regulators may change the legislative or regulatory frameworks within which we operate without providing us any recourse to address any adverse effects on our business, including, without limitation, regulatory determinations or rules regarding dispute resolution, business relationships with other railroads, calculation of our cost of capital or other inputs relevant to computing our revenue adequacy, the prices we charge, and costs and expenses. Significant legislative activity in Congress or regulatory activity by the STB could expand regulation of railroad operations and prices for rail services, which could reduce capital spending on our rail network, facilities and equipment and have a material adverse effect on our results of operations, financial condition, and liquidity. As part of the Rail Safety Improvement Act of 2008, rail carriers were to implement PTC by the end of 2015 (the Rail Safety Improvement Act). The Surface Transportation Extension Act of 2015 amended the Rail Safety Improvement Act to require implementation of PTC by the end of 2018, which deadline may be extended to December 31, 2020, provided certain other criteria are satisfied. This implementation could have a material adverse effect on our ability to make other capital investments. Additionally, one or more consolidations of Class I railroads could also lead to increased regulation of the rail industry.

We May Be Affected by General Economic Conditions – Prolonged severe adverse domestic and global economic conditions or disruptions of financial and credit markets may affect the producers and consumers of the commodities we carry and may have a material adverse effect on our access to liquidity and our results of operations and financial condition.

We Face Competition from Other Railroads and Other Transportation Providers – We face competition from other railroads, motor carriers, ships, barges, and pipelines. In addition to price competition, we face competition with respect to transit times and quality and reliability of service. We must build or acquire and maintain our rail system, while trucks, barges and maritime operators are able to use public rights-of-way maintained by public entities. Any future improvements or expenditures materially increasing the quality or reducing the cost of alternative modes of transportation, or legislation that eliminates or significantly reduces the burden of the size or weight limitations currently applicable to motor carriers, could have a material adverse effect on our results of operations, financial condition, and liquidity. Additionally, any future consolidation of the rail industry could materially affect the competitive environment in which we operate.

We Rely on Technology and Technology Improvements in Our Business Operations – We rely on information technology in all aspects of our business. If we do not have sufficient capital to acquire new technology or if we are unable to develop or implement new technology such as PTC or the latest version of our transportation control systems, we may suffer a competitive disadvantage within the rail industry and with companies providing other modes of transportation service, which could have a material adverse effect on our results of operations, financial condition, and liquidity. Additionally, if a cyber attack or other event causes significant disruption or failure of one or more of our information technology systems, including computer hardware, software, and communications equipment, we could suffer a significant service interruption, safety failure, security breach, or other operational difficulties, which could have a material adverse impact on our results of operations, financial condition, and liquidity.

We May Be Subject to Various Claims and Lawsuits That Could Result in Significant Expenditures – As a railroad with operations in densely populated urban areas and other cities and a vast rail network, we are exposed to the potential for various claims and litigation related to labor and employment, personal injury, property damage, environmental liability, and other matters. Any material changes to litigation trends or a catastrophic rail accident or series of accidents involving any or all of property damage, personal injury, and environmental liability that exceed our insurance coverage for such risks could have a material adverse effect on our results of operations, financial condition, and liquidity.

We Are Subject to Significant Environmental Laws and Regulations – Due to the nature of the railroad business, our operations are subject to extensive federal, state, and local environmental laws and regulations concerning, among other things, emissions to the air; discharges to waters; handling, storage, transportation, disposal of waste and other materials; and hazardous material or petroleum releases. We generate and transport hazardous and non-hazardous waste in our operations, and we did so in our former operations. Environmental liability can extend to previously owned or operated properties, leased properties, and properties owned by third parties, as well as to properties we currently own. Environmental liabilities have arisen and may also arise from claims asserted by adjacent landowners or other third parties in toxic tort litigation. We have been and may be subject to allegations or findings that we have violated, or are strictly liable under, these laws or regulations. We currently have certain obligations at existing sites for investigation, remediation and monitoring, and we likely will have obligations at other sites in the future. Liabilities for these obligations affect our estimate based on our experience and, as necessary, the advice and assistance of our consultants. However, actual costs may vary from our estimates due to any or all of several factors, including changes to environmental laws or interpretations of such laws, technological changes affecting investigations and remediation, the participation and financial viability of other parties responsible for any such liability and the corrective action or change to corrective actions required to remediate any existing or future sites. We could incur significant costs as a result of any of the foregoing, and we may be required to incur significant expenses to investigate and remediate known, unknown, or future environmental contamination, which could have a material adverse effect on our results of operations, financial condition, and liquidity.

We May Be Affected by Climate Change and Market or Regulatory Responses to Climate Change – Climate change, including the impact of global warming, could have a material adverse effect on our results of operations, financial condition, and liquidity. Restrictions, caps, taxes, or other controls on emissions of greenhouse gasses, including diesel exhaust, could significantly increase our operating costs. Restrictions on emissions could also affect our customers that (a) use commodities that we carry to produce energy, (b) use significant amounts of energy in producing or delivering the commodities we

carry, or (c) manufacture or produce goods that consume significant amounts of energy or burn fossil fuels, including chemical producers, farmers and food producers, and automakers and other manufacturers. Significant cost increases, government regulation, or changes of consumer preferences for goods or services relating to alternative sources of energy or emissions reductions could materially affect the markets for the commodities we carry, which in turn could have a material adverse effect on our results of operations, financial condition, and liquidity. Government incentives encouraging the use of alternative sources of energy could also affect certain of our customers and the markets for certain of the commodities we carry in an unpredictable manner that could alter our traffic patterns, including, for example, the impacts of ethanol incentives on farming and ethanol producers. Finally, we could face increased costs related to defending and resolving legal claims and other litigation related to climate change and the alleged impact of our operations on climate change. Any of these factors, individually or in operation with one or more of the other factors, or other unforeseen impacts of climate change could reduce the amount of traffic we handle and have a material adverse effect on our results of operations, financial condition, and liquidity.

Severe Weather Could Result in Significant Business Interruptions and Expenditures – As a railroad with a vast network, we are exposed to severe weather conditions and other natural phenomena, including earthquakes, hurricanes, fires, floods, mudslides or landslides, extreme temperatures, and significant precipitation. Line outages and other interruptions caused by these conditions can adversely affect our entire rail network and can adversely affect revenue, costs, and liabilities, which could have a material adverse effect on our results of operations, financial condition, and liquidity.

Strikes or Work Stoppages Could Adversely Affect Our Operations – The U.S. Class I railroads are party to collective bargaining agreements with various labor unions. The majority of our employees belong to labor unions and are subject to these agreements. Disputes with regard to the terms of these agreements or our potential inability to negotiate acceptable contracts with these unions could result in, among other things, strikes, work stoppages, slowdowns, or lockouts, which could cause a significant disruption of our operations and have a material adverse effect on our results of operations, financial condition, and liquidity. Additionally, future national labor agreements, or renegotiation of labor agreements or provisions of labor agreements, could compromise our service reliability or significantly increase our costs for health care, wages, and other benefits, which could have a material adverse impact on our results of operations, financial condition, and liquidity. Labor disputes, work stoppages, slowdowns or lockouts at loading/unloading facilities, ports or other transport access points could compromise our service reliability and have a material adverse impact on our results of operations, financial condition, and liquidity. Labor disputes, work stoppages, slowdowns or lockouts by employees of our customers or our suppliers could compromise our service reliability and have a material adverse impact on our results of operations, financial condition, and liquidity.

The Availability of Qualified Personnel Could Adversely Affect Our Operations – Changes in demographics, training requirements, and the availability of qualified personnel could negatively affect our ability to meet demand for rail service. Unpredictable increases in demand for rail services and a lack of network fluidity may exacerbate such risks, which could have a negative impact on our operational efficiency and otherwise have a material adverse effect on our results of operations, financial condition, and liquidity.

We May Be Affected By Fluctuating Fuel Prices – Fuel costs constitute a significant portion of our transportation expenses. Diesel fuel prices can be subject to dramatic fluctuations, and significant price increases could have a material adverse effect on our operating results. Although we currently are able to recover a significant amount of our fuel expenses from our customers through revenue from fuel surcharges, we cannot be certain that we will always be able to mitigate rising or elevated fuel costs through our fuel surcharges. Additionally, future market conditions or legislative or regulatory activities could adversely affect our ability to apply fuel surcharges or adequately recover increased fuel costs through fuel surcharges. As fuel prices fluctuate, our fuel surcharge programs trail such fluctuations in fuel price by approximately two months, and may be a significant source of quarter-over-quarter and year-over-year volatility, particularly in periods of rapidly changing prices. International, political, and economic factors, events and conditions affect the volatility of fuel prices and supplies. Weather can also affect fuel supplies and limit domestic refining capacity. A severe shortage of, or disruption to, domestic fuel supplies could have a material adverse effect on our results of operations, financial condition, and liquidity. Alternatively, lower fuel prices could have a positive impact on the economy by increasing consumer discretionary spending that potentially could increase demand for various consumer products we transport. However, lower fuel prices could have a negative impact on other commodities we

transport, such as coal, frac sand and crude oil shipments, which could have a material adverse affect on our results of operations, financial condition, and liquidity.

We Utilize Capital Markets – Due to the significant capital expenditures required to operate and maintain a safe and efficient railroad, we rely on the capital markets to provide some of our capital requirements. We utilize long-term debt instruments, bank financing and commercial paper from time-to-time, and we pledge certain of our receivables. Significant instability or disruptions of the capital markets, including the credit markets, or deterioration of our financial condition due to internal or external factors could restrict or prohibit our access to, and significantly increase the cost of, commercial paper and other financing sources, including bank credit facilities and the issuance of long-term debt, including corporate bonds. A significant deterioration of our financial condition could result in a reduction of our credit rating to below investment grade, which could restrict, or at certain credit levels below investment grade may prohibit us, from utilizing our current receivables securitization facility. This may also limit our access to external sources of capital and significantly increase the costs of short and long-term debt financing.

A Significant Portion of Our Revenue Involves Transportation of Commodities to and from International Markets – Although revenues from our operations are attributable to transportation services provided in the U.S., a significant portion of our revenues involves the transportation of commodities to and from international markets, including Mexico and Southeast Asia, by various carriers and, at times, various modes of transportation. Significant and sustained interruptions of trade with Mexico or countries in Southeast Asia, including China, could adversely affect customers and other entities that, directly or indirectly, purchase or rely on rail transportation services in the U.S. as part of their operations, and any such interruptions could have a material adverse effect on our results of operations, financial condition and liquidity. Any one or more of the following could cause a significant and sustained interruption of trade with Mexico or countries in Southeast Asia: (a) a deterioration of security for international trade and businesses; (b) the adverse impact of new laws, rules and regulations or the interpretation of laws, rules and regulations by government entities, courts or regulatory bodies, including taxing authorities, that affect our customers doing business in foreign countries; (c) any significant adverse economic developments, such as extended periods of high inflation, material disruptions in the banking sector or in the capital markets of these foreign countries, and significant changes in the valuation of the currencies of these foreign countries that could materially affect the cost or value of imports or exports; (d) shifts in patterns of international trade that adversely affect import and export markets; and (e) a material reduction in foreign direct investment in these countries.

We Are Subject to Legislative, Regulatory, and Legal Developments Involving Taxes – Taxes are a significant part of our expenses. We are subject to U.S. federal, state, and foreign income, payroll, property, sales and use, fuel, and other types of taxes. Changes in tax rates, enactment of new tax laws, revisions of tax regulations, and claims or litigation with taxing authorities could result in substantially higher taxes and, therefore, could have a material adverse effect on our results of operations, financial condition, and liquidity.

We Are Dependent on Certain Key Suppliers of Locomotives and Rail – Due to the capital intensive nature and sophistication of locomotive equipment, potential new suppliers face high barriers to entry. Therefore, if one of the domestic suppliers of high horsepower locomotives discontinues manufacturing locomotives for any reason, including bankruptcy or insolvency, we could experience significant cost increases and reduced availability of the locomotives that are necessary for our operations. Additionally, for a high percentage of our rail purchases, we utilize two steel producers (one domestic and one international) that meet our specifications. Rail is critical to our operations for rail replacement programs, maintenance, and for adding additional network capacity, new rail and storage yards, and expansions of existing facilities. This industry similarly has high barriers to entry, and if one of these suppliers discontinues operations for any reason, including bankruptcy or insolvency, we could experience both significant cost increases for rail purchases and difficulty obtaining sufficient rail for maintenance and other projects.

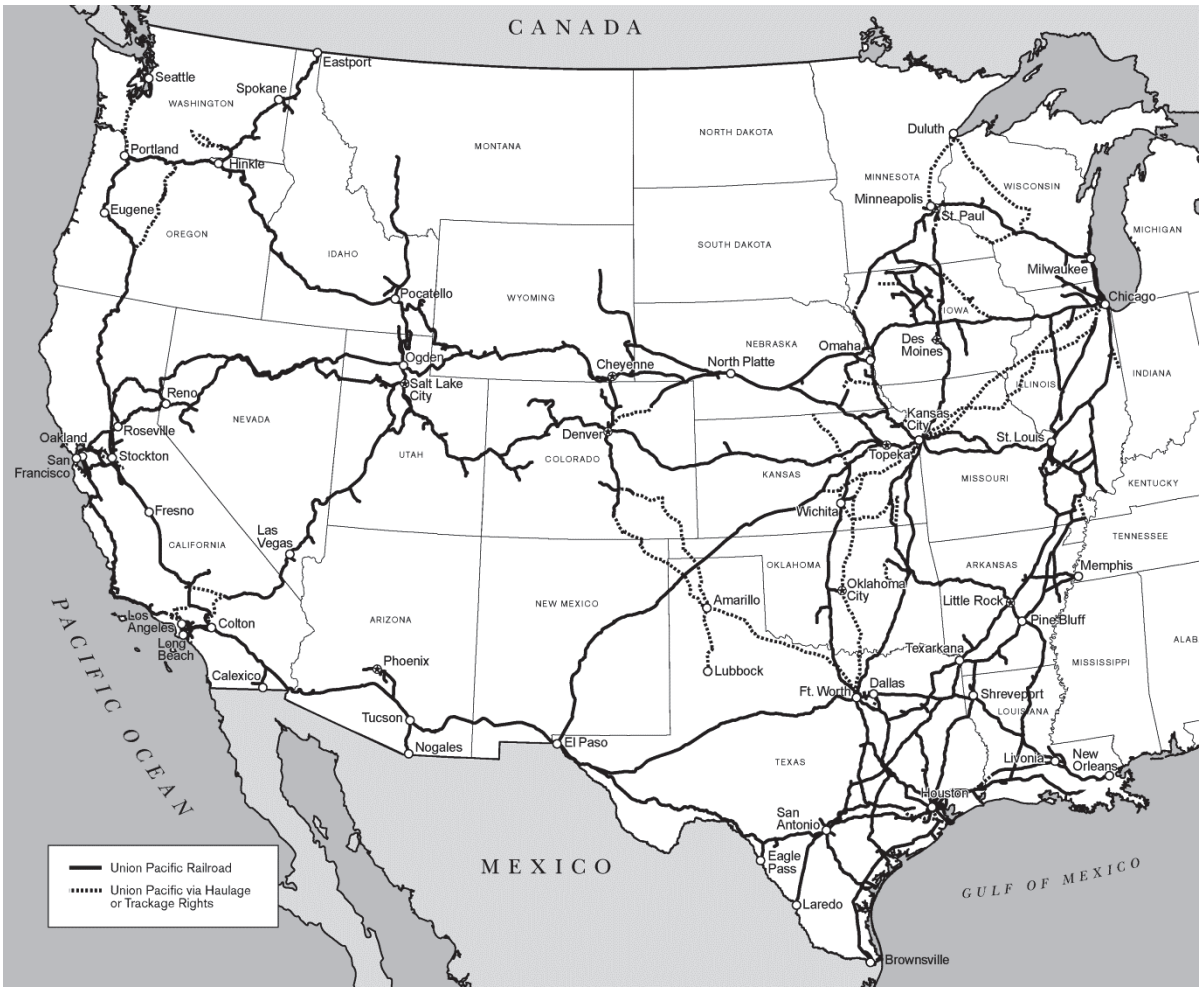
We May Be Affected by Acts of Terrorism, War, or Risk of War – Our rail lines, facilities, and equipment, including rail cars carrying hazardous materials, could be direct targets or indirect casualties of terrorist attacks. Terrorist attacks, or other similar events, any government response thereto, and war or risk of war may adversely affect our results of operations, financial condition, and liquidity. In addition, insurance premiums for some or all of our current coverages could increase dramatically, or certain coverages may not be available to us in the future.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

We employ a variety of assets in the management and operation of our rail business. Our rail network covers 23 states in the western two-thirds of the U.S.



TRACK

Our rail network includes 32,084 route miles. We own 26,064 miles and operate on the remainder pursuant to trackage rights or leases. The following table describes track miles at December 31, 2015 and 2014.

	2015	*2014*
Route	**32,084**	31,974
Other main line	**7,012**	6,943
Passing lines and turnouts	**3,235**	3,197
Switching and classification yard lines	**9,108**	9,058
Total miles	**51,439**	51,172

HEADQUARTERS BUILDING

We own our headquarters building in Omaha, Nebraska. The facility has 1.2 million square feet of space for approximately 4,000 employees.

HARRIMAN DISPATCHING CENTER

The Harriman Dispatching Center (HDC), located in Omaha, Nebraska, is our primary dispatching facility. It is linked to regional dispatching and locomotive management facilities at various locations along our network. HDC employees coordinate moves of locomotives and trains, manage traffic and train crews on our network, and coordinate interchanges with other railroads. Approximately 900 employees currently work on-site in the facility. In the event of a disruption of operations at HDC due to a cyber attack, flooding or severe weather or other event, we maintain the capability to conduct critical operations at back-up facilities in different locations.

RAIL FACILITIES

In addition to our track structure, we operate numerous facilities, including terminals for intermodal and other freight; rail yards for building trains (classification yards), switching, storage-in-transit (the temporary storage of customer goods in rail cars prior to shipment) and other activities; offices to administer and manage our operations; dispatching centers to direct traffic on our rail network; crew quarters to house train crews along our network; and shops and other facilities for fueling, maintenance, and repair of locomotives and repair and maintenance of rail cars and other equipment. The following table includes the major yards and terminals on our system:

Major Classification Yards	*Major Intermodal Terminals*
North Platte, Nebraska	ICTF (Los Angeles), California
North Little Rock, Arkansas	Joliet (Global 4), Illinois
Englewood (Houston), Texas	East Los Angeles, California
Proviso (Chicago), Illinois	DIT (Dallas), Texas
Fort Worth, Texas	Global I (Chicago), Illinois
Livonia, Louisiana	Marion (Memphis), Tennessee
Roseville, California	Global II (Chicago), Illinois
Pine Bluff, Arkansas	Mesquite, Texas
West Colton, California	City of Industry, California
Neff (Kansas City), Missouri	Lathrop, California

RAIL EQUIPMENT

Our equipment includes owned and leased locomotives and rail cars; heavy maintenance equipment and machinery; other equipment and tools in our shops, offices, and facilities; and vehicles for maintenance, transportation of crews, and other activities. As of December 31, 2015, we owned or leased the following units of equipment:

Locomotives	*Owned*	*Leased*	*Total*	*Average Age (yrs.)*
Multiple purpose	5,917	2,135	8,052	18.7
Switching	273	12	285	35.0
Other	70	57	127	36.6
Total locomotives	6,260	2,204	8,464	N/A

Freight cars	*Owned*	*Leased*	*Total*	*Average Age (yrs.)*
Covered hoppers	12,693	15,189	27,882	20.2
Open hoppers	7,272	3,464	10,736	29.0
Gondolas	5,856	3,674	9,530	25.2
Boxcars	3,147	4,432	7,579	32.9
Refrigerated cars	2,681	4,006	6,687	25.1
Flat cars	2,617	1,447	4,064	29.3
Other	33	352	385	22.2
Total freight cars	34,299	32,564	66,863	N/A

Highway revenue equipment	*Owned*	*Leased*	*Total*	*Average Age (yrs.)*
Containers	33,633	25,998	59,631	8.0
Chassis	22,086	26,837	48,923	9.6
Total highway revenue equipment	55,719	52,835	108,554	N/A

CAPITAL EXPENDITURES

Our rail network requires significant annual capital investments for replacement, improvement, and expansion. These investments enhance safety, support the transportation needs of our customers, and improve our operational efficiency. Additionally, we add new locomotives and freight cars to our fleet to replace older, less efficient equipment, to support growth and customer demand, and to reduce our impact on the environment through the acquisition of more fuel-efficient and low-emission locomotives.

2015 Capital Program – During 2015, our capital program totaled $4.3 billion. (See the cash capital expenditures table in Management's Discussion and Analysis of Financial Condition and Results of Operations – Liquidity and Capital Resources, Item 7.)

2016 Capital Plan – In 2016, we expect our capital plan to be approximately $3.75 billion, which will include expenditures for PTC of approximately $375 million and may include non-cash investments. We may revise our 2016 capital plan if business conditions warrant or if new laws or regulations affect our ability to generate sufficient returns on these investments. (See discussion of our 2016 capital plan in Management's Discussion and Analysis of Financial Condition and Results of Operations – 2016 Outlook, Item 7.)

OTHER

Equipment Encumbrances – Equipment with a carrying value of approximately $2.6 billion and $2.8 billion at December 31, 2015, and 2014, respectively served as collateral for capital leases and other types of equipment obligations in accordance with the secured financing arrangements utilized to acquire or refinance such railroad equipment.

As a result of the merger of Missouri Pacific Railroad Company (MPRR) with and into UPRR on January 1, 1997, and pursuant to the underlying indentures for the MPRR mortgage bonds, UPRR must maintain the same value of assets after the merger in order to comply with the security requirements of the mortgage bonds. As of the merger date, the value of the MPRR assets that secured the mortgage bonds was approximately $6.0 billion. In accordance with the terms of the indentures, this collateral value must be maintained during the entire term of the mortgage bonds irrespective of the outstanding balance of such bonds.

Environmental Matters – Certain of our properties are subject to federal, state, and local laws and regulations governing the protection of the environment. (See discussion of environmental issues in Business – Governmental and Environmental Regulation, Item 1, and Management's Discussion and Analysis of Financial Condition and Results of Operations – Critical Accounting Policies – Environmental, Item 7.)

Item 3. Legal Proceedings

From time to time, we are involved in legal proceedings, claims, and litigation that occur in connection with our business. We routinely assess our liabilities and contingencies in connection with these matters based upon the latest available information and, when necessary, we seek input from our third-party advisors when making these assessments. Consistent with SEC rules and requirements, we describe below material pending legal proceedings (other than ordinary routine litigation incidental to our business), material proceedings known to be contemplated by governmental authorities, other proceedings arising under federal, state, or local environmental laws and regulations (including governmental proceedings involving potential fines, penalties, or other monetary sanctions in excess of $100,000), and such other pending matters that we may determine to be appropriate.

ENVIRONMENTAL MATTERS

As previously reported in our Annual Report on Form 10-K for the fiscal year ended December 31, 2012, the Illinois Attorney General's Office notified UPRR on January 14, 2013, that it will seek a penalty against the Railroad for environmental conditions caused by its predecessor at a former locomotive fueling facility in South Pekin, Illinois. This former CNW facility discontinued fueling operations in the early 1980s. Subsequent environmental investigation revealed evidence of fuel releases to soil and groundwater. In January 2007, the State rejected UPRR's proposed compliance commitment agreement and responded with a notice of intent to pursue legal action. UPRR continued to perform remedial investigations under the supervision of the Illinois EPA. In June 2012, the Illinois EPA approved UPRR's proposed remedial action plan for the site, consisting of no further action and monitoring for a period of ten years. Subsequently, the State notified UPRR that it would seek to recover a civil penalty, and during early negotiations, it offered to settle its claim for $240,000. UPRR rejected this offer. The State sued UPRR on October 26, 2013, in the Circuit Court for the Tenth Judicial Circuit, Tazewell County, Illinois. Through continued settlement negotiations, the parties reached an agreement to settle this matter in exchange for a payment by UPRR of $100,000. A final agreement was signed by the parties and approved by the Circuit Court and UPRR completed payment of $100,000.

As previously reported in our Quarterly Report on Form 10-Q for the quarter ended March 31, 2015, a punctured tank car resulted in an accidental release of sulfuric acid in a rail yard in Herington, Kansas in January, 2012. The acid was released on the ground and entered a creek that runs adjacent to the yard. Environmental remediation at the site is complete. Despite negotiations with the federal government, the Assistant U.S. Attorney (District of Kansas) filed a criminal charge against the Railroad on March 30, 2015, in the U.S. District Court for Kansas. The action alleges a misdemeanor charge for negligent violation of the Clean Water Act. The penalty range was $2,500 to $200,000. In addition, the federal government may debar the facility if UPRR were convicted. A debarment would prevent Herington Yard from participating in new government contract work. On January 12, 2016, the federal judge in the U.S. District Court for Kansas dismissed the charge against the Railroad. The EPA is considering whether to appeal the case or pursue civil penalties. We cannot predict the ultimate impact of this proceeding at this time, but the proposed penalty could exceed $100,000.

We receive notices from the EPA and state environmental agencies alleging that we are or may be liable under federal or state environmental laws for remediation costs at various sites throughout the U.S., including sites on the Superfund National Priorities List or state superfund lists. We cannot predict the ultimate impact of these proceedings and suits because of the number of potentially responsible parties involved, the degree of contamination by various wastes, the scarcity and quality of volumetric data related to many of the sites, and the speculative nature of remediation costs.

Information concerning environmental claims and contingencies and estimated remediation costs is set forth in Management’s Discussion and Analysis of Financial Condition and Results of Operations – Critical Accounting Policies – Environmental, Item 7.

OTHER MATTERS

Antitrust Litigation - As we reported in our Quarterly Report on Form 10-Q for the quarter ended June 30, 2007, 20 rail shippers (many of whom are represented by the same law firms) filed virtually identical antitrust lawsuits in various federal district courts against us and four other Class I railroads in the U.S. Currently, UPRR and three other Class I railroads are the named defendants in the lawsuit. The original plaintiff filed the first of these claims in the U.S. District Court in New Jersey on May 14, 2007. The number of complaints reached a total of 30. These suits allege that the named railroads engaged in price-fixing by establishing common fuel surcharges for certain rail traffic.

In addition to suits filed by direct purchasers of rail transportation services, a few of the suits involved plaintiffs alleging that they are or were indirect purchasers of rail transportation and sought to represent a purported class of indirect purchasers of rail transportation services that paid fuel surcharges. These complaints added allegations under state antitrust and consumer protection laws. On November 6, 2007, the Judicial Panel on Multidistrict Litigation ordered that all of the rail fuel surcharge cases be transferred to Judge Paul Friedman of the U.S. District Court in the District of Columbia for coordinated or consolidated pretrial proceedings. Following numerous hearings and rulings, Judge Friedman dismissed the complaints of the indirect purchasers, which the indirect purchasers appealed. On April 16, 2010, the U.S. Court of Appeals for the District of Columbia affirmed Judge Friedman’s ruling dismissing the indirect purchasers’ claims based on various state laws.

On June 21, 2012, Judge Friedman issued a decision that certified a class of plaintiffs with eight named plaintiff representatives. The decision included in the class all shippers that paid a rate-based fuel surcharge to any one of the defendant railroads for rate-unregulated rail transportation from July 1, 2003, through December 31, 2008. This was a procedural ruling, which did not affirm any of the claims asserted by the plaintiffs and does not address the ability of the railroad defendants to disprove the allegations made by the plaintiffs. On July 5, 2012, the defendant railroads filed a petition with the U.S. Court of Appeals for the District of Columbia requesting that the court review the class certification ruling. On August 28, 2012, a panel of the Circuit Court of the District of Columbia referred the petition to a merits panel of the court to address the issues in the petition and to address whether the district court properly granted class certification. The Circuit Court heard oral arguments on May 3, 2013. On August 9, 2013, the Circuit Court vacated the class certification decision and remanded the case to the district court to reconsider the class certification decision in light of a recent Supreme Court case and incomplete consideration of errors in the expert report of the plaintiffs. On October 31, 2013, Judge Friedman approved a schedule agreed to by all parties for consideration of the class certification issue on remand.

On October 2, 2014, the plaintiffs informed Judge Friedman that their economic expert had a previously undisclosed conflict of interest. Judge Friedman ruled on November 26, 2014, that the plaintiffs had until April 1, 2015, to file a supplemental expert report to support their motion for class certification. The plaintiffs filed their supplemental expert report on April 1, 2015. Judge Friedman issued a scheduling order on June 19, 2015, scheduling a class certification hearing for November 2, 2015. Judge Friedman then vacated the hearing date in an Order on September 28, 2015 because of the potential impact resulting from the decision of the U.S. Supreme Court case, *Tyson Foods v. Bouaphakeo*, related to class action certification and damages, which was heard on November 10, 2015. The Order requires the parties to file a joint schedule and briefing statement within fourteen days after the U.S. Supreme Court decision in the *Tyson Foods* matter, which is expected to be issued during the first half of 2016.

As we reported in our Current Report on Form 8-K, filed on June 10, 2011, the Railroad received a complaint filed in the U.S. District Court for the District of Columbia on June 7, 2011, by Oxbow Carbon & Minerals LLC and related entities (Oxbow). The complaint named the Railroad and one other U.S. Class I Railroad as defendants and alleged that the named railroads engaged in price-fixing and monopolistic practices in connection with fuel surcharge programs and pricing of shipments of certain commodities, including coal and petroleum coke. The complaint sought injunctive relief and payment of damages of over $30 million, and other unspecified damages, including treble damages. Some of the allegations in the complaint were addressed in the existing fuel surcharge litigation referenced above. The complaint also included additional unrelated allegations regarding alleged limitations on competition for shipments of Oxbow's commodities. Judge Friedman, who presides over the fuel surcharge matter described above, also presides over this matter. On February 26, 2013, Judge Friedman granted the defendants' motion to dismiss Oxbow's complaint for failure to state properly a claim under the antitrust laws. However, the dismissal was without prejudice to refile the complaint. Judge Friedman approved a schedule that allowed Oxbow to file a revised complaint, which Oxbow filed on May 1, 2013. The amended complaint alleges that UPRR and one other Class I railroad violated Sections 1 and 2 of the Sherman Antitrust Act and that UPRR also breached a tolling agreement between Oxbow and UPRR. Oxbow claims that it paid more than $50 million in wrongfully imposed fuel surcharges. UPRR and the other railroad filed separate motions to dismiss the Oxbow revised complaint on July 1, 2013. Judge Friedman heard oral arguments on the motions to dismiss filed by UPRR and the other railroad on January 8, 2015. Judge Friedman denied the motions to dismiss on February 24, 2015. This was a procedural ruling, which did not affirm any of the claims asserted by Oxbow and does not affect the ability of the railroad defendants to disprove the allegations made by Oxbow. UPRR filed its answer to Oxbow's complaint on March 24, 2015, and the parties have commenced discovery.

We deny the allegations that our fuel surcharge programs violate the antitrust laws or any other laws. We believe that these lawsuits are without merit, and we will vigorously defend our actions. Therefore, we currently believe that these matters will not have a material adverse effect on any of our results of operations, financial condition, and liquidity.

Item 4. Mine Safety Disclosures

Not applicable.

Executive Officers of the Registrant and Principal Executive Officers of Subsidiaries

The Board of Directors typically elects and designates our executive officers on an annual basis at the board meeting held in conjunction with the Annual Meeting of Shareholders, and they hold office until their successors are elected. Executive officers also may be elected and designated throughout the year, as the Board of Directors considers appropriate. There are no family relationships among the officers, nor is there any arrangement or understanding between any officer and any other person pursuant to which the officer was selected. The following table sets forth certain information current as of February 5, 2016, relating to the executive officers.

Name	Position	Age	Business Experience During Past Five Years
Lance M. Fritz	Chairman, President and Chief Executive Officer of UPC and the Railroad	53	[1]
Robert M. Knight, Jr.	Executive Vice President – Finance and Chief Financial Officer of UPC and the Railroad	58	Current Position
Eric L. Butler	Executive Vice President – Marketing and Sales of the Railroad	55	[2]
Diane K. Duren	Executive Vice President and Corporate Secretary of UPC and the Railroad	56	[3]
Todd M. Rynaski	Vice President and Controller of UPC and Chief Accounting Officer and Controller of the Railroad	45	[4]
Cameron A. Scott	Executive Vice President – Operations of the Railroad	53	[5]

[1] On July 30, 2015, Mr. Fritz was named Chairman of the Board of UPC and the Railroad effective October 1, 2015. Mr. Fritz was elected President and Chief Executive Officer of UPC and the Railroad effective February 5, 2015. Previously, Mr. Fritz was President and Chief Operating Officer of the Railroad effective February 6, 2014, Executive Vice President – Operations of the Railroad effective September 1, 2010, and Vice President – Operations of the Railroad effective January 1, 2010.

[2] Mr. Butler was elected to his current position effective March 15, 2012. He previously was Vice President and General Manager - Industrial Products effective April 14, 2005.

[3] Ms. Duren was elected Executive Vice President of UPC and the Railroad effective October 1, 2012. In addition, Ms. Duren was elected Corporate Secretary effective March 1, 2013. She previously was Vice President and General Manager - Chemicals effective August 1, 2006.

[4] Mr. Rynaski was elected Vice President and Controller of UPC and Chief Accounting Officer and Controller of the Railroad effective September 1, 2015. He previously was Assistant Vice President – Accounting of the Railroad effective January 1, 2014, and Assistant Vice President – Financial Reporting and Analysis effective April 1, 2011, and General Director – Information Technologies effective September 1, 2008.

[5] Mr. Scott was elected to his current position effective February 6, 2014. He previously was Vice President Network Planning and Operations effective June 30, 2012, Regional Vice President – Western Region effective April 1, 2012, and Assistant Vice President Operations – Western Region effective February 16, 2009.

PART II

Item 5. Market for the Registrant's Common Equity, Related Stockholder Matters, and Issuer Purchases of Equity Securities

Our common stock is traded on the New York Stock Exchange (NYSE) under the symbol "UNP". The following table presents the dividends declared and the high and low prices of our common stock for each of the indicated quarters. All amounts are retroactively adjusted to reflect the June 6, 2014 stock split.

2015 - Dollars Per Share	*Q1*	*Q2*	*Q3*	*Q4*
Dividends	$ 0.55	$ 0.55	$ 0.55	$ 0.55
Common stock price:				
High	124.52	112.44	99.71	98.28
Low	106.75	94.91	79.31	74.78

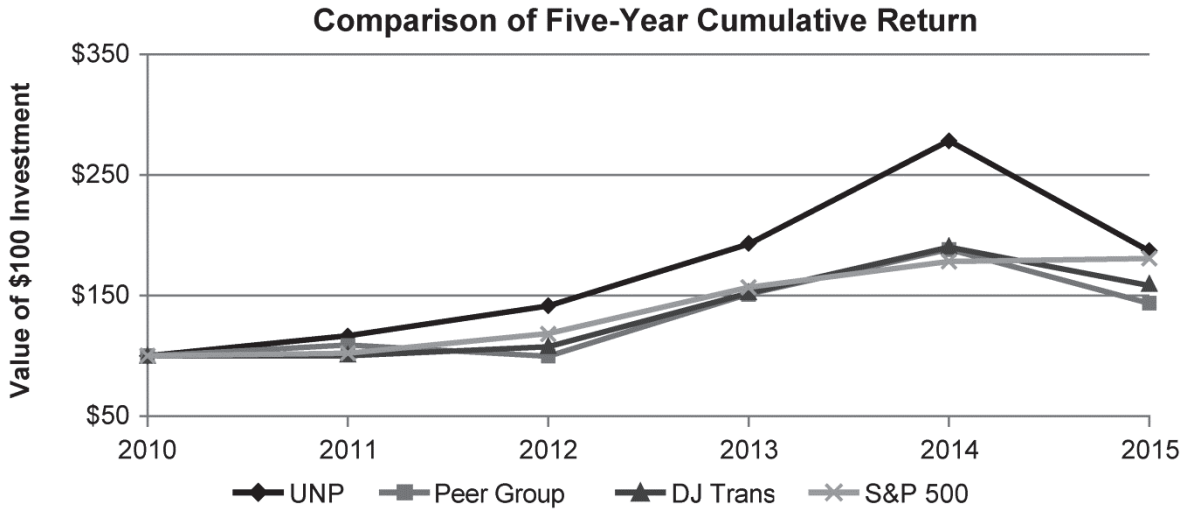
2014 - Dollars Per Share	*Q1*	*Q2*	*Q3*	*Q4*
Dividends	$ 0.455	$ 0.455	$ 0.50	$ 0.50
Common stock price:				
High	95.24	102.96	110.26	123.61
Low	82.49	90.36	96.76	96.17

At January 29, 2016, there were 846,414,350 shares of common stock outstanding and 32,209 common shareholders of record. On that date, the closing price of the common stock on the NYSE was $72.00. We paid dividends to our common shareholders during each of the past 116 years. We declared dividends totaling $1,906 million in 2015 and $1,714 million in 2014. We are subject to certain restrictions regarding retained earnings with respect to the payment of cash dividends to our shareholders. The amount of retained earnings available for dividends decreased to $13.6 billion at December 31, 2015, from $15.4 billion at December 31, 2014. (See discussion of this restriction in Management's Discussion and Analysis of Financial Condition and Results of Operations – Liquidity and Capital Resources, Item 7.) We do not believe the restriction on retained earnings will affect our ability to pay dividends, and we currently expect to pay dividends in 2016.

Comparison Over One- and Three-Year Periods – The following table presents the cumulative total shareholder returns, assuming reinvestment of dividends, over one- and three-year periods for the Corporation (UNP), a peer group index (comprised of CSX Corporation and Norfolk Southern Corporation), the Dow Jones Transportation Index (DJ Trans), and the Standard & Poor's 500 Stock Index (S&P 500).

Period	*UNP*	*Peer Group*	*DJ Trans*	*S&P 500*
1 Year (2015)	(32.9)%	(23.9)%	(16.8)%	1.4 %
3 Year (2013 - 2015)	32.2	43.9	47.2	52.5

Five-Year Performance Comparison – The following graph provides an indicator of cumulative total shareholder returns for the Corporation as compared to the peer group index (described above), the DJ Trans, and the S&P 500. The graph assumes that $100 was invested in the common stock of Union Pacific Corporation and each index on December 31, 2010 and that all dividends were reinvested. The information below is historical in nature and is not necessarily indicative of future performance.



Purchases of Equity Securities – During 2015, we repurchased 36,921,641 shares of our common stock at an average price of $99.16. The following table presents common stock repurchases during each month for the fourth quarter of 2015:

Period	*Total Number of Shares Purchased [a]*	*Average Price Paid Per Share*	*Total Number of Shares Purchased as Part of a Publicly Announced Plan or Program [b]*	*Maximum Number of Shares Remaining Under the Plan or Program [b]*
Oct. 1 through Oct. 31	3,247,731	$ 92.98	3,221,153	56,078,192
Nov. 1 through Nov. 30	2,325,865	86.61	2,322,992	53,755,200
Dec. 1 through Dec. 31	1,105,389	77.63	1,102,754	52,652,446
Total	6,678,985	$ 88.22	6,646,899	N/A

[a] Total number of shares purchased during the quarter includes approximately 32,086 shares delivered or attested to UPC by employees to pay stock option exercise prices, satisfy excess tax withholding obligations for stock option exercises or vesting of retention units, and pay withholding obligations for vesting of retention shares.

[b] Effective January 1, 2014, our Board of Directors authorized the repurchase of up to 120 million shares of our common stock by December 31, 2017. These repurchases may be made on the open market or through other transactions. Our management has sole discretion with respect to determining the timing and amount of these transactions.

Item 6. Selected Financial Data

The following table presents as of, and for the years ended, December 31, our selected financial data for each of the last five years. The selected financial data should be read in conjunction with Management's Discussion and Analysis of Financial Condition and Results of Operations, Item 7, and with the Financial Statements and Supplementary Data, Item 8. The information below is historical in nature and is not necessarily indicative of future financial condition or results of operations.

Millions, Except per Share Amounts, Carloads, Employee Statistics, and Ratios	***2015***	*2014*	*2013*	*2012*	*2011*
For the Year Ended December 31					
Operating revenues [a]	**$ 21,813**	$ 23,988	$ 21,963	$ 20,926	$ 19,557
Operating income	**8,052**	8,753	7,446	6,745	5,724
Net income	**4,772**	5,180	4,388	3,943	3,292
Earnings per share - basic [b]	**5.51**	5.77	4.74	4.17	3.39
Earnings per share - diluted [b]	**5.49**	5.75	4.71	4.14	3.36
Dividends declared per share [b]	**2.20**	1.91	1.48	1.245	0.965
Cash provided by operating activities	**7,344**	7,385	6,823	6,161	5,873
Cash used in investing activities	**(4,476)**	(4,249)	(3,405)	(3,633)	(3,119)
Cash used in financing activities	**(3,063)**	(2,982)	(3,049)	(2,682)	(2,623)
Cash used for common share repurchases	**(3,465)**	(3,225)	(2,218)	(1,474)	(1,418)
At December 31					
Total assets [c]	**$ 54,600**	$ 52,372	$ 49,410	$ 46,842	$ 44,742
Long-term obligations [c] [d]	**30,692**	27,419	24,395	23,847	22,848
Debt due after one year [c]	**13,607**	10,952	8,820	8,754	8,650
Common shareholders' equity	**20,702**	21,189	21,225	19,877	18,578
Additional Data					
Freight revenues [a]	**$ 20,397**	$ 22,560	$ 20,684	$ 19,686	$ 18,508
Revenue carloads (units) (000)	**9,062**	9,625	9,022	9,048	9,072
Operating ratio (%) [e]	**63.1**	63.5	66.1	67.8	70.7
Average employees (000)	**47.5**	47.2	46.4	45.9	44.9
Financial Ratios (%)					
Debt to capital [c] [f]	**40.7**	35.0	31.0	31.0	32.3
Return on average common shareholders' equity [g]	**22.8**	24.4	21.4	20.5	18.1

[a] Includes fuel surcharge revenue of $1.3 billion, $2.8 billion, $2.6 billion, $2.6 billion, and $2.2 billion for 2015, 2014, 2013, 2012, and 2011, respectively, which partially offsets increased operating expenses for fuel. (See further discussion in Management's Discussion and Analysis of Financial Condition and Results of Operations – Results of Operations – Operating Revenues, Item 7.)

[b] Earnings per share and dividends declared per share are retroactively adjusted to reflect the June 6, 2014 stock split.

[c] Total assets, long-term obligations, debt due after one year, and debt to capital are retroactively adjusted to reflect the adoption of accounting standard updates on deferred debt issuance costs and deferred taxes. (See further discussion in Financial Statements and Supplementary Data– Accounting Pronouncements, Item 8.)

[d] Long-term obligations is determined as follows: total liabilities less current liabilities.

[e] Operating ratio is defined as operating expenses divided by operating revenues.

[f] Debt to capital is determined as follows: total debt divided by total debt plus common shareholders' equity.

[g] Return on average common shareholders' equity is determined as follows: Net income divided by average common shareholders' equity.

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations

The following discussion should be read in conjunction with the Consolidated Financial Statements and applicable notes to the Financial Statements and Supplementary Data, Item 8, and other information in this report, including Risk Factors set forth in Item 1A and Critical Accounting Policies and Cautionary Information at the end of this Item 7.

The Railroad, along with its subsidiaries and rail affiliates, is our one reportable business segment. Although revenue is analyzed by commodity, we analyze the net financial results of the Railroad as one segment due to the integrated nature of the rail network.

EXECUTIVE SUMMARY

2015 Results

- **Safety** – During 2015, we continued our focus on safety to reduce risk and eliminate incidents for our employees, our customers and the public. We achieved our best ever reportable personal injury incidents per 200,000 employee-hours of 0.87. In addition, we finished 2015 with a 3% improvement in our crossing incident rate per million train miles compared to the prior year. These results demonstrate our employees' dedication to our safety initiatives and our efforts to further engage the workforce through programs such as Courage to Care, Total Safety Culture, and UP Way (our continuous improvement culture).

- **Financial Performance** – In 2015, we generated operating income of $8.1 billion, an 8% decrease compared to a record-setting 2014. Despite a 6% decrease in carloads, it was our second-best financial performance ever. Core pricing gains of 3.7%, productivity, and improved network operations partially offset the lower volumes. Our operating ratio for 2015 of 63.1% was an all-time best, improving from last year's operating ratio of 63.5%. Net income of $4.8 billion translated into earnings of $5.49 per diluted share for 2015.

- **Freight Revenues** – Our freight revenues declined 10% year-over-year to $20.4 billion as a result of lower volume levels in five of our six commodity groups and overall lower fuel surcharge revenue, partially offset by core pricing gains. Volume declines in coal, international intermodal, frac sand, metals, crude oil, and grain shipments more than offset volume growth in domestic intermodal, finished vehicles, automotive parts, industrial chemicals and plastics shipments.

- **Network Operations** – Significant improvements were made in our operating and service metrics, as our average train speed, as reported to the AAR, increased 6% in 2015 compared to 2014, and our average terminal dwell time decreased 3%, both reflecting the impact of lower volumes and improved network fluidity.

- **Fuel Prices** – Our average price per gallon of diesel fuel in 2015 decreased 38% from the average price in 2014, as both crude oil and the conversion spreads between crude oil and diesel declined in 2015. The lower price decreased operating expenses by $1.2 billion (excluding any impact from year-over-year volume declines). Gross-ton miles decreased 9%, which also decreased fuel expense. These declines were partially offset by a 1% increase in our fuel consumption rate, computed as gallons of fuel consumed divided by gross ton-miles in thousands.

- **Free Cash Flow** – Cash generated by operating activities totaled $7.3 billion, yielding free cash flow of $524 million after reductions of $4.5 billion for cash used in investing activities and a 15% increase in dividends declared per share. In 2015, the timing of the dividend declaration and payable dates was aligned to occur within the same quarter, which resulted in two payments in the first quarter of 2015. Free cash flow is defined as cash provided by operating activities less cash used in investing activities and dividends paid.

  Free cash flow is not considered a financial measure under accounting principles generally accepted in the U.S. (GAAP) by SEC Regulation G and Item 10 of SEC Regulation S-K and may not be defined and calculated by other companies in the same manner. We believe free cash flow is important to management and investors in evaluating our financial performance and measures our ability to generate cash without additional external financings. Free cash flow should be considered in addition

to, rather than as a substitute for, cash provided by operating activities. The following table reconciles cash provided by operating activities (GAAP measure) to free cash flow (non-GAAP measure):

Millions	***2015***	*2014*	*2013*
Cash provided by operating activities	**$ 7,344**	$ 7,385	$ 6,823
Cash used in investing activities	**(4,476)**	(4,249)	(3,405)
Dividends paid	**(2,344)**	(1,632)	(1,333)
Free cash flow	**$ 524**	$ 1,504	$ 2,085

2016 Outlook

- **Safety** – Operating a safe railroad benefits all our constituents: our employees, customers, shareholders and the communities we serve. We will continue using a multi-faceted approach to safety, utilizing technology, risk assessment, quality control, training and employee engagement, and targeted capital investments. We will continue using and expanding the deployment of Total Safety Culture and Courage to Care throughout our operations, which allows us to identify and implement best practices for employee and operational safety. We will continue our efforts to increase detection of rail defects; improve or close crossings; and educate the public and law enforcement agencies about crossing safety through a combination of our own programs (including risk assessment strategies), industry programs and local community activities across our network.

- **Network Operations** – In 2016, we will continue to align resources with customer demand, continue to improve network performance, and maintain our surge capability.

- **Fuel Prices** – With the dramatic drop in fuel prices during 2015, fuel price projections continue to be uncertain in the current environment. We again could see volatile fuel prices during the year, as they are sensitive to global and U.S. domestic demand, refining capacity, geopolitical events, weather conditions and other factors. As prices fluctuate, there will be a timing impact on earnings, as our fuel surcharge programs trail fluctuations in fuel price by approximately two months.

  Continuing lower fuel prices could have a positive impact on the economy by increasing consumer discretionary spending that potentially could increase demand for various consumer products that we transport. Alternatively, lower fuel prices will likely have a negative impact on other commodities such as coal, frac sand and crude oil shipments.

- **Capital Plan** – In 2016, we expect our capital plan to be approximately $3.75 billion, including expenditures for PTC, 230 locomotives and 450 freight cars. The capital plan may be revised if business conditions warrant or if new laws or regulations affect our ability to generate sufficient returns on these investments. (See further discussion in this Item 7 under Liquidity and Capital Resources – Capital Plan.)

- **Financial Expectations** – Economic conditions in many of our market sectors continue to drive uncertainty with respect to our volume levels. We expect volumes to be down slightly in 2016 compared to 2015, but will depend on the overall economy and market conditions. The strong U.S. dollar and historic low commodity prices could also drive continued volatility. One of the biggest uncertainties is the outlook for energy markets, which will bring both challenges and opportunities. In the current environment, we expect continued margin improvement driven by continued pricing opportunities, ongoing productivity initiatives, and the ability to leverage our resources and strengthen our franchise. Over the longer term, we expect the overall U.S. economy to continue to improve at a modest pace, with some markets outperforming others.

RESULTS OF OPERATIONS

Operating Revenues

Millions	***2015***	*2014*	*2013*	***% Change 2015 v 2014***	*% Change 2014 v 2013*
Freight revenues	**$ 20,397**	$ 22,560	$ 20,684	**(10)%**	9 %
Other revenues	**1,416**	1,428	1,279	**(1)%**	12 %
Total	**$ 21,813**	$ 23,988	$ 21,963	**(9)%**	9 %

We generate freight revenues by transporting freight or other materials from our six commodity groups. Freight revenues vary with volume (carloads) and average revenue per car (ARC). Changes in price, traffic mix and fuel surcharges drive ARC. We provide some of our customers with contractual incentives for meeting or exceeding specified cumulative volumes or shipping to and from specific locations, which we record as reductions to freight revenues based on the actual or projected future shipments. We recognize freight revenues as shipments move from origin to destination. We allocate freight revenues between reporting periods based on the relative transit time in each reporting period and recognize expenses as we incur them.

Other revenues include revenues earned by our subsidiaries, revenues from commuter rail operations that we manage, accessorial revenues, which we earn when customers retain equipment owned or controlled by us or when we perform additional services such as switching or storage, and miscellaneous contract revenue. We recognize other revenues as we perform services or meet contractual obligations.

Freight revenues from five of our six commodity groups decreased in 2015 compared to 2014 due to a 6% decline in carloadings and lower fuel surcharge revenue, partially offset by core pricing gains. Volume declines in coal, international intermodal, frac sand, metals, crude oil, and grain shipments more than offset volume growth in domestic intermodal, finished vehicles, automotive parts, industrial chemicals and plastics shipments.

Freight revenues from all six commodity groups increased during 2014 compared to 2013 driven by 7% volume growth and core pricing gains of 2.5%. Volume growth from grain, frac sand, rock, and intermodal (domestic and international) shipments offset declines in crude oil.

Our fuel surcharge programs generated freight revenues of $1.3 billion, $2.8 billion, and $2.6 billion in 2015, 2014, and 2013, respectively. Fuel surcharge revenue in 2015 decreased $1.5 billion as a result of a 38% decrease in fuel price and a 6% reduction in carloadings. Fuel surcharge revenue in 2014 increased 6% based on our 7% carloadings increase.

In 2015, other revenue decreased from 2014 due to lower revenues at our subsidiaries, primarily those that broker intermodal and automotive services, partially offset by higher accessorial revenue driven by increased revenue for container usage and demurrage fees.

In 2014, other revenue increased from 2013 due to higher revenues at our subsidiaries, primarily those that broker intermodal and automotive services, accessorial revenue driven by increased volume and per diem revenue for container usage (previously included in automotive freight revenue).

The following tables summarize the year-over-year changes in freight revenues, revenue carloads, and ARC by commodity type:

Freight Revenues					***% Change***	*% Change*
Millions	***2015***	*2014*	*2013*		***2015 v 2014***	*2014 v 2013*
Agricultural Products	**$ 3,581**	$ 3,777	$ 3,276		**(5)%**	15 %
Automotive	**2,154**	2,103	2,077		**2**	1
Chemicals	**3,543**	3,664	3,501		**(3)**	5
Coal	**3,237**	4,127	3,978		**(22)**	4
Industrial Products	**3,808**	4,400	3,822		**(13)**	15
Intermodal	**4,074**	4,489	4,030		**(9)**	11
Total	**$ 20,397**	$ 22,560	$ 20,684		**(10)%**	9 %

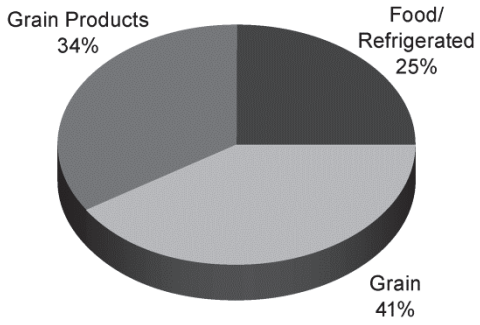
Revenue Carloads				***% Change***	*% Change*
Thousands	***2015***	*2014*	*2013*	***2015 v 2014***	*2014 v 2013*
Agricultural Products	**941**	973	874	**(3)%**	11 %
Automotive	**863**	809	781	**7**	4
Chemicals	**1,098**	1,116	1,103	**(2)**	1
Coal	**1,459**	1,768	1,703	**(17)**	4
Industrial Products	**1,213**	1,368	1,236	**(11)**	11
Intermodal [a]	**3,488**	3,591	3,325	**(3)**	8
Total	**9,062**	9,625	9,022	**(6)%**	7 %

				% Change	*% Change*
Average Revenue per Car	***2015***	*2014*	*2013*	***2015 v 2014***	*2014 v 2013*
Agricultural Products	**$ 3,805**	$ 3,881	$ 3,746	**(2)%**	4 %
Automotive	**2,498**	2,602	2,659	**(4)**	(2)
Chemicals	**3,227**	3,282	3,176	**(2)**	3
Coal	**2,218**	2,334	2,336	**(5)**	-
Industrial Products	**3,139**	3,217	3,093	**(2)**	4
Intermodal [a]	**1,168**	1,250	1,212	**(7)**	3
Average	**$ 2,251**	$ 2,344	$ 2,293	**(4)%**	2 %

[a] Each intermodal container or trailer equals one carload.

Agricultural Products – Lower fuel surcharge revenue and volume declines, partially offset by core pricing gains, decreased freight revenue from agricultural shipments in 2015 compared to 2014. Grain shipments decreased 11% in 2015 compared to 2014. The strength of the U.S. dollar, lower grain commodity prices, and higher worldwide inventories contributed to the reduction in overall demand.

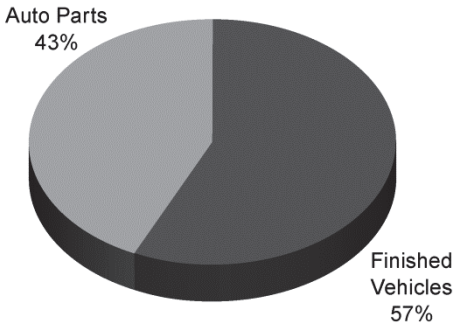
2015 Agricultural Products Carloads



Higher volume and pricing gains drove the increase in freight revenue from agricultural shipments in 2014 versus 2013. Grain shipments increased 27%, reflecting the strong overall harvest in 2013 and 2014. The 2012 drought also negatively impacted the first three quarters of 2013, which created favorable comparisons for the first three quarters of 2014. Lower export wheat shipments due to a larger world crop partially offset gains in grain.

Automotive – Freight revenue from automotive shipments increased compared to 2014 driven by volume growth and core pricing gains, which were partially offset by lower fuel surcharge revenue. Higher automotive production and record sales levels drove the volume growth.

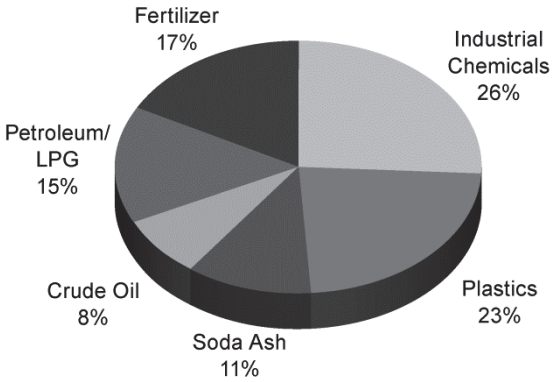
2015 Automotive Carloads



Freight revenue from automotive shipments increased in 2014 compared to 2013. Growth in automotive parts and finished vehicle shipments and core price improvements drove the higher revenue. The increase in automotive parts volume was driven by continued strength in production and market penetration. Finished vehicles shipments increased the last three quarters of 2014 with improved sales and production, which offset declines in the first quarter due to winter weather. Shifts in business mix and a change in how we are compensated for container usage, which is now included as a per diem charge in other revenue, negatively impacted ARC compared to 2013.

Chemicals – Freight revenue from chemical shipments declined in 2015 versus 2014 due to lower fuel surcharge revenue and volume declines, which more than offset core price improvements. Crude oil shipments declined as a result of the drop in crude oil prices and production declines from various shale formations, which impacted the regional pricing differences for crude oil. Lower fertilizer shipments also decreased freight revenue in 2015. Strength in export plastics markets and industrial chemical shipments helped offset the decline in crude oil and fertilizer shipments.

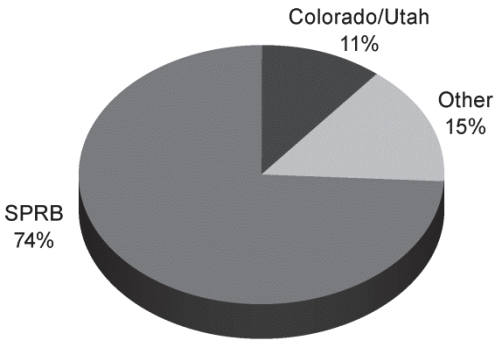
2015 Chemicals Carloads



Core price improvements, higher volumes and ARC driven by positive business mix increased freight revenue from chemicals in 2014 compared to 2013. Shipments of industrial chemicals grew as a result of continued strong demand in the drilling market. Fertilizer shipments increased due to strong exports of potash. Reduced shipments of crude oil from the Bakken and Permian shale formations to the Gulf area partially offset these gains as market factors, primarily regional pricing differences for various types of crude oil, displaced some of the former Gulf Coast shipments to the East and West Coasts.

Coal – Lower volume and fuel surcharge revenue, partially offset by core pricing gains, drove the decline in freight revenue from coal shipments in 2015 compared to 2014. Shipments out of the Southern Powder River Basin (SPRB) declined 17% in 2015 as a result of depressed coal markets due to low natural gas prices and high inventory levels. Shipments out of the SPRB also were negatively impacted as heavy rains in June flooded coal mines and washed out tracks in some areas, impacting both second and third quarter shipments. Shipments out of Colorado and Utah declined 33% in 2015 primarily due to lower domestic demand for Colorado and Utah coal. This lower demand was a result of several utilities switching to other fuel sources due to lower natural gas prices. In addition, coal exports declined due to a soft global market.

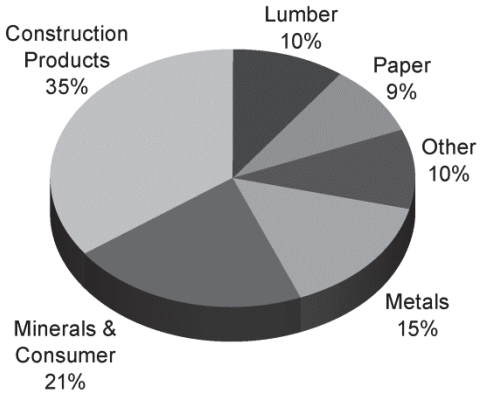
2015 Coal Carloads



Freight revenue from coal shipments increased in 2014 compared to 2013, driven by higher volumes. Shifts in business mix negatively impacted ARC compared to 2013. SPRB shipments increased 3% from 2013. Strong demand continued throughout the year due to inventory replenishment but network performance and contract losses limited year-over-year volume growth. Shipments from Colorado and Utah mines increased 6% compared to 2013, driven by higher natural gas prices for most of the year and strong exports through the West Coast. However, in the fourth quarter volumes from Colorado and Utah mines declined as exports to the Gulf Coast decreased.

Industrial Products – Freight revenue from industrial products shipments decreased in 2015 compared to 2014 due to volume declines, lower fuel surcharge revenue, and lower ARC due to the mix of traffic, partially offset by core price improvements. Declines in shale drilling activity due to lower oil prices decreased non-metallic mineral shipments (primarily frac sand carloadings). Steel shipments also declined as a result of reductions in shale drilling activity, low commodity prices, and increased imports associated with the strength of the U.S. dollar. Low commodity prices for lumber and the strong U.S. dollar resulted in inventory reductions that reduced lumber shipments.

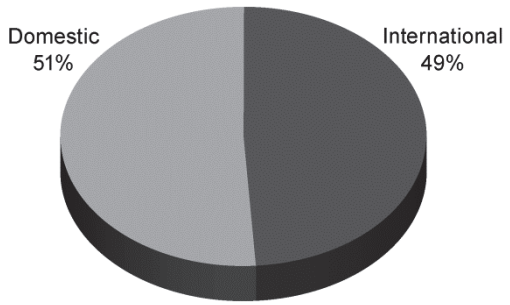
2015 Industrial Products Carloads



Volume growth, core pricing gains and positive business mix in 2014 increased freight revenue for industrial products shipments versus 2013. Shipments of non-metallic minerals (primarily frac sand, up 31%) grew as a result of drilling activity for energy products, as well as evolving drilling practices, which can increase the amount of frac sand used at certain wells. Additionally, rock and lumber shipments increased from 2013, driven by new housing and commercial construction.

Intermodal – Lower fuel surcharge revenue and volume declines, partially offset by core pricing gains, resulted in a decline in freight revenue from intermodal shipments in 2015 compared to 2014. International shipments declined 8% resulting from the supply chain disruptions stemming from the West Coast port work disruptions and historically high retail inventories. Domestic volume increased 3% driven by continued conversions from trucks and new premium services, more than offsetting the impact of high retail inventory levels and modest retail sales activity.

2015 Intermodal Carloads



Freight revenue from intermodal shipments increased in 2014 compared to 2013 driven by volume growth, core pricing improvements and positive business mix. Domestic traffic increased 11% due to continued conversions from truck transportation to rail and new premium services. International traffic grew 5% versus 2013, driven primarily by new business and improving economic conditions. International gains in the last three quarters of the year offset the declines in the first quarter due to severe weather that negatively impacted consumer demand.

Mexico Business – Each of our commodity groups includes revenue from shipments to and from Mexico. Freight revenue from Mexico business decreased 4% to $2.2 billion in 2015 compared to 2014 primarily due to lower fuel surcharge revenue. Volume levels were flat compared to 2014 as lower shipments of Intermodal, Agricultural, and Industrial Products were offset by growth in Automotive, Coal, and Chemical shipments.

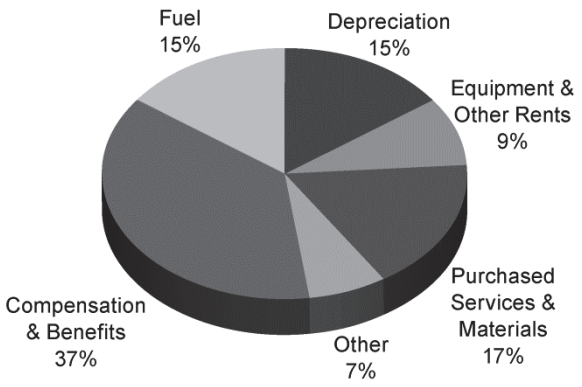
Revenue from Mexico business increased 8% to $2.3 billion in 2014 versus 2013. Volume levels increased 8% from 2013, as increases in Agricultural Products, Chemicals, Intermodal, Automotive and Industrial Products offset lower export Coal shipments.

Operating Expenses

Millions		***2015***		*2014*		*2013*	***% Change 2015 v 2014***	*% Change 2014 v 2013*
Compensation and benefits	**$**	**5,161**	$	5,076	$	4,807	**2 %**	6 %
Purchased services and materials		**2,421**		2,558		2,315	**(5)**	10
Fuel		**2,013**		3,539		3,534	**(43)**	-
Depreciation		**2,012**		1,904		1,777	**6**	7
Equipment and other rents		**1,230**		1,234		1,235	**-**	-
Other		**924**		924		849	**-**	9
Total	**$**	**13,761**	$	15,235	$	14,517	**(10)%**	5 %

Operating expenses decreased nearly $1.5 billion compared to 2014 driven by significantly lower fuel prices and volume-related cost savings. Productivity gains in the second half of the year also drove expenses lower. These decreases were partially offset by wage inflation, higher depreciation, and property taxes. In addition, we incurred approximately $35 million of weather-related costs in 2014.

2015 Operating Expenses



Operating expenses increased $718 million in 2014 versus 2013. Volume-related expenses, incremental costs associated with operating a slower network, depreciation, wage and benefit inflation, and locomotive and freight car materials contributed to the higher costs. Lower fuel price partially offset these increases. In addition, there were approximately $35 million of weather-related costs in the first quarter of 2014.

Compensation and Benefits – Compensation and benefits include wages, payroll taxes, health and welfare costs, pension costs, other postretirement benefits, and incentive costs. In 2015, lower volume-related costs and second half productivity gains were more than offset by general wage inflation and increased hiring and training expenses related to a larger workforce in the first half of the year.

Volume-related expenses, including training, and a slower network increased our train and engine work force, which, along with general wage and benefit inflation, resulted in increased wages in 2014 compared to 2013. Weather-related costs in the first quarter of 2014 also increased costs.

Purchased Services and Materials – Expense for purchased services and materials includes the costs of services purchased from outside contractors and other service providers (including equipment maintenance and contract expenses incurred by our subsidiaries for external transportation services); materials used to maintain the Railroad's lines, structures, and equipment; costs of operating facilities jointly used by UPRR and other railroads; transportation and lodging for train crew employees; trucking and contracting costs for intermodal containers; leased automobile maintenance expenses; and tools and supplies. Purchased services and materials decreased $137 million compared to 2014 primarily due to lower volume-related costs, including a decrease in external transportation expenses incurred by our logistics subsidiaries. Expenses also decreased due to lower locomotive and freight car repair costs.

Expenses for purchased services in 2014 increased 8% compared to 2013 primarily due to volume-related expenses incurred by our logistics subsidiaries for external transportation and increased crew transportation and lodging due to volumes and a slower network. In addition, higher consulting fees and higher contract expenses (including equipment maintenance) increased costs compared to 2013. Locomotive and freight car material expenses increased in 2014 compared to 2013 due to additional volumes, including the impact of activating stored equipment to address operational issues caused by demand and a slower network.

Fuel – Fuel includes locomotive fuel and gasoline for highway and non-highway vehicles and heavy equipment. Locomotive diesel fuel prices, which averaged $1.84 per gallon (including taxes and transportation costs) in 2015, compared to $2.97 per gallon in 2014, decreased expenses $1.2 billion. In

addition, fuel costs were lower as gross-ton miles decreased 9%. The fuel consumption rate (c-rate), computed as gallons of fuel consumed divided by gross ton-miles in thousands, increased 1% compared to 2014. Decreases in heavier, more fuel-efficient shipments, decreased gross-ton miles and increased the c-rate.

Volume growth of 7%, as measured by gross ton-miles, drove the increase in fuel expense in 2014 compared to 2013. This was essentially offset by lower locomotive diesel fuel prices, which averaged $2.97 per gallon (including taxes and transportation costs) in 2014, compared to $3.15 in 2013, along with a slight improvement in c-rate, computed as gallons of fuel consumed divided by gross ton-miles.

Depreciation – The majority of depreciation relates to road property, including rail, ties, ballast, and other track material. A higher depreciable asset base, reflecting higher capital spending in recent years, increased depreciation expense in 2015 compared to 2014. This increase was partially offset by our recent depreciation studies that resulted in lower depreciation rates for some asset classes.

Depreciation was up 7% in 2014 compared to 2013. A higher depreciable asset base, reflecting higher ongoing capital spending drove the increase.

Equipment and Other Rents – Equipment and other rents expense primarily includes rental expense that the Railroad pays for freight cars owned by other railroads or private companies; freight car, intermodal, and locomotive leases; and office and other rent expenses. Equipment and other rents expense decreased $4 million compared to 2014 primarily from a decrease in manifest and intermodal shipments, partially offset by growth in finished vehicle shipments.

Higher intermodal volumes and longer cycle times increased short-term freight car rental expense in 2014 compared to 2013. Lower equipment leases essentially offset the higher freight car rental expense, as we exercised purchase options on some of our leased equipment.

Other – Other expenses include state and local taxes, freight, equipment and property damage, utilities, insurance, personal injury, environmental, employee travel, telephone and cellular, computer software, bad debt, and other general expenses. Other expenses were flat in 2015 compared to 2014 as higher property taxes were offset by lower costs in other areas.

Higher property taxes, personal injury expense and utilities costs partially offset by lower environmental expense and costs associated with damaged freight resulted in an increase in other costs in 2014 compared to 2013.

Non-Operating Items

Millions	***2015***	*2014*	*2013*	***% Change 2015 v 2014***	*% Change 2014 v 2013*
Other income	**$ 226**	$ 151	$ 128	**50 %**	18 %
Interest expense	**(622)**	(561)	(526)	**11**	7
Income taxes	**(2,884)**	(3,163)	(2,660)	**(9)%**	19 %

Other Income – Other income increased in 2015 compared to 2014 primarily due to a $113 million gain from a real estate sale in the second quarter of 2015, partially offset by a gain from the sale of a permanent easement in 2014.

Other income increased in 2014 versus 2013 due to higher gains from real estate sales and a sale of a permanent easement. These gains were partially offset by higher environmental costs on non-operating property in 2014 and lower lease income due to the $17 million settlement of a land lease contract in 2013.

Interest Expense – Interest expense increased in 2015 compared to 2014 due to an increased weighted-average debt level of $13.0 billion in 2015 from $10.7 billion in 2014, partially offset by the impact of a lower effective interest rate of 4.8% in 2015 compared to 5.3% in 2014.

Interest expense increased in 2014 versus 2013 due to an increased weighted-average debt level of $10.7 billion in 2014 from $9.6 billion in 2013, which more than offset the impact of the lower effective interest rate of 5.3% in 2014 versus 5.7% in 2013.

Income Taxes – Lower pre-tax income decreased income taxes in 2015 compared to 2014. Our effective tax rate for 2015 was 37.7% compared to 37.9% in 2014.

Higher pre-tax income increased income taxes in 2014 compared to 2013. Our effective tax rate for 2014 was 37.9% compared to 37.7% in 2013.

OTHER OPERATING/PERFORMANCE AND FINANCIAL STATISTICS

We report a number of key performance measures weekly to the Association of American Railroads. We provide this data on our website at www.up.com/investor/aar-stb_reports/index.htm.

Operating/Performance Statistics

Railroad performance measures are included in the table below:

	2015	*2014*	*2013*	***% Change 2015 v 2014***	*% Change 2014 v 2013*
Average train speed (miles per hour)	**25.4**	24.0	26.0	**6 %**	(8)%
Average terminal dwell time (hours)	**29.3**	30.3	27.1	**(3)%**	12 %
Gross ton-miles (billions)	**927.7**	1,014.9	949.1	**(9)%**	7 %
Revenue ton-miles (billions)	**485.0**	549.6	514.3	**(12)%**	7 %
Operating ratio	**63.1**	63.5	66.1	**(0.4)pts**	(2.6)pts
Employees (average)	**47,457**	47,201	46,445	**1 %**	2 %

Average Train Speed – Average train speed is calculated by dividing train miles by hours operated on our main lines between terminals. Average train speed, as reported to the Association of American Railroads, improved 6% in 2015 compared to 2014. Velocity gains resulted from lower volumes, improved network fluidity and a strong resource position. More favorable weather conditions in the first quarter of 2015 also contributed to the improvement in our average train speed.

Average train speed decreased 8% in 2014 versus 2013. The decline was as result of a 7% volume increase, a major infrastructure project in Fort Worth, Texas and inclement weather, including flooding in the Midwest in the second quarter and severe weather conditions in the first quarter that impacted all major U.S. and Canadian railroads.

Average Terminal Dwell Time – Average terminal dwell time is the average time that a rail car spends at our terminals. Lower average terminal dwell time improves asset utilization and service. Average terminal dwell time improved 3% in 2015 compared to 2014, reflecting the impact of lower volume and improved network operations.

Average terminal dwell time increased 12% in 2014 compared to 2013, caused by higher volumes and inclement weather.

Gross and Revenue Ton-Miles – Gross ton-miles are calculated by multiplying the weight of loaded and empty freight cars by the number of miles hauled. Revenue ton-miles are calculated by multiplying the weight of freight by the number of tariff miles. Gross ton-miles and revenue ton-miles decreased 9% and 12%, respectively in 2015 compared to 2014, resulting from a 6% decrease in carloads. Changes in commodity mix drove the variances in year-over-year declines between gross ton-miles, revenue ton-miles and carloads.

Gross ton-miles, revenue ton-miles and carloadings all increased 7% in 2014 compared to 2013.

Operating Ratio – Operating ratio is our operating expenses reflected as a percentage of operating revenue. Our operating ratio improved 0.4 points to a new record low of 63.1% in 2015 compared to 2014. Core pricing gains, the impact of lower fuel prices, resource realignments, network efficiencies and productivity gains more than offset the impact of lower volume and inflation.

Our operating ratio improved 2.6 points to 63.5% in 2014 versus 2013. Core pricing, business demand and productivity more than offset the incremental operating costs associated with volume, a slower network, weather and inflation.

Employees – Employee levels increased 1% in 2015 compared to 2014, driven by more employees in training and an increase in capital project work. More employees were in training as a result of the number of transportation employees hired during the last half of 2014 and early 2015 to handle expected volume increases, and who continued receiving training in 2015, most of which occurred in the first nine months of the year.

Employee levels increased 2% in 2014 versus 2013. A decrease in our capital workforce due to improved productivity and project mix partially offset the larger train and engine workforce required for higher volume levels and a slower network. We successfully managed the growth of our full-time equivalent train and engine force levels at a rate less than our volume growth in 2014.

Return on Average Common Shareholders' Equity

Millions, Except Percentages		***2015***		*2014*		*2013*
Net income	**$**	**4,772**	$	5,180	$	4,388
Average equity	**$**	**20,946**	$	21,207	$	20,551
Return on average common shareholders' equity		**22.8%**		24.4%		21.4%

Return on Invested Capital as Adjusted (ROIC)

Millions, Except Percentages		***2015***		*2014*		*2013*
Net income	**$**	**4,772**	$	5,180	$	4,388
Interest expense		**622**		561		526
Interest on present value of operating leases		**135**		158		175
Taxes on interest		**(285)**		(273)		(264)
Net operating profit after taxes as adjusted (a)	**$**	**5,244**	$	5,626	$	4,825
Average equity	**$**	**20,946**	$	21,207	$	20,551
Average debt*		**12,807**		10,469		9,237
Average present value of operating leases		**2,814**		2,980		3,077
Average invested capital as adjusted (b)	**$**	**36,567**	$	34,656	$	32,865
Return on invested capital as adjusted (a/b)		**14.3%**		16.2%		14.7%

* *Adjusted for the retrospective adoption of Accounting Standard Update 2015-03 related to the presentation of deferred debt issuance costs.*

ROIC is considered a non-GAAP financial measure by SEC Regulation G and Item 10 of SEC Regulation S-K, and may not be defined and calculated by other companies in the same manner. We believe this measure is important to management and investors in evaluating the efficiency and effectiveness of our long-term capital investments. In addition, we currently use ROIC as a performance criteria in determining certain elements of equity compensation for our executives. ROIC should be considered in addition to, rather than as a substitute for, other information provided in accordance with GAAP. The most comparable GAAP measure is Return on Average Common Shareholders' Equity. The tables above provide reconciliations from return on average common shareholders' equity to ROIC. Our 2015 ROIC decreased 1.9 points compared to 2014, primarily as a result of lower earnings and a higher invested capital base.

Debt to Capital

Millions, Except Percentages		***2015***		*2014*
Debt* (a)	**$**	**14,201**	$	**11,413**
Equity		**20,702**		**21,189**
Capital (b)	**$**	**34,903**	$	**32,602**
Debt to capital (a/b)		**40.7%**		**35.0%**

* *Adjusted for the retrospective adoption of Accounting Standard Update 2015-03 related to the presentation of deferred debt issuance costs.*

Adjusted Debt to Capital

Millions, Except Percentages		***2015***		*2014*
Debt	**$**	**14,201**	$	**11,413**
Net present value of operating leases		**2,726**		**2,902**
Unfunded pension and OPEB, after tax		**463**		**523**
Adjusted debt* (a)	**$**	**17,390**	$	**14,838**
Equity		**20,702**		**21,189**
Adjusted capital (b)	**$**	**38,092**	$	**36,027**
Adjusted debt to capital (a/b)		**45.7%**		**41.2%**

* *Adjusted for the retrospective adoption of Accounting Standard Update 2015-03 related to the presentation of deferred debt issuance costs.*

Adjusted debt to capital is a non-GAAP financial measure under SEC Regulation G and Item 10 of SEC Regulation S-K, and may not be defined and calculated by other companies in the same manner. We believe this measure is important to management and investors in evaluating the total amount of leverage in our capital structure, including off-balance sheet lease obligations, which we generally incur in connection with financing the acquisition of locomotives and freight cars and certain facilities. Operating leases were discounted using 4.8% and 5.3% at December 31, 2015 and 2014, respectively. The discount rate reflects our effective interest rate. We monitor the ratio of adjusted debt to capital as we manage our capital structure to balance cost-effective and efficient access to the capital markets with our overall cost of capital. Adjusted debt to capital should be considered in addition to, rather than as a substitute for, debt to capital. The tables above provide reconciliations from debt to capital to adjusted debt to capital. Our December 31, 2015 debt to capital ratios increased as a result of a $2.8 billion increase in debt from December 31, 2014.

LIQUIDITY AND CAPITAL RESOURCES

As of December 31, 2015, our principal sources of liquidity included cash, cash equivalents, our receivables securitization facility, and our revolving credit facility, as well as the availability of commercial paper and other sources of financing through the capital markets. We had $1.7 billion of committed credit available under our credit facility, with no borrowings outstanding as of December 31, 2015. We did not make any borrowings under this facility during 2015. The value of the outstanding undivided interest held by investors under the $650 million capacity receivables securitization facility was $400 million as of December 31, 2015, and is included in our Consolidated Statements of Financial Position as debt due after one year. Our access to this receivables securitization facility may be reduced or restricted if our bond ratings fall to certain levels below investment grade. If our bond rating were to deteriorate, it could have an adverse impact on our liquidity. Access to commercial paper as well as other capital market financings is dependent on market conditions. Deterioration of our operating results or financial condition due to internal or external factors could negatively impact our ability to access capital markets as a source of liquidity. Access to liquidity through the capital markets is also dependent on our financial stability. We expect that we will continue to have access to liquidity through any or all of the following sources or activities: (i) increasing the size or utilization of our receivables securitization, (ii) issuing commercial paper, (iii) entering into bank loans, outside of our revolving credit facility, or (iv) issuing bonds or other debt securities to public or private investors based on our assessment of the current condition of the credit markets. The Company's $1.7 billion revolving credit facility is intended to support the issuance of commercial paper by UPC and also serves as an emergency source of liquidity. The Company currently does not intend to make any borrowings under this facility.

At December 31, 2015 and 2014, we had a modest working capital surplus. This reflects a strong cash position that provides enhanced liquidity in an uncertain economic environment. In addition, we believe we have adequate access to capital markets to meet any foreseeable cash requirements, and we have sufficient financial capacity to satisfy our current liabilities.

Cash Flows			
Millions	***2015***	*2014*	*2013*
Cash provided by operating activities	**$ 7,344**	$ 7,385	$ 6,823
Cash used in investing activities	**(4,476)**	(4,249)	(3,405)
Cash used in financing activities	**(3,063)**	(2,982)	(3,049)
Net change in cash and cash equivalents	**$ (195)**	$ 154	$ 369

Operating Activities

Cash provided by operating activities decreased in 2015 compared to 2014 due to lower net income and changes in working capital, partially offset by the timing of tax payments.

Federal tax law provided for 100% bonus depreciation for qualified investments made during 2011 and 50% bonus depreciation for qualified investments made during 2012-2013. As a result, the Company deferred a substantial portion of its 2011-2013 income tax expense, contributing to the positive operating cash flow in those years. Congress extended 50% bonus depreciation for 2014, but this extension occurred in December, and the related benefit was realized in 2015, rather than 2014. Similarly, in December of 2015, Congress extended bonus depreciation through 2019, which delayed the benefit of 2015 bonus depreciation into 2016. Bonus depreciation will be at a rate of 50% for 2015, 2016 and 2017, 40% for 2018 and 30% for 2019.

Higher net income in 2014 increased cash provided by operating activities compared to 2013, despite higher income tax payments. 2014 income tax payments were higher than 2013 primarily due to higher income, but also because we paid taxes previously deferred by bonus depreciation.

Investing Activities

Higher capital investments in locomotives and freight cars, including $327 million in early lease buyouts, which we exercised due to favorable economic terms and market conditions, drove the increase in cash used in investing activities in 2015 compared to 2014.

Higher capital investments, including the early buyout of the long-term operating lease of our headquarters building for approximately $261 million, drove the increase in cash used in investing activities in 2014 compared to 2013. Significant investments also were made for new locomotives, freight cars and containers, and capacity and commercial facility projects. Capital investments in 2014 also included $99 million for the early buyout of locomotives and freight cars under long-term operating leases, which we exercised due to favorable economic terms and market conditions.

The following tables detail cash capital investments and track statistics for the years ended December 31, 2015, 2014, and 2013:

Millions	***2015***	*2014*	*2013*
Rail and other track material	**$ 734**	$ 749	$ 743
Ties	**455**	415	438
Ballast	**233**	204	226
Other [a]	**438**	378	326
Total road infrastructure replacements	**1,860**	1,746	1,733
Line expansion and other capacity projects	**457**	515	455
Commercial facilities	**227**	217	146
Total capacity and commercial facilities	**684**	732	601
Locomotives and freight cars [b]	**1,436**	1,067	580
Positive train control	**381**	384	419
Technology and other [c]	**289**	417	163
Total cash capital investments	**$ 4,650**	$ 4,346	$ 3,496

[a] Other includes bridges and tunnels, signals, other road assets, and road work equipment.
[b] Locomotives and freight cars include early lease buyouts of $327 million in 2015, $75 million in 2014, and $16 million in 2013.
[c] Technology and other includes the $261 million early buyout of our headquarters building operating lease in 2014.

	2015	*2014*	*2013*
Track miles of rail replaced	**767**	912	834
Track miles of rail capacity expansion	**103**	119	97
New ties installed (thousands)	**4,178**	4,076	3,870
Miles of track surfaced	**10,076**	10,791	11,017

Capital Plan – In 2016, we expect our capital plan to be approximately $3.75 billion, which may be revised if business conditions or the regulatory environment affect our ability to generate sufficient returns on these investments. While asset replacements will fluctuate as part of our renewal strategy, we expect to use 55% to 60% of our capital investments to renew and improve existing capital assets. We will continue to invest in our network and terminals where appropriate, balancing terminal capacity with mainline capacity. Significant investments in technology improvements are planned, including approximately $375 million for PTC. We will also continue commercial investments in rail facilities and equipment, including 230 locomotives and 450 freight cars.

We expect to fund our 2016 cash capital plan by using some or all of the following: cash generated from operations, proceeds from the sale or lease of various operating and non-operating properties, proceeds from the issuance of long-term debt, and cash on hand. Our annual capital plan is a critical component of our long-term strategic plan. We expect our plan will enhance the long-term value of the Company for our shareholders by providing sufficient resources to (i) replace and improve our existing track infrastructure to provide safe and fluid operations, (ii) increase network efficiency by adding or improving facilities and track, and (iii) make investments that meet customer demand and take advantage of opportunities for long-term growth.

Financing Activities

Cash used in financing activities increased in 2015 compared to 2014. An increase of $712 million in dividends paid and $240 million for the repurchase of shares under our common stock repurchase program more than offset an increase of $740 million in debt issued and a decrease of $154 million in debt repaid. The higher dividend payments primarily were a result of adjusting the dividend payable dates to align with the timing of the quarterly dividend declaration and payment within the same quarter. Aligning the quarterly dividend declaration and payment resulted in two payments in the first quarter of 2015: the fourth quarter 2014 dividend of $438 million, which was paid on January 2, 2015, as well as the first quarter 2015 dividend of $484 million, which was paid on March 30, 2015. The second quarter 2015 dividend of $479 million was paid on June 30, 2015, the third quarter 2015 dividend of $476 million was paid on September 30, 2015, and the fourth quarter 2015 dividend of $467 million was paid on December 31, 2015. Higher dividends per share also contributed to the increase in dividends paid.

Cash used in financing activities remained flat in 2014 versus 2013. Increases for the repurchase of shares under our common stock repurchase program and higher dividend payments in 2014 of $1.6 billion compared to $1.3 billion in 2013 were offset by higher debt issuances in 2014.

Credit Facilities – At December 31, 2015, we had $1.7 billion of credit available under our revolving credit facility (the facility), which is designated for general corporate purposes and supports the issuance of commercial paper. We did not draw on the facility during 2015. Commitment fees and interest rates payable under the facility are similar to fees and rates available to comparably rated, investment-grade borrowers. The facility allows for borrowings at floating rates based on London Interbank Offered Rates, plus a spread, depending upon credit ratings for our senior unsecured debt. The facility matures in May 2019 under a five-year term and requires UPC to maintain a debt-to-net-worth coverage ratio. At December 31, 2015, and December 31, 2014 (and at all times during the periods presented), we were in compliance with this covenant.

The definition of debt used for purposes of calculating the debt-to-net-worth coverage ratio includes, among other things, certain credit arrangements, capital leases, guarantees and unfunded and vested pension benefits under Title IV of ERISA. At December 31, 2015, the debt-to-net-worth coverage ratio allowed us to carry up to $41.4 billion of debt (as defined in the facility), and we had $14.3 billion of debt (as defined in the facility) outstanding at that date. Under our current capital plans, we expect to continue to satisfy the debt-to-net-worth coverage ratio; however, many factors beyond our reasonable control could affect our ability to comply with this provision in the future. The facility does not include any other financial restrictions, credit rating triggers (other than rating-dependent pricing), or any other provision that could require us to post collateral. The facility also includes a $125 million cross-default provision and a change-of-control provision.

During 2015, we did not issue or repay any commercial paper, and at December 31, 2015, and 2014, we had no commercial paper outstanding. Our revolving credit facility supports our outstanding commercial paper balances, and, unless we change the terms of our commercial paper program, our aggregate issuance of commercial paper will not exceed the amount of borrowings available under the facility.

(See further discussion in this Item 7 under Receivables Securitization Facility for information regarding the Company's receivables securitization facility.)

Ratio of Earnings to Fixed Charges

For each of the years ended December 31, 2015, 2014, and 2013, our ratio of earnings to fixed charges was 11.6, 13.5, and 11.8, respectively. The ratio of earnings to fixed charges was computed on a consolidated basis. Earnings represent income from continuing operations, less equity earnings net of distributions, plus fixed charges and income taxes. Fixed charges represent interest charges, amortization of debt discount, and the estimated amount representing the interest portion of rental charges. (See Exhibit 12 to this report for the calculation of the ratio of earnings to fixed charges.)

Common Shareholders' Equity

Dividend Restrictions – Our revolving credit facility includes a debt-to-net worth covenant (discussed in the Credit Facilities section above) that, under certain circumstances, restricts the payment of cash dividends to our shareholders. The amount of retained earnings available for dividends was $13.6 billion and $15.4 billion at December 31, 2015, and 2014, respectively.

Share Repurchase Program

Effective January 1, 2014, our Board of Directors authorized the repurchase of up to 120 million shares of our common stock by December 31, 2017, replacing our previous repurchase program. As of December 31, 2015, we repurchased a total of $16.0 billion of our common stock since the commencement of our repurchase programs in 2007. The table below represents shares repurchased under this repurchase program.

	Number of Shares Purchased		*Average Price Paid*	
	2015	*2014*	***2015***	*2014*
First quarter	**6,881,455**	7,640,000	**$ 117.28**	$ 89.43
Second quarter	**7,975,100**	8,320,000	**104.62**	96.84
Third quarter	**13,800,700**	8,347,000	**89.65**	102.54
Fourth quarter	**6,646,899**	7,736,400	**88.19**	113.77
Total	**35,304,154**	32,043,400	**$ 98.14**	$ 100.65
Remaining number of shares that may be repurchased under current authority				52,652,446

Management's assessments of market conditions and other pertinent facts guide the timing and volume of all repurchases. We expect to fund any share repurchases under this program through cash generated from operations, the sale or lease of various operating and non-operating properties, debt issuances, and cash on hand. Repurchased shares are recorded in treasury stock at cost, which includes any applicable commissions and fees.

From January 1, 2016, through February 4, 2016, we repurchased 3.7 million shares at an aggregate cost of approximately $268 million.

Shelf Registration Statement and Significant New Borrowings – We filed a new shelf registration statement with the SEC that became effective on February 9, 2015. The Board of Directors authorized the issuance of up to $4.0 billion of debt securities, replacing the $4.0 billion authorized under our shelf registration filed in February 2013, which was fully utilized after our January 2015 debt offering noted below. Under our current shelf registration, we may issue, from time to time, any combination of debt securities, preferred stock, common stock, or warrants for debt securities or preferred stock in one or more offerings. We have no immediate plans to issue equity securities; however, we will continue to explore opportunities to replace existing debt or access capital through issuances of debt securities under our shelf registration, and, therefore, we may issue additional debt securities at any time.

During 2015, we issued the following unsecured, fixed-rate debt securities under our shelf registrations:

Date	*Description of Securities*
January 29, 2015	$250 million of 1.80% Notes due February 1, 2020
	$450 million of 3.375% Notes due February 1, 2035
	$450 million of 3.875% Notes due February 1, 2055
June 19, 2015	$400 million of 2.250% Notes due June 19, 2020
	$300 million of 3.250% Notes due August 15, 2025
October 29, 2015	$200 million of reopened 3.250% Notes due August 15, 2025
	$500 million of 4.050% Notes due November 15, 2045
	$400 million of 4.375% Notes due November 15, 2065

We used the net proceeds from the offerings for general corporate purposes, including the repurchase of common stock pursuant to our share repurchase program. These debt securities include change-of-control provisions. At December 31, 2015, we had remaining authority to issue up to $2.2 billion of debt securities under our current shelf registration.

Equipment Trust – On May 12, 2015, UPRR consummated a pass-through (P/T) financing, whereby a P/T trust was created, which issued $399 million of P/T trust certificates with a stated interest rate of 2.695%. The P/T trust certificates will mature on May 12, 2027. The proceeds from the issuance of the P/T trust certificates were used to purchase equipment trust certificates to be issued by UPRR to finance the acquisition of 182 locomotives. The equipment trust certificates are secured by a lien on the

locomotives. The $399 million is classified as debt due after one year in our Consolidated Statements of Financial Position.

Debt Exchange – On August 21, 2013, we exchanged $1,170 million of various outstanding notes and debentures due between 2016 and 2040 (the Existing Notes) for $439 million of 3.646% notes (the New 2024 Notes) due February 15, 2024 and $700 million of 4.821% notes (the New 2044 Notes) due February 1, 2044, plus cash consideration of approximately $280 million in addition to $8 million for accrued and unpaid interest on the Existing Notes. In accordance with ASC 470-50-40, Debt-Modifications and Extinguishments-Derecognition, this transaction was accounted for as a debt exchange, as the exchanged debt instruments are not considered to be substantially different. The cash consideration was recorded as an adjustment to the carrying value of debt, and the balance of the unamortized discount and issue costs from the Existing Notes is being amortized as an adjustment of interest expense over the terms of the New 2024 Notes and the New 2044 Notes. No gain or loss was recognized as a result of the exchange. Costs related to the debt exchange that were payable to parties other than the debt holders totaled approximately $9 million and were included in interest expense during the year ended December 31, 2013.

The following table lists the outstanding notes and debentures that were exchanged:

Millions	*Principal amount exchanged*
The 2024 Offers	
7.000% Debentures due 2016	$ 8
5.650% Notes due 2017	38
5.750% Notes due 2017	70
5.700% Notes due 2018	103
7.875% Notes due 2019	20
6.125% Notes due 2020	238
The 2044 Offers	
7.125% Debentures due 2028	73
6.625% Debentures due 2029	177
6.250% Debentures due 2034	19
6.150% Debentures due 2037	138
5.780% Notes due 2040	286
Total	$ 1,170

Receivables Securitization Facility – The Railroad maintains a $650 million, 3-year receivables securitization facility maturing in July 2017 under which it sells most of its eligible third-party receivables to Union Pacific Receivables, Inc. (UPRI), a consolidated, wholly-owned, bankruptcy-remote subsidiary that may subsequently transfer, without recourse, an undivided interest in accounts receivable to investors. The investors have no recourse to the Railroad's other assets except for customary warranty and indemnity claims. Creditors of the Railroad do not have recourse to the assets of UPRI.

The amount outstanding under the facility was $400 million at both December 31, 2015, and December 31, 2014, respectively. The facility was supported by $0.9 billion and $1.2 billion of accounts receivable as collateral at December 31, 2015, and December 31, 2014, respectively, which, as a retained interest, is included in accounts receivable, net in our Consolidated Statements of Financial Position.

The outstanding amount the Railroad is allowed to maintain under the facility, with a maximum of $650 million, may fluctuate based on the availability of eligible receivables and is directly affected by business volumes and credit risks, including receivables payment quality measures such as default and dilution ratios. If default or dilution ratios increase one percent, the allowable outstanding amount under the facility would not materially change.

The costs of the receivables securitization facility include interest, which will vary based on prevailing benchmark and commercial paper rates, program fees paid to participating banks, commercial paper issuance costs, and fees of participating banks for unused commitment availability. The costs of the receivables securitization facility are included in interest expense and were $5 million, $4 million, and $5 million for 2015, 2014, and 2013, respectively.

Contractual Obligations and Commercial Commitments

As described in the notes to the Consolidated Financial Statements and as referenced in the tables below, we have contractual obligations and commercial commitments that may affect our financial condition. Based on our assessment of the underlying provisions and circumstances of our contractual obligations and commercial commitments, including material sources of off-balance sheet and structured finance arrangements, other than the risks that we and other similarly situated companies face with respect to the condition of the capital markets (as described in Item 1A of Part II of this report), there is no known trend, demand, commitment, event, or uncertainty that is reasonably likely to occur that would have a material adverse effect on our consolidated results of operations, financial condition, or liquidity. In addition, our commercial obligations, financings, and commitments are customary transactions that are similar to those of other comparable corporations, particularly within the transportation industry.

The following tables identify material obligations and commitments as of December 31, 2015:

		Payments Due by December 31,						
Contractual Obligations							*After*	
Millions	*Total*	*2016*	*2017*	*2018*	*2019*	*2020*	*2020*	*Other*
Debt [a]	$ 22,885	$ 1,006	$ 1,434	$ 938	$ 981	$ 1,339	$ 17,187	$ -
Operating leases [b]	3,430	491	446	371	339	282	1,501	-
Capital lease obligations [c]	1,587	217	220	198	184	193	575	-
Purchase obligations [d]	3,983	2,309	673	306	255	211	197	32
Other post retirement benefits [e]	453	45	45	46	46	46	225	-
Income tax contingencies [f]	94	-	-	-	-	-	-	94
Total contractual obligations	$ 32,432	$ 4,068	$ 2,818	$ 1,859	$ 1,805	$ 2,071	$ 19,685	$ 126

[a] Excludes capital lease obligations of $1,268 million, as well as unamortized discount and deferred issuance costs of $(674) million. Includes an interest component of $9,278 million.
[b] Includes leases for locomotives, freight cars, other equipment, and real estate.
[c] Represents total obligations, including interest component of $319 million.
[d] Purchase obligations include locomotive maintenance contracts; purchase commitments for fuel purchases, locomotives, ties, ballast, and rail; and agreements to purchase other goods and services. For amounts where we cannot reasonably estimate the year of settlement, they are reflected in the Other column.
[e] Includes estimated other post retirement, medical, and life insurance payments, payments made under the unfunded pension plan for the next ten years.
[f] Future cash flows for income tax contingencies reflect the recorded liabilities and assets for unrecognized tax benefits, including interest and penalties, as of December 31, 2015. For amounts where the year of settlement is uncertain, they are reflected in the Other column.

		Amount of Commitment Expiration per Period					
Other Commercial Commitments							*After*
Millions	*Total*	*2016*	*2017*	*2018*	*2019*	*2020*	*2020*
Credit facilities [a]	$ 1,700	$ -	$ -	$ -	$ 1,700	$ -	$ -
Receivables securitization facility [b]	650	-	650	-	-	-	-
Guarantees [c]	53	9	10	11	8	5	10
Standby letters of credit [d]	35	33	2	-	-	-	-
Total commercial commitments	$ 2,438	$ 42	$ 662	$ 11	$ 1,708	$ 5	$ 10

[a] None of the credit facility was used as of December 31, 2015.
[b] $400 million of the receivables securitization facility was utilized as of December 31, 2015, which is accounted for as debt. The full program matures in July 2017.
[c] Includes guaranteed obligations related to our affiliated operations.
[d] None of the letters of credit were drawn upon as of December 31, 2015.

Off-Balance Sheet Arrangements

Guarantees – At December 31, 2015, and 2014, we were contingently liable for $53 million and $82 million in guarantees. We have recorded liabilities of $0 and $0.3 million for the fair value of these obligations as of December 31, 2015, and 2014, respectively. We entered into these contingent guarantees in the normal course of business, and they include guaranteed obligations related to our affiliated operations. The final guarantee expires in 2022. We are not aware of any existing event of

default that would require us to satisfy these guarantees. We do not expect that these guarantees will have a material adverse effect on our consolidated financial condition, results of operations, or liquidity.

OTHER MATTERS

Labor Agreements – Approximately 85% of our 47,457 full-time-equivalent employees are represented by 14 major rail unions. On January 1, 2015, current labor agreements became subject to modification and we began the current round of negotiations with the unions. Existing agreements remain in effect until new agreements are reached or the Railway Labor Act's procedures (which include mediation, cooling-off periods, and the possibility of Presidential Emergency Boards and Congressional intervention) are exhausted. Contract negotiations historically continue for an extended period of time and we rarely experience work stoppages while negotiations are pending.

Inflation – Long periods of inflation significantly increase asset replacement costs for capital-intensive companies. As a result, assuming that we replace all operating assets at current price levels, depreciation charges (on an inflation-adjusted basis) would be substantially greater than historically reported amounts.

Derivative Financial Instruments – We may use derivative financial instruments in limited instances to assist in managing our overall exposure to fluctuations in interest rates and fuel prices. We are not a party to leveraged derivatives and, by policy, do not use derivative financial instruments for speculative purposes. Derivative financial instruments qualifying for hedge accounting must maintain a specified level of effectiveness between the hedging instrument and the item being hedged, both at inception and throughout the hedged period. We formally document the nature and relationships between the hedging instruments and hedged items at inception, as well as our risk-management objectives, strategies for undertaking the various hedge transactions, and method of assessing hedge effectiveness. Changes in the fair market value of derivative financial instruments that do not qualify for hedge accounting are charged to earnings. We may use swaps, collars, futures, and/or forward contracts to mitigate the risk of adverse movements in interest rates and fuel prices; however, the use of these derivative financial instruments may limit future benefits from favorable price movements.

Market and Credit Risk – We address market risk related to derivative financial instruments by selecting instruments with value fluctuations that highly correlate with the underlying hedged item. We manage credit risk related to derivative financial instruments, which is minimal, by requiring high credit standards for counterparties and periodic settlements. At December 31, 2015 and 2014, we were not required to provide collateral, nor had we received collateral, relating to our hedging activities.

Determination of Fair Value – We determine the fair values of our derivative financial instrument positions based upon current fair values as quoted by recognized dealers or the present value of expected future cash flows.

Sensitivity Analyses – The sensitivity analyses that follow illustrate the economic effect that hypothetical changes in interest rates could have on our results of operations and financial condition. These hypothetical changes do not consider other factors that could impact actual results.

At December 31, 2015, we had variable-rate debt representing approximately 4.2% of our total debt. If variable interest rates average one percentage point higher in 2016 than our December 31, 2015 variable rate, which was approximately 1.1%, our interest expense would increase by approximately $6 million. This amount was determined by considering the impact of the hypothetical interest rate on the balances of our variable-rate debt at December 31, 2015.

Market risk for fixed-rate debt is estimated as the potential increase in fair value resulting from a hypothetical one percentage point decrease in interest rates as of December 31, 2015, and amounts to an increase of approximately $1.6 billion to the fair value of our debt at December 31, 2015. We estimated the fair values of our fixed-rate debt by considering the impact of the hypothetical interest rates on quoted market prices and current borrowing rates.

Interest Rate Fair Value Hedges – We manage our overall exposure to fluctuations in interest rates by adjusting the proportion of fixed and floating rate debt instruments within our debt portfolio over a given period. We generally manage the mix of fixed and floating rate debt through the issuance of targeted amounts of each as debt matures or as we require incremental borrowings. We employ derivatives, primarily swaps, as one of the tools to obtain the targeted mix. In addition, we also obtain flexibility in

managing interest costs and the interest rate mix within our debt portfolio by evaluating the issuance of and managing outstanding callable fixed-rate debt securities.

Swaps allow us to convert debt from fixed rates to variable rates and thereby hedge the risk of changes in the debt's fair value attributable to the changes in interest rates. We account for swaps as fair value hedges using the short-cut method as allowed by the Derivatives and Hedging Topic of the Financial Accounting Standards Board (FASB) ASC 815; therefore, we do not record any ineffectiveness within our Consolidated Financial Statements. As of December 31, 2015 and 2014, we had no interest rate fair value hedges outstanding.

Interest Rate Cash Flow Hedges – We report changes in the fair value of cash flow hedges in accumulated other comprehensive loss until the hedged item affects earnings. As of December 31, 2015, and 2014, we had no interest rate cash flow hedges outstanding.

Accounting Pronouncements – In May 2014, the FASB issued Accounting Standards Update No. 2014-09 (ASU 2014-09), *Revenue from Contracts with Customers (Topic 606)*. ASU 2014-09 supersedes the revenue recognition guidance in Topic 605, Revenue Recognition. The core principle of the guidance is that an entity should recognize revenue to depict the transfer of promised goods and services to customers in an amount that reflects the consideration to which the entity expects to be entitled in the exchange for those goods or services. This standard is effective for annual reporting periods beginning after December 15, 2017, and can be adopted either retrospectively or as a cumulative effect adjustment as of the date of adoption. ASU 2014-09 is not expected to have a material impact on our consolidated financial position, results of operations, or cash flows.

In April 2015, the FASB issued Accounting Standards Update No. 2015-03 (ASU 2015-03), *Interest - Imputation of Interest (Subtopic 835-30)*. ASU 2015-03 changes the presentation of debt issuance costs in the financial statements to present such costs as a direct deduction from the related debt liability rather than as an asset. Amortization of debt issuance costs will be reported as interest expense. This standard is effective for annual reporting periods beginning after December 15, 2015. We elected to early adopt ASU 2015-03 on December 31, 2015. As a result, the Company reclassified debt issuance costs from other assets to a direct deduction from debt due after one year on the Consolidated Statements of Financial Position. ASU 2015-03 did not have a material impact on our consolidated financial position, and had no impact on our results of operations or cash flows. All prior period financial information presented herein has been adjusted to reflect the retrospective application of this ASU.

In November 2015, the FASB issued Accounting Standards Update No. 2015-17 (ASU 2015-17), *Balance Sheet Classification of Deferred Taxes (Subtopic 740-10)*. ASU 2015-17 simplifies the presentation of deferred income taxes by eliminating the requirement for companies to present deferred tax liabilities and assets as current and non-current on the Consolidated Statements of Financial Position. Instead, companies will be required to classify all deferred tax assets and liabilities as non-current. This guidance is effective for annual and interim periods beginning after December 15, 2016 and early adoption is permitted. We elected to early adopt ASU 2015-17 on December 31, 2015. ASU 2015-17 did not have a material impact on our consolidated financial position, and had no impact on our results of operations or cash flows. All prior period financial information presented herein has been adjusted to reflect the retrospective application of this ASU.

In January 2016, the FASB issued Accounting Standards Update No. 2016-01 (ASU 2016-01), *Recognition and Measurement of Financial Assets and Financial Liabilities (Subtopic 825-10)*. ASU 2016-01 provides guidance for the recognition, measurement, presentation, and disclosure of financial instruments. This guidance is effective for annual and interim periods beginning after December 15, 2017, and early adoption is not permitted. ASU 2016-01 is not expected to have a material impact on our consolidated financial position, results of operations, or cash flows.

Asserted and Unasserted Claims – Various claims and lawsuits are pending against us and certain of our subsidiaries. We cannot fully determine the effect of all asserted and unasserted claims on our consolidated results of operations, financial condition, or liquidity. To the extent possible, we have recorded a liability where asserted and unasserted claims are considered probable and where such claims can be reasonably estimated. We do not expect that any known lawsuits, claims, environmental costs, commitments, contingent liabilities, or guarantees will have a material adverse effect on our consolidated results of operations, financial condition, or liquidity after taking into account liabilities and insurance recoveries previously recorded for these matters.

Indemnities – Our maximum potential exposure under indemnification arrangements, including certain tax indemnifications, can range from a specified dollar amount to an unlimited amount, depending on the nature of the transactions and the agreements. Due to uncertainty as to whether claims will be made or how they will be resolved, we cannot reasonably determine the probability of an adverse claim or reasonably estimate any adverse liability or the total maximum exposure under these indemnification arrangements. We do not have any reason to believe that we will be required to make any material payments under these indemnity provisions.

Climate Change – Although climate change could have an adverse impact on our operations and financial performance in the future (see Risk Factors under Item 1A of this report), we are currently unable to predict the manner or severity of such impact. However, we continue to take steps and explore opportunities to reduce the impact of our operations on the environment, including investments in new technologies, using training programs to reduce fuel consumption, and changing our operations to increase fuel efficiency.

CRITICAL ACCOUNTING POLICIES

Our Consolidated Financial Statements have been prepared in accordance with GAAP. The preparation of these financial statements requires estimation and judgment that affect the reported amounts of revenues, expenses, assets, and liabilities. We base our estimates on historical experience and on various other assumptions that we believe are reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. The following critical accounting policies are a subset of our significant accounting policies described in Note 2 to the Financial Statements and Supplementary Data, Item 8. These critical accounting policies affect significant areas of our financial statements and involve judgment and estimates. If these estimates differ significantly from actual results, the impact on our Consolidated Financial Statements may be material.

Personal Injury – The cost of personal injuries to employees and others related to our activities is charged to expense based on estimates of the ultimate cost and number of incidents each year. We use an actuarial analysis to measure the expense and liability, including unasserted claims. The Federal Employers' Liability Act (FELA) governs compensation for work-related accidents. Under FELA, damages are assessed based on a finding of fault through litigation or out-of-court settlements. We offer a comprehensive variety of services and rehabilitation programs for employees who are injured at work.

Our personal injury liability is not discounted to present value due to the uncertainty surrounding the timing of future payments. Approximately 94% of the recorded liability is related to asserted claims and approximately 6% is related to unasserted claims at December 31, 2015. Because of the uncertainty surrounding the ultimate outcome of personal injury claims, it is reasonably possible that future costs to settle these claims may range from approximately $318 million to $345 million. We record an accrual at the low end of the range as no amount of loss within the range is more probable than any other. Estimates can vary over time due to evolving trends in litigation.

Our personal injury liability activity was as follows:

Millions	***2015***	*2014*	*2013*
Beginning balance	**$ 335**	$ 294	$ 334
Current year accruals	**89**	96	87
Changes in estimates for prior years	**(3)**	9	(38)
Payments	**(103)**	(64)	(89)
Ending balance at December 31	**$ 318**	$ 335	$ 294
Current portion, ending balance at December 31	**$ 63**	$ 111	$ 82

Our personal injury claims activity was as follows:

	2015	*2014*	*2013*
Open claims, beginning balance	**2,618**	2,605	2,792
New claims	**2,573**	2,773	2,705
Settled or dismissed claims	**(2,787)**	(2,760)	(2,892)
Open claims, ending balance at December 31	**2,404**	2,618	2,605

In conjunction with the liability update performed in 2015, we also reassessed our estimated insurance recoveries. We have recognized an asset for estimated insurance recoveries at December 31, 2015, and 2014.

Asbestos – We are a defendant in a number of lawsuits in which current and former employees and other parties allege exposure to asbestos. We assess our potential liability using a statistical analysis of resolution costs for asbestos-related claims. This liability is updated annually and excludes future defense and processing costs. The liability for resolving both asserted and unasserted claims was based on the following assumptions:

- The ratio of future claims by alleged disease would be consistent with historical averages adjusted for inflation.
- The number of claims filed against us will decline each year.
- The average settlement values for asserted and unasserted claims will be equivalent to historical averages.
- The percentage of claims dismissed in the future will be equivalent to historical averages.

Our liability for asbestos-related claims is not discounted to present value due to the uncertainty surrounding the timing of future payments. Approximately 22% of the recorded liability related to asserted claims and approximately 78% related to unasserted claims at December 31, 2015. Because of the uncertainty surrounding the ultimate outcome of asbestos-related claims, it is reasonably possible that future costs to settle these claims may range from approximately $120 million to $129 million. We record an accrual at the low end of the range as no amount of loss within the range is more probable than any other.

Our asbestos-related liability activity was as follows:

Millions	***2015***	*2014*	*2013*
Beginning balance	**$ 126**	$ 131	$ 139
Accruals/(Credits)	**-**	1	2
Payments	**(6)**	(6)	(10)
Ending balance at December 31	**$ 120**	$ 126	$ 131
Current portion, ending balance at December 31	**$ 6**	$ 8	$ 9

Our asbestos-related claims activity was as follows:

	2015	*2014*	*2013*
Open claims, beginning balance	**1,065**	1,140	1,258
New claims	**193**	183	192
Settled or dismissed claims	**(169)**	(258)	(310)
Open claims, ending balance at December 31	**1,089**	1,065	1,140

In conjunction with the liability update performed in 2015, we also reassessed our estimated insurance recoveries. We have recognized an asset for estimated insurance recoveries at December 31, 2015, and 2014. The amounts recorded for asbestos-related liabilities and related insurance recoveries were based on currently known facts. However, future events, such as the number of new claims filed each year, average settlement costs, and insurance coverage issues, could cause the actual costs and insurance recoveries to be higher or lower than the projected amounts. Estimates also may vary in the future if strategies, activities, and outcomes of asbestos litigation materially change; federal and state laws

governing asbestos litigation increase or decrease the probability or amount of compensation of claimants; and there are material changes with respect to payments made to claimants by other defendants.

Environmental Costs – We are subject to federal, state, and local environmental laws and regulations. We have identified 290 sites at which we are or may be liable for remediation costs associated with alleged contamination or for violations of environmental requirements. This includes 31 sites that are the subject of actions taken by the U.S. government, 19 of which are currently on the Superfund National Priorities List. Certain federal legislation imposes joint and several liability for the remediation of identified sites; consequently, our ultimate environmental liability may include costs relating to activities of other parties, in addition to costs relating to our own activities at each site.

When we identify an environmental issue with respect to property owned, leased, or otherwise used in our business, we perform, with assistance of our consultants, environmental assessments on the property. We expense the cost of the assessments as incurred. We accrue the cost of remediation where our obligation is probable and such costs can be reasonably estimated. Our environmental liability is not discounted to present value due to the uncertainty surrounding the timing of future payments.

Our environmental liability activity was as follows:

Millions	***2015***	*2014*	*2013*
Beginning balance	**$ 182**	$ 171	$ 170
Accruals	**61**	56	58
Payments	**(53)**	(45)	(57)
Ending balance at December 31	**$ 190**	$ 182	$ 171
Current portion, ending balance at December 31	**$ 52**	$ 60	$ 53

Our environmental site activity was as follows:

	2015	*2014*	*2013*
Open sites, beginning balance	**270**	268	284
New sites	**66**	55	41
Closed sites	**(46)**	(53)	(57)
Open sites, ending balance at December 31	**290**	270	268

The environmental liability includes future costs for remediation and restoration of sites, as well as ongoing monitoring costs, but excludes any anticipated recoveries from third parties. Cost estimates are based on information available for each site, financial viability of other potentially responsible parties, and existing technology, laws, and regulations. The ultimate liability for remediation is difficult to determine because of the number of potentially responsible parties, site-specific cost sharing arrangements with other potentially responsible parties, the degree of contamination by various wastes, the scarcity and quality of volumetric data related to many of the sites, and the speculative nature of remediation costs. Estimates of liability may vary over time due to changes in federal, state, and local laws governing environmental remediation. Current obligations are not expected to have a material adverse effect on our consolidated results of operations, financial condition, or liquidity.

Property and Depreciation – Our railroad operations are highly capital intensive, and our large base of homogeneous, network-type assets turns over on a continuous basis. Each year we develop a capital program for the replacement of assets and for the acquisition or construction of assets that enable us to enhance our operations or provide new service offerings to customers. Assets purchased or constructed throughout the year are capitalized if they meet applicable minimum units of property criteria. Properties and equipment are carried at cost and are depreciated on a straight-line basis over their estimated service lives, which are measured in years, except for rail in high-density traffic corridors (i.e., all rail lines except for those subject to abandonment, yard and switching tracks, and electronic yards) for which lives are measured in millions of gross tons per mile of track. We use the group method of depreciation in which all items with similar characteristics, use, and expected lives are grouped together in asset classes, and are depreciated using composite depreciation rates. The group method of depreciation treats each asset class as a pool of resources, not as singular items. We currently have more than 60 depreciable

asset classes, and we may increase or decrease the number of asset classes due to changes in technology, asset strategies, or other factors.

We determine the estimated service lives of depreciable railroad property by means of depreciation studies. We perform depreciation studies at least every three years for equipment and every six years for track assets (i.e., rail and other track material, ties, and ballast) and other road property. Our depreciation studies take into account the following factors:

- Statistical analysis of historical patterns of use and retirements of each of our asset classes;
- Evaluation of any expected changes in current operations and the outlook for continued use of the assets;
- Evaluation of technological advances and changes to maintenance practices; and
- Expected salvage to be received upon retirement.

For rail in high-density traffic corridors, we measure estimated service lives in millions of gross tons per mile of track. It has been our experience that the lives of rail in high-density traffic corridors are closely correlated to usage (i.e., the amount of weight carried over the rail). The service lives also vary based on rail weight, rail condition (e.g., new or secondhand), and rail type (e.g., straight or curve). Our depreciation studies for rail in high-density traffic corridors consider each of these factors in determining the estimated service lives. For rail in high-density traffic corridors, we calculate depreciation rates annually by dividing the number of gross ton-miles carried over the rail (i.e., the weight of loaded and empty freight cars, locomotives and maintenance of way equipment transported over the rail) by the estimated service lives of the rail measured in millions of gross tons per mile. Rail in high-density traffic corridors accounts for approximately 70 percent of the historical cost of rail and other track material. Based on the number of gross ton-miles carried over our rail in high density traffic corridors during 2015, the estimated service lives of the majority of this rail ranged from approximately 19 years to approximately 39 years. For all other depreciable assets, we compute depreciation based on the estimated service lives of our assets as determined from the analysis of our depreciation studies. Changes in the estimated service lives of our assets and their related depreciation rates are implemented prospectively.

Estimated service lives of depreciable railroad property may vary over time due to changes in physical use, technology, asset strategies, and other factors that will have an impact on the retirement profiles of our assets. We are not aware of any specific factors that are reasonably likely to significantly change the estimated service lives of our assets. Actual use and retirement of our assets may vary from our current estimates, which would impact the amount of depreciation expense recognized in future periods.

Changes in estimated useful lives of our assets due to the results of our depreciation studies could significantly impact future periods' depreciation expense and have a material impact on our Consolidated Financial Statements. If the estimated useful lives of all depreciable assets were increased by one year, annual depreciation expense would decrease by approximately $66 million. If the estimated useful lives of all depreciable assets were decreased by one year, annual depreciation expense would increase by approximately $70 million. Our recent depreciation studies have resulted in lower depreciation rates for some asset classes. These lower rates will partially offset the impact of a projected higher depreciable asset base, resulting in an increase in total depreciation expense by approximately 1% to 2% in 2016 versus 2015.

Under group depreciation, the historical cost (net of salvage) of depreciable property that is retired or replaced in the ordinary course of business is charged to accumulated depreciation and no gain or loss is recognized. The historical cost of certain track assets is estimated using (i) inflation indices published by the Bureau of Labor Statistics and (ii) the estimated useful lives of the assets as determined by our depreciation studies. The indices were selected because they closely correlate with the major costs of the properties comprising the applicable track asset classes. Because of the number of estimates inherent in the depreciation and retirement processes and because it is impossible to precisely estimate each of these variables until a group of property is completely retired, we continually monitor the estimated service lives of our assets and the accumulated depreciation associated with each asset class to ensure our depreciation rates are appropriate. In addition, we determine if the recorded amount of accumulated depreciation is deficient (or in excess) of the amount indicated by our depreciation studies. Any deficiency (or excess) is amortized as a component of depreciation expense over the remaining service lives of the applicable classes of assets.

For retirements of depreciable railroad properties that do not occur in the normal course of business, a gain or loss may be recognized if the retirement meets each of the following three conditions: (i) it is unusual, (ii) it is material in amount, and (iii) it varies significantly from the retirement profile identified through our depreciation studies. During the last three fiscal years, no gains or losses were recognized due to the retirement of depreciable railroad properties. A gain or loss is recognized in other income when we sell land or dispose of assets that are not part of our railroad operations.

Income Taxes – We account for income taxes by recording taxes payable or refundable for the current year and deferred tax assets and liabilities for the expected future tax consequences of events that have been recognized in our financial statements or tax returns. These expected future tax consequences are measured based on current tax law; the effects of future tax legislation are not anticipated. Future tax legislation, such as a change in the corporate tax rate, could have a material impact on our financial condition, results of operations, or liquidity. For example, a 1% increase in future income tax rates would increase our deferred tax liability by approximately $390 million.

When appropriate, we record a valuation allowance against deferred tax assets to reflect that these tax assets may not be realized. In determining whether a valuation allowance is appropriate, we consider whether it is more likely than not that all or some portion of our deferred tax assets will not be realized, based on management's judgments using available evidence for purposes of estimating whether future taxable income will be sufficient to realize a deferred tax asset. In 2015 and 2014, there were no valuation allowances.

We recognize tax benefits that are more likely than not to be sustained upon examination by tax authorities. The amount recognized is measured as the largest amount of benefit that is greater than 50 percent likely to be realized upon settlement. A liability for "unrecognized tax benefits" is recorded for any tax benefits claimed in our tax returns that do not meet these recognition and measurement standards.

Pension and Other Postretirement Benefits – We use an actuarial analysis to measure the liabilities and expenses associated with providing pension and medical and life insurance benefits (OPEB) to eligible employees. In order to use actuarial methods to value the liabilities and expenses, we must make several assumptions. The critical assumptions used to measure pension obligations and expenses are the discount rate and expected rate of return on pension assets. For OPEB, the critical assumptions are the discount rate and health care cost trend rate.

We evaluate our critical assumptions at least annually, and selected assumptions are based on the following factors:

- Discount rate is based on a Mercer yield curve of high quality corporate bonds (rated AA by a recognized rating agency) for which the timing and amount of cash flows matches our plans' expected benefit payments.
- Expected return on plan assets is based on our asset allocation mix and our historical return, taking into consideration current and expected market conditions.
- Health care cost trend rate is based on our historical rates of inflation and expected market conditions.

The following tables present the key assumptions used to measure net periodic pension and OPEB cost/(benefit) for 2015 and the estimated impact on 2015 net periodic pension and OPEB cost/(benefit) relative to a change in those assumptions:

Assumptions	*Pension*	*OPEB*
Discount rate	3.94%	3.74%
Expected return on plan assets	7.50%	N/A
Compensation increase	4.00%	N/A
Health care cost trend rate:		
Pre-65 current	N/A	6.34%
Pre-65 level in 2028	N/A	4.50%

Sensitivities	*Increase in Expense*	
Millions	*Pension*	*OPEB*
0.25% decrease in discount rate	$ 14	$ 1
0.25% increase in compensation scale	$ 9	N/A
0.25% decrease in expected return on plan assets	$ 8	N/A
1% increase in health care cost trend rate	N/A	$ 3

The following table presents the net periodic pension and OPEB cost for the years ended December 31:

Millions	*Est. 2016*	*2015*	*2014*	*2013*
Net periodic pension cost	$ 42	$ 120	$ 69	$ 110
Net periodic OPEB cost	13	19	15	14

In 2016, we will measure the service cost and interest cost components of our net periodic benefit cost by using individual spot rates matched with separate cash flows for each future year instead of a single weighted-average discount rate approach. Our net periodic pension cost is expected to decrease to approximately $42 million in 2016 from $120 million in 2015. Our net periodic OPEB expense is expected to decrease to approximately $13 million in 2016 from $19 million in 2015.

CAUTIONARY INFORMATION

Certain statements in this report, and statements in other reports or information filed or to be filed with the SEC (as well as information included in oral statements or other written statements made or to be made by us), are, or will be, forward-looking statements as defined by the Securities Act of 1933 and the Securities Exchange Act of 1934. These forward-looking statements and information include, without limitation, (A) statements in the Chairman's letter preceding Part I; statements regarding planned capital expenditures under the caption "2016 Capital Plan" in Item 2 of Part I; statements regarding dividends in Item 5 of Part II; and statements and information set forth under the captions "2016 Outlook"; "Liquidity and Capital Resources"; and "Pension and Other Postretirement Benefits" in this Item 7 of Part II, and (B) any other statements or information in this report (including information incorporated herein by reference) regarding: expectations as to financial performance, revenue growth and cost savings; the time by which goals, targets, or objectives will be achieved; projections, predictions, expectations, estimates, or forecasts as to our business, financial and operational results, future economic performance, and general economic conditions; expectations as to operational or service performance or improvements; expectations as to the effectiveness of steps taken or to be taken to improve operations and/or service, including capital expenditures for infrastructure improvements and equipment acquisitions, any strategic business acquisitions, and modifications to our transportation plans; expectations as to existing or proposed new products and services; expectations as to the impact of any new regulatory activities or legislation on our operations or financial results; estimates of costs relating to environmental remediation and restoration; estimates and expectations regarding tax matters; expectations that claims, litigation, environmental costs, commitments, contingent liabilities, labor negotiations or agreements, or other matters will not have a material adverse effect on our consolidated results of operations, financial condition, or liquidity and any other similar expressions concerning matters that are not historical facts. Forward-looking statements may be identified by their use of forward-looking terminology, such as "believes," "expects," "may," "should," "would," "will," "intends," "plans," "estimates," "anticipates," "projects" and similar words, phrases or expressions.

Forward-looking statements should not be read as a guarantee of future performance or results, and will not necessarily be accurate indications of the times that, or by which, such performance or results will be achieved. Forward-looking statements and information are subject to risks and uncertainties that could cause actual performance or results to differ materially from those expressed in the statements and information. Forward-looking statements and information reflect the good faith consideration by management of currently available information, and may be based on underlying assumptions believed to be reasonable under the circumstances. However, such information and assumptions (and, therefore, such forward-looking statements and information) are or may be subject to variables or unknown or unforeseeable events or circumstances over which management has little or no influence or control. The Risk Factors in Item 1A of this report could affect our future results and could cause those results or other outcomes to differ materially from those expressed or implied in any forward-looking statements or information. To the extent circumstances require or we deem it otherwise necessary, we will update or

amend these risk factors in a Form 10-Q, Form 8-K or subsequent Form 10-K. All forward-looking statements are qualified by, and should be read in conjunction with, these Risk Factors.

Forward-looking statements speak only as of the date the statement was made. We assume no obligation to update forward-looking information to reflect actual results, changes in assumptions or changes in other factors affecting forward-looking information. If we do update one or more forward-looking statements, no inference should be drawn that we will make additional updates with respect thereto or with respect to other forward-looking statements.

Item 7A. Quantitative and Qualitative Disclosures about Market Risk

Information concerning market risk sensitive instruments is set forth under Management's Discussion and Analysis of Financial Condition and Results of Operations – Other Matters, Item 7.

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Item 8. Financial Statements and Supplementary Data

Index to Consolidated Financial Statements **Page**

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

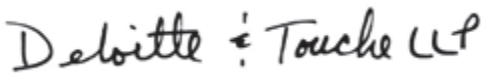
To the Board of Directors and Shareholders of Union Pacific Corporation
Omaha, Nebraska

We have audited the accompanying consolidated statements of financial position of Union Pacific Corporation and Subsidiary Companies (the "Corporation") as of December 31, 2015 and 2014, and the related consolidated statements of income, comprehensive income, changes in common shareholders' equity, and cash flows for each of the three years in the period ended December 31, 2015. Our audits also included the financial statement schedule listed in the Table of Contents at Part IV, Item 15. These financial statements and financial statement schedule are the responsibility of the Corporation's management. Our responsibility is to express an opinion on the financial statements and financial statement schedule based on our audits.

We conducted our audits in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, such consolidated financial statements present fairly, in all material respects, the financial position of Union Pacific Corporation and Subsidiary Companies as of December 31, 2015 and 2014, and the results of their operations and their cash flows for each of the three years in the period ended December 31, 2015, in conformity with accounting principles generally accepted in the United States of America. Also, in our opinion, such financial statement schedule, when considered in relation to the basic consolidated financial statements taken as a whole, presents fairly, in all material respects, the information set forth therein.

We have also audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States), the Corporation's internal control over financial reporting as of December 31, 2015, based on the criteria established in *Internal Control — Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission and our report dated February 5, 2016 expressed an unqualified opinion on the Corporation's internal control over financial reporting.



Omaha, Nebraska
February 5, 2016

CONSOLIDATED STATEMENTS OF INCOME

Union Pacific Corporation and Subsidiary Companies

Millions, Except Per Share Amounts, for the Years Ended December 31,	***2015***	*2014*	*2013*
Operating revenues:			
Freight revenues	**$ 20,397**	$ 22,560	$ 20,684
Other revenues	**1,416**	1,428	1,279
Total operating revenues	**21,813**	23,988	21,963
Operating expenses:			
Compensation and benefits	**5,161**	5,076	4,807
Purchased services and materials	**2,421**	2,558	2,315
Fuel	**2,013**	3,539	3,534
Depreciation	**2,012**	1,904	1,777
Equipment and other rents	**1,230**	1,234	1,235
Other	**924**	924	849
Total operating expenses	**13,761**	15,235	14,517
Operating income	**8,052**	8,753	7,446
Other income (Note 7)	**226**	151	128
Interest expense	**(622)**	(561)	(526)
Income before income taxes	**7,656**	8,343	7,048
Income taxes (Note 8)	**(2,884)**	(3,163)	(2,660)
Net income	**$ 4,772**	$ 5,180	$ 4,388
Share and Per Share (Note 9):			
Earnings per share - basic	**$ 5.51**	$ 5.77	$ 4.74
Earnings per share - diluted	**$ 5.49**	$ 5.75	$ 4.71
Weighted average number of shares - basic	**866.2**	897.1	926.5
Weighted average number of shares - diluted	**869.4**	901.1	931.5
Dividends declared per share	**$ 2.20**	$ 1.91	$ 1.48

CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME

Union Pacific Corporation and Subsidiary Companies

Millions, for the Years Ended December 31,	***2015***	*2014*	*2013*
Net income	**$ 4,772**	$ 5,180	$ 4,388
Other comprehensive income/(loss):			
Defined benefit plans	**58**	(448)	436
Foreign currency translation	**(43)**	(12)	(1)
Derivatives	**-**	-	1
Total other comprehensive income/(loss) [a]	**15**	(460)	436
Comprehensive income	**$ 4,787**	$ 4,720	$ 4,824

[a] Net of deferred taxes of ($8) million, $291 million, and ($264) million during 2015, 2014, and 2013, respectively.
The accompanying notes are an integral part of these Consolidated Financial Statements.

CONSOLIDATED STATEMENTS OF FINANCIAL POSITION

Union Pacific Corporation and Subsidiary Companies

Millions, Except Share and Per Share Amounts as of December 31,		***2015***		*2014*
Assets				
Current assets:				
Cash and cash equivalents	**$**	**1,391**	$	1,586
Accounts receivable, net (Note 11)		**1,356**		1,611
Materials and supplies		**736**		712
Other current assets		**647**		492
Total current assets		**4,130**		4,401
Investments		**1,410**		1,390
Net properties (Note 12)		**48,866**		46,272
Other assets		**194**		309
Total assets	**$**	**54,600**	$	52,372
Liabilities and Common Shareholders' Equity				
Current liabilities:				
Accounts payable and other current liabilities (Note 13)	**$**	**2,612**	$	3,303
Debt due within one year (Note 15)		**594**		461
Total current liabilities		**3,206**		3,764
Debt due after one year (Note 15)		**13,607**		10,952
Deferred income taxes (Note 8)		**15,241**		14,403
Other long-term liabilities		**1,844**		2,064
Commitments and contingencies (Notes 17 and 18)				
Total liabilities		**33,898**		31,183
Common shareholders' equity:				
Common shares, $2.50 par value, 1,400,000,000 authorized; 1,110,426,354 and 1,110,100,423 issued; 849,211,436 and 883,366,476 outstanding, respectively		**2,776**		2,775
Paid-in-surplus		**4,417**		4,321
Retained earnings		**30,233**		27,367
Treasury stock		**(15,529)**		(12,064)
Accumulated other comprehensive loss (Note 10)		**(1,195)**		(1,210)
Total common shareholders' equity		**20,702**		21,189
Total liabilities and common shareholders' equity	**$**	**54,600**	$	52,372

The accompanying notes are an integral part of these Consolidated Financial Statements.

CONSOLIDATED STATEMENTS OF CASH FLOWS
Union Pacific Corporation and Subsidiary Companies

Millions, for the Years Ended December 31,	***2015***	*2014*	*2013*
Operating Activities			
Net income	**$ 4,772**	$ 5,180	$ 4,388
Adjustments to reconcile net income to cash provided by operating activities:			
Depreciation	**2,012**	1,904	1,777
Deferred and other income taxes	**765**	895	723
Net gain on non-operating asset dispositions	**(144)**	(69)	(32)
Other operating activities, net	**116**	(216)	(194)
Changes in current assets and liabilities:			
Accounts receivable, net	**255**	(197)	(83)
Materials and supplies	**(24)**	(59)	7
Other current assets	**(47)**	(35)	1
Accounts payable and other current liabilities	**(276)**	295	40
Income and other taxes	**(85)**	(313)	196
Cash provided by operating activities	**7,344**	7,385	6,823
Investing Activities			
Capital investments	**(4,650)**	(4,346)	(3,496)
Proceeds from asset sales	**251**	138	98
Other investing activities, net	**(77)**	(41)	(7)
Cash used in investing activities	**(4,476)**	(4,249)	(3,405)
Financing Activities			
Common share repurchases (Note 19)	**(3,465)**	(3,225)	(2,218)
Debt issued	**3,328**	2,588	1,443
Dividends paid	**(2,344)**	(1,632)	(1,333)
Debt repaid	**(556)**	(710)	(640)
Debt exchange	**-**	-	(289)
Other financing activities, net	**(26)**	(3)	(12)
Cash used in financing activities	**(3,063)**	(2,982)	(3,049)
Net change in cash and cash equivalents	**(195)**	154	369
Cash and cash equivalents at beginning of year	**1,586**	1,432	1,063
Cash and cash equivalents at end of year	**$ 1,391**	$ 1,586	$ 1,432
Supplemental Cash Flow Information			
Non-cash investing and financing activities:			
Capital investments accrued but not yet paid	**$ 100**	$ 174	$ 133
Capital lease financings	**13**	-	39
Cash dividends declared but not yet paid (Note 13)	**-**	438	356
Cash paid during the year for:			
Income taxes, net of refunds	**$ (2,156)**	$ (2,492)	$ (1,656)
Interest, net of amounts capitalized	**(592)**	(554)	(528)

The accompanying notes are an integral part of these Consolidated Financial Statements.

CONSOLIDATED STATEMENTS OF CHANGES IN COMMON SHAREHOLDERS' EQUITY
Union Pacific Corporation and Subsidiary Companies

Millions	*Common Shares*	*Treasury Shares*	*Common Shares*	*Paid-in-Surplus*	*Retained Earnings*	*Treasury Stock*	*AOCI [a]*	*Total*
Balance at January 1, 2013	1,109.3	(170.3)	$ 2,773	$ 4,113	$ 20,884	$ (6,707)	$ (1,186)	$ 19,877
Net income			-	-	4,388	-	-	4,388
Other comp. income			-	-	-	-	436	436
Conversion, stock option exercises, forfeitures, and other	0.4	1.6	1	97	-	15	-	113
Share repurchases (Note 19)	-	(29.0)	-	-	-	(2,218)	-	(2,218)
Cash dividends declared ($1.48 per share)	-	-	-	-	(1,371)	-	-	(1,371)
Balance at December 31, 2013	1,109.7	(197.7)	$ 2,774	$ 4,210	$ 23,901	$ (8,910)	$ (750)	$ 21,225
Net income			-	-	5,180	-	-	5,180
Other comp. loss			-	-	-	-	(460)	(460)
Conversion, stock option exercises, forfeitures, and other	0.4	3.0	1	111	-	71	-	183
Share repurchases (Note 19)	-	(32.0)	-	-	-	(3,225)	-	(3,225)
Cash dividends declared ($1.91 per share)	-	-	-	-	(1,714)	-	-	(1,714)
Balance at December 31, 2014	1,110.1	(226.7)	$ 2,775	$ 4,321	$ 27,367	$ (12,064)	$ (1,210)	$ 21,189
Net income			-	-	4,772	-	-	4,772
Other comp. income			-	-	-	-	15	15
Conversion, stock option exercises, forfeitures, and other	0.3	0.8	1	96	-	-	-	97
Share repurchases (Note 19)	-	(35.3)	-	-	-	(3,465)	-	(3,465)
Cash dividends declared ($2.20 per share)	-	-	-	-	(1,906)	-	-	(1,906)
Balance at December 31, 2015	**1,110.4**	**(261.2)**	**$ 2,776**	**$ 4,417**	**$ 30,233**	**$ (15,529)**	**$ (1,195)**	**$ 20,702**

[a] AOCI = Accumulated Other Comprehensive Income/(Loss) (Note 10)
The accompanying notes are an integral part of these Consolidated Financial Statements.

For purposes of this report, unless the context otherwise requires, all references herein to the "Corporation", "Company", "UPC", "we", "us", and "our" mean Union Pacific Corporation and its subsidiaries, including Union Pacific Railroad Company, which will be separately referred to herein as "UPRR" or the "Railroad".

1. Nature of Operations

Operations and Segmentation – We are a Class I railroad operating in the U.S. Our network includes 32,084 route miles, linking Pacific Coast and Gulf Coast ports with the Midwest and Eastern U.S. gateways and providing several corridors to key Mexican gateways. We own 26,064 miles and operate on the remainder pursuant to trackage rights or leases. We serve the western two-thirds of the country and maintain coordinated schedules with other rail carriers for the handling of freight to and from the Atlantic Coast, the Pacific Coast, the Southeast, the Southwest, Canada, and Mexico. Export and import traffic is moved through Gulf Coast and Pacific Coast ports and across the Mexican and Canadian borders.

The Railroad, along with its subsidiaries and rail affiliates, is our one reportable operating segment. Although we provide and analyze revenue by commodity group, we treat the financial results of the Railroad as one segment due to the integrated nature of our rail network. The following table provides freight revenue by commodity group:

Millions	***2015***	*2014*	*2013*
Agricultural Products	**$ 3,581**	$ 3,777	$ 3,276
Automotive	**2,154**	2,103	2,077
Chemicals	**3,543**	3,664	3,501
Coal	**3,237**	4,127	3,978
Industrial Products	**3,808**	4,400	3,822
Intermodal	**4,074**	4,489	4,030
Total freight revenues	**$ 20,397**	$ 22,560	$ 20,684
Other revenues	**1,416**	1,428	1,279
Total operating revenues	**$ 21,813**	$ 23,988	$ 21,963

Although our revenues are principally derived from customers domiciled in the U.S., the ultimate points of origination or destination for some products transported by us are outside the U.S. Each of our commodity groups includes revenue from shipments to and from Mexico. Included in the above table are freight revenues from our Mexico business which amounted to $2.2 billion in 2015, $2.3 billion in 2014, and $2.1 billion in 2013.

Basis of Presentation – The Consolidated Financial Statements are presented in accordance with accounting principles generally accepted in the U.S. (GAAP) as codified in the Financial Accounting Standards Board (FASB) Accounting Standards Codification (ASC). Certain prior period amounts in the statement of cash flows and income tax footnote have been aggregated or disaggregated further to conform to the current period financial presentation.

2. Significant Accounting Policies

Principles of Consolidation – The Consolidated Financial Statements include the accounts of Union Pacific Corporation and all of its subsidiaries. Investments in affiliated companies (20% to 50% owned) are accounted for using the equity method of accounting. All intercompany transactions are eliminated. We currently have no less than majority-owned investments that require consolidation under variable interest entity requirements.

Cash and Cash Equivalents – Cash equivalents consist of investments with original maturities of three months or less.

Accounts Receivable – Accounts receivable includes receivables reduced by an allowance for doubtful accounts. The allowance is based upon historical losses, credit worthiness of customers, and current

economic conditions. Receivables not expected to be collected in one year and the associated allowances are classified as other assets in our Consolidated Statements of Financial Position.

Investments – Investments represent our investments in affiliated companies (20% to 50% owned) that are accounted for under the equity method of accounting and investments in companies (less than 20% owned) accounted for under the cost method of accounting.

Materials and Supplies – Materials and supplies are carried at the lower of average cost or market.

Property and Depreciation – Properties and equipment are carried at cost and are depreciated on a straight-line basis over their estimated service lives, which are measured in years, except for rail in high-density traffic corridors (i.e., all rail lines except for those subject to abandonment, yard and switching tracks, and electronic yards), for which lives are measured in millions of gross tons per mile of track. We use the group method of depreciation in which all items with similar characteristics, use, and expected lives are grouped together in asset classes, and are depreciated using composite depreciation rates. The group method of depreciation treats each asset class as a pool of resources, not as singular items. We determine the estimated service lives of depreciable railroad assets by means of depreciation studies. Under the group method of depreciation, no gain or loss is recognized when depreciable property is retired or replaced in the ordinary course of business.

Impairment of Long-lived Assets – We review long-lived assets, including identifiable intangibles, for impairment when events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. If impairment indicators are present and the estimated future undiscounted cash flows are less than the carrying value of the long-lived assets, the carrying value is reduced to the estimated fair value as measured by the discounted cash flows.

Revenue Recognition – We recognize freight revenues as freight moves from origin to destination. The allocation of revenue between reporting periods is based on the relative transit time in each reporting period with expenses recognized as incurred. Other revenues, which include revenues earned by our subsidiaries, revenues from our commuter rail operations, and accessorial revenue, are recognized as service is performed or contractual obligations are met. Customer incentives, which are primarily provided for shipping a specified cumulative volume or shipping to/from specific locations, are recorded as a reduction to operating revenues based on actual or projected future customer shipments.

Translation of Foreign Currency – Our portion of the assets and liabilities related to foreign investments are translated into U.S. dollars at the exchange rates in effect at the balance sheet date. Revenue and expenses are translated at the average rates of exchange prevailing during the year. Unrealized gains or losses are reflected within common shareholders' equity as accumulated other comprehensive income or loss.

Fair Value Measurements – We use a fair value hierarchy that prioritizes the inputs to valuation techniques used to measure fair value into three broad levels. The level in the fair value hierarchy within which the fair value measurement in its entirety falls is determined based on the lowest level input that is significant to the fair value measurement in its entirety. These levels include:

Level 1: Quoted market prices in active markets for identical assets or liabilities.
Level 2: Observable market-based inputs or unobservable inputs that are corroborated by market data.
Level 3: Unobservable inputs that are not corroborated by market data.

We have applied fair value measurements to our pension plan assets and short- and long-term debt.

Stock-Based Compensation – We have several stock-based compensation plans under which employees and non-employee directors receive stock options, nonvested retention shares, and nonvested stock units. We refer to the nonvested shares and stock units collectively as "retention awards". We have elected to issue treasury shares to cover option exercises and stock unit vestings, while new shares are issued when retention shares are granted.

We measure and recognize compensation expense for all stock-based awards made to employees and directors, including stock options. Compensation expense is based on the calculated fair value of the awards as measured at the grant date and is expensed ratably over the service period of the awards (generally the vesting period). The fair value of retention awards is the closing stock price on the date of grant, while the fair value of stock options is determined by using the Black-Scholes option pricing model.

Earnings Per Share – Basic earnings per share are calculated on the weighted-average number of common shares outstanding during each period. Diluted earnings per share include shares issuable upon exercise of outstanding stock options and stock-based awards where the conversion of such instruments would be dilutive.

Income Taxes – We account for income taxes by recording taxes payable or refundable for the current year and deferred tax assets and liabilities for the expected future tax consequences of events that have been recognized in our financial statements or tax returns. These expected future tax consequences are measured based on current tax law; the effects of future tax legislation are not anticipated. Future tax legislation, such as a change in the corporate tax rate, could have a material impact on our financial condition, results of operations, or liquidity.

When appropriate, we record a valuation allowance against deferred tax assets to reflect that these tax assets may not be realized. In determining whether a valuation allowance is appropriate, we consider whether it is more likely than not that all or some portion of our deferred tax assets will not be realized, based on management's judgments using available evidence for purposes of estimating whether future taxable income will be sufficient to realize a deferred tax asset.

We recognize tax benefits that are more likely than not to be sustained upon examination by tax authorities. The amount recognized is measured as the largest amount of benefit that is greater than 50 percent likely to be realized upon settlement. A liability for "unrecognized tax benefits" is recorded for any tax benefits claimed in our tax returns that do not meet these recognition and measurement standards.

Pension and Postretirement Benefits – We incur certain employment-related expenses associated with pensions and postretirement health benefits. In order to measure the expense associated with these benefits, we must make various assumptions including discount rates used to value certain liabilities, expected return on plan assets used to fund these expenses, compensation increases, employee turnover rates, anticipated mortality rates, and expected future health care costs. The assumptions used by us are based on our historical experience as well as current facts and circumstances. We use an actuarial analysis to measure the expense and liability associated with these benefits.

Personal Injury – The cost of injuries to employees and others on our property is charged to expense based on estimates of the ultimate cost and number of incidents each year. We use an actuarial analysis to measure the expense and liability. Our personal injury liability is not discounted to present value. Legal fees and incidental costs are expensed as incurred.

Asbestos – We estimate a liability for asserted and unasserted asbestos-related claims based on an assessment of the number and value of those claims. We use a statistical analysis to assist us in properly measuring our potential liability. Our liability for asbestos-related claims is not discounted to present value due to the uncertainty surrounding the timing of future payments. Legal fees and incidental costs are expensed as incurred.

Environmental – When environmental issues have been identified with respect to property currently or formerly owned, leased, or otherwise used in the conduct of our business, we perform, with the assistance of our consultants, environmental assessments on such property. We expense the cost of the assessments as incurred. We accrue the cost of remediation where our obligation is probable and such costs can be reasonably estimated. We do not discount our environmental liabilities when the timing of the anticipated cash payments is not fixed or readily determinable. Legal fees and incidental costs are expensed as incurred.

Use of Estimates – The preparation of our Consolidated Financial Statements in conformity with GAAP requires management to make estimates and assumptions that affect certain reported assets and liabilities, and the disclosure of certain contingent assets and liabilities as of the date of the consolidated financial statements, as well as the reported amounts of revenue and expenses during the reporting period. Actual future results may differ from such estimates.

3. Accounting Pronouncements

In May 2014, the FASB issued Accounting Standards Update No. 2014-09 (ASU 2014-09), *Revenue from Contracts with Customers (Topic 606)*. ASU 2014-09 supersedes the revenue recognition guidance in Topic 605, Revenue Recognition. The core principle of the guidance is that an entity should recognize revenue to depict the transfer of promised goods and services to customers in an amount that reflects the

consideration to which the entity expects to be entitled in the exchange for those goods or services. This standard is effective for annual reporting periods beginning after December 15, 2017, and can be adopted either retrospectively or as a cumulative effect adjustment as of the date of adoption. ASU 2014-09 is not expected to have a material impact on our consolidated financial position, results of operations, or cash flows.

In April 2015, the FASB issued Accounting Standards Update No. 2015-03 (ASU 2015-03), *Interest - Imputation of Interest (Subtopic 835-30)*. ASU 2015-03 changes the presentation of debt issuance costs in the financial statements to present such costs as a direct deduction from the related debt liability rather than as an asset. Amortization of debt issuance costs will be reported as interest expense. This standard is effective for annual reporting periods beginning after December 15, 2015. We elected to early adopt ASU 2015-03 on December 31, 2015. As a result, the Company reclassified debt issuance costs from other assets to debt on the Consolidated Statements of Financial Position. ASU 2015-03 did not have a material impact on our consolidated financial position, and had no impact on our results of operations or cash flows. All prior period financial information presented herein has been adjusted to reflect the retrospective application of this ASU.

In November 2015, the FASB issued Accounting Standards Update No. 2015-17 (ASU 2015-17), *Balance Sheet Classification of Deferred Taxes (Subtopic 740-10)*. ASU 2015-17 simplifies the presentation of deferred income taxes by eliminating the requirement for companies to present deferred tax liabilities and assets as current and non-current on the Consolidated Statements of Financial Position. Instead, companies will be required to classify all deferred tax assets and liabilities as non-current. This guidance is effective for annual and interim periods beginning after December 15, 2016 and early adoption is permitted. We elected to early adopt ASU 2015-17 on December 31, 2015. ASU 2015-17 did not have a material impact on our consolidated financial position, and had no impact on our results of operations or cash flows. All prior period financial information presented herein has been adjusted to reflect the retrospective application of this ASU.

In January 2016, the FASB issued Accounting Standards Update No. 2016-01 (ASU 2016-01), *Recognition and Measurement of Financial Assets and Financial Liabilities (Subtopic 825-10)*. ASU 2016-01 provides guidance for the recognition, measurement, presentation, and disclosure of financial instruments. This guidance is effective for annual and interim periods beginning after December 15, 2017, and early adoption is not permitted. ASU 2016-01 is not expected to have a material impact on our consolidated financial position, results of operations, or cash flows.

4. Stock Split

On June 6, 2014, we completed a two-for-one stock split, effected in the form of a 100% stock dividend. The stock split entitled all shareholders of record at the close of business on May 27, 2014, to receive one additional share of our common stock, par value $2.50 per share, for each share of common stock held on that date. All references to common shares and per share amounts have been retroactively adjusted to reflect the stock split for all periods presented.

5. Stock Options and Other Stock Plans

There are 7,140 restricted shares outstanding under the 1992 Restricted Stock Plan for Non-Employee Directors of Union Pacific Corporation. We no longer grant awards of restricted shares under this plan.

In April 2000, the shareholders approved the Union Pacific Corporation 2000 Directors Plan (Directors Plan) whereby 2,200,000 shares of our common stock were reserved for issuance to our non-employee directors. Under the Directors Plan, each non-employee director, upon his or her initial election to the Board of Directors, receives a grant of 4,000 retention shares or retention stock units. Prior to December 31, 2007, each non-employee director received annually an option to purchase at fair value a number of shares of our common stock, not to exceed 20,000 shares during any calendar year, determined by dividing 60,000 by 1/3 of the fair market value of one share of our common stock on the date of such Board of Directors meeting, with the resulting quotient rounded up or down to the nearest 50 shares. In September 2007, the Board of Directors eliminated the annual payment of options for 2008 and all future years. As of December 31, 2015, 36,000 restricted shares and 45,400 options were outstanding under the Directors Plan.

The Union Pacific Corporation 2004 Stock Incentive Plan (2004 Plan) was approved by shareholders in April 2004. The 2004 Plan reserved 84,000,000 shares of our common stock for issuance, plus any

shares subject to awards made under previous plans that were outstanding on April 16, 2004, and became available for regrant pursuant to the terms of the 2004 Plan. Under the 2004 Plan, non-qualified options, stock appreciation rights, retention shares, stock units, and incentive bonus awards may be granted to eligible employees of the Corporation and its subsidiaries. Non-employee directors are not eligible for awards under the 2004 Plan. As of December 31, 2015, 3,652,954 options and 2,092,721 retention shares and stock units were outstanding under the 2004 Plan. We no longer grant any stock options or other stock or unit awards under this plan.

The Union Pacific Corporation 2013 Stock Incentive Plan (2013 Plan) was approved by shareholders in May 2013. The 2013 Plan reserved 78,000,000 shares of our common stock for issuance, plus any shares subject to awards made under previous plans as of February 28, 2013, that are subsequently cancelled, expired, forfeited or otherwise not issued under previous plans. Under the 2013 Plan, non-qualified options, incentive stock options, retention shares, stock units, and incentive bonus awards may be granted to eligible employees of the Corporation and its subsidiaries. Non-employee directors are not eligible for awards under the 2013 Plan. As of December 31, 2015, 1,873,014 options and 2,061,737 retention shares and stock units were outstanding under the 2013 Plan.

Pursuant to the above plans 76,548,520; 77,786,772; and 79,574,896 shares of our common stock were authorized and available for grant at December 31, 2015, 2014, and 2013, respectively.

Stock-Based Compensation – We have several stock-based compensation plans under which employees and non-employee directors receive stock options, nonvested retention shares, and nonvested stock units. We refer to the nonvested shares and stock units collectively as “retention awards”. We have elected to issue treasury shares to cover option exercises and stock unit vestings, while new shares are issued when retention shares are granted.

Information regarding stock-based compensation appears in the table below:

Millions	***2015***	*2014*	*2013*
Stock-based compensation, before tax:			
Stock options	**$ 17**	$ 21	$ 19
Retention awards	**81**	91	79
Total stock-based compensation, before tax	**$ 98**	$ 112	$ 98
Excess tax benefits from equity compensation plans	**$ 62**	$ 118	$ 76

Stock Options – We estimate the fair value of our stock option awards using the Black-Scholes option pricing model. The table below shows the annual weighted-average assumptions used for valuation purposes:

Weighted-Average Assumptions	***2015***	*2014*	*2013*
Risk-free interest rate	**1.3%**	1.6%	0.8%
Dividend yield	**1.8%**	2.1%	2.1%
Expected life (years)	**5.1**	5.2	5.0
Volatility	**23.4%**	30.0%	36.2%
Weighted-average grant-date fair value of options granted	**$ 22.30**	$ 20.18	$ 17.49

The risk-free rate is based on the U.S. Treasury yield curve in effect at the time of grant; the expected dividend yield is calculated as the ratio of dividends paid per share of common stock to the stock price on the date of grant; the expected life is based on historical and expected exercise behavior; and expected volatility is based on the historical volatility of our stock price over the expected life of the option.

A summary of stock option activity during 2015 is presented below:

	Options (thous.)	*Weighted-Average Exercise Price*	*Weighted-Average Remaining Contractual Term*	*Aggregate Intrinsic Value (millions)*
Outstanding at January 1, 2015	5,387	$ 53.56	5.8 yrs.	$ 353
Granted	934	122.85	N/A	N/A
Exercised	(716)	40.10	N/A	N/A
Forfeited or expired	(34)	89.24	N/A	N/A
Outstanding at December 31, 2015	5,571	$ 66.69	5.4 yrs.	$ 114
Vested or expected to vest at December 31, 2015	5,532	$ 66.32	5.4 yrs.	$ 114
Options exercisable at December 31, 2015	3,672	$ 49.00	4.1 yrs.	$ 110

Stock options are granted at the closing price on the date of grant, have ten-year contractual terms, and vest no later than three years from the date of grant. None of the stock options outstanding at December 31, 2015, are subject to performance or market-based vesting conditions.

At December 31, 2015, there was $18 million of unrecognized compensation expense related to nonvested stock options, which is expected to be recognized over a weighted-average period of 1.0 year. Additional information regarding stock option exercises appears in the table below:

Millions	***2015***	*2014*	*2013*
Intrinsic value of stock options exercised	**$ 50**	$ 194	$ 112
Cash received from option exercises	**27**	54	51
Treasury shares repurchased for employee payroll taxes	**(12)**	(24)	(21)
Tax benefit realized from option exercises	**19**	74	43
Aggregate grant-date fair value of stock options vested	**19**	17	16

Retention Awards – The fair value of retention awards is based on the closing price of the stock on the grant date. Dividends and dividend equivalents are paid to participants during the vesting periods.

Changes in our retention awards during 2015 were as follows:

	Shares (thous.)	*Weighted-Average Grant-Date Fair Value*
Nonvested at January 1, 2015	3,403	$ 64.39
Granted	521	122.79
Vested	(934)	47.66
Forfeited	(90)	72.87
Nonvested at December 31, 2015	2,900	$ 80.01

Retention awards are granted at no cost to the employee or non-employee director and vest over periods lasting up to four years. At December 31, 2015, there was $88 million of total unrecognized compensation expense related to nonvested retention awards, which is expected to be recognized over a weighted-average period of 1.5 years.

Performance Retention Awards – In February 2015, our Board of Directors approved performance stock unit grants. Other than different performance targets, the basic terms of these performance stock units are identical to those granted in February 2013 and February 2014, including using annual return on invested capital (ROIC) as the performance measure. We define ROIC as net operating profit adjusted for interest expense (including interest on the present value of operating leases) and taxes on interest divided by average invested capital adjusted for the present value of operating leases.

Stock units awarded to selected employees under these grants are subject to continued employment for 37 months and the attainment of certain levels of ROIC. We expense the fair value of the units that are

probable of being earned based on our forecasted ROIC over the 3-year performance period. We measure the fair value of these performance stock units based upon the closing price of the underlying common stock as of the date of grant, reduced by the present value of estimated future dividends. Dividend equivalents are paid to participants only after the units are earned.

The assumptions used to calculate the present value of estimated future dividends related to the February 2015 grant were as follows:

	2015
Dividend per share per quarter	$ 0.55
Risk-free interest rate at date of grant	0.8%

Changes in our performance retention awards during 2015 were as follows:

	Shares (thous.)	*Weighted-Average Grant-Date Fair Value*
Nonvested at January 1, 2015	1,583	$ 65.33
Granted	339	117.42
Vested	(580)	54.38
Forfeited	(87)	86.66
Nonvested at December 31, 2015	1,255	$ 82.98

At December 31, 2015, there was $19 million of total unrecognized compensation expense related to nonvested performance retention awards, which is expected to be recognized over a weighted-average period of 0.7 years. This expense is subject to achievement of the ROIC levels established for the performance stock unit grants.

6. Retirement Plans

Pension and Other Postretirement Benefits

Pension Plans – We provide defined benefit retirement income to eligible non-union employees through qualified and non-qualified (supplemental) pension plans. Qualified and non-qualified pension benefits are based on years of service and the highest compensation during the latest years of employment, with specific reductions made for early retirements.

Other Postretirement Benefits (OPEB) – We provide medical and life insurance benefits for eligible retirees. These benefits are funded as medical claims and life insurance premiums are paid.

Funded Status

We are required by GAAP to separately recognize the overfunded or underfunded status of our pension and OPEB plans as an asset or liability. The funded status represents the difference between the projected benefit obligation (PBO) and the fair value of the plan assets. Our non-qualified (supplemental) pension plan is unfunded by design. The PBO of the pension plans is the present value of benefits earned to date by plan participants, including the effect of assumed future compensation increases. The PBO of the OPEB plan is equal to the accumulated benefit obligation, as the present value of the OPEB liabilities is not affected by compensation increases. Plan assets are measured at fair value. We use a December 31 measurement date for plan assets and obligations for all our retirement plans.

Changes in our PBO and plan assets were as follows for the years ended December 31:

Funded Status	*Pension*		*OPEB*	
Millions	***2015***	*2014*	***2015***	*2014*
Projected Benefit Obligation				
Projected benefit obligation at beginning of year	**$ 4,142**	$ 3,372	**$ 354**	$ 330
Service cost	**106**	70	**3**	2
Interest cost	**163**	158	**13**	14
Actuarial loss/(gain)	**(267)**	735	**(18)**	33
Gross benefits paid	**(186)**	(193)	**(23)**	(25)
Projected benefit obligation at end of year	**$ 3,958**	$ 4,142	**$ 329**	$ 354
Plan Assets				
Fair value of plan assets at beginning of year	**$ 3,654**	$ 3,429	**$ -**	$ -
Actual return on plan assets	**(43)**	185	**-**	-
Voluntary funded pension plan contributions	**100**	200	**-**	-
Non-qualified plan benefit contributions	**19**	33	**23**	25
Gross benefits paid	**(186)**	(193)	**(23)**	(25)
Fair value of plan assets at end of year	**$ 3,544**	$ 3,654	**$ -**	$ -
Funded status at end of year	**$ (414)**	$ (488)	**$ (329)**	$ (354)

Amounts recognized in the statement of financial position as of December 31, 2015 and 2014 consist of:

	Pension		*OPEB*	
Millions	***2015***	*2014*	***2015***	*2014*
Noncurrent assets	**$ 1**	$ 1	**$ -**	$ -
Current liabilities	**(22)**	(19)	**(23)**	(23)
Noncurrent liabilities	**(393)**	(470)	**(306)**	(331)
Net amounts recognized at end of year	**$ (414)**	$ (488)	**$ (329)**	$ (354)

Pre-tax amounts recognized in accumulated other comprehensive income/(loss) as of December 31, 2015 and 2014 consist of:

	2015			*2014*		
Millions	***Pension***	***OPEB***	***Total***	*Pension*	*OPEB*	*Total*
Prior service (cost)/credit	**$ -**	**$ 7**	**$ 7**	$ -	$ 17	$ 17
Net actuarial loss	**(1,652)**	**(117)**	**(1,769)**	(1,727)	(148)	(1,875)
Total	**$ (1,652)**	**$ (110)**	**$ (1,762)**	$ (1,727)	$ (131)	$ (1,858)

Pre-tax changes recognized in other comprehensive income/(loss) during 2015, 2014 and 2013 were as follows:

	Pension			*OPEB*		
Millions	***2015***	*2014*	*2013*	***2015***	*2014*	*2013*
Net actuarial (loss)/gain	**$ (31)**	$ (780)	$ 561	**$ 18**	$ (33)	$ 34
Amortization of:						
Prior service cost/(credit)	**-**	-	-	**(10)**	(11)	(16)
Actuarial loss	**106**	71	106	**13**	10	15
Total	**$ 75**	$ (709)	$ 667	**$ 21**	$ (34)	$ 33

Amounts included in accumulated other comprehensive income/(loss) expected to be amortized into net periodic cost during 2016:

Millions	*Pension*	*OPEB*	*Total*
Prior service credit	$ -	$ 9	$ 9
Net actuarial loss	(80)	(10)	(90)
Total	$ (80)	$ (1)	$ (81)

Underfunded Accumulated Benefit Obligation – The accumulated benefit obligation (ABO) is the present value of benefits earned to date, assuming no future compensation growth. The underfunded accumulated benefit obligation represents the difference between the ABO and the fair value of plan assets. At December 31, 2015 and 2014, the non-qualified (supplemental) plan ABO was $388 million and $379 million, respectively. The following table discloses only the PBO, ABO, and fair value of plan assets for pension plans where the accumulated benefit obligation is in excess of the fair value of the plan assets as of December 31:

Underfunded Accumulated Benefit Obligation *Millions*	***2015***	*2014*
Projected benefit obligation	**$ 398**	$ 388
Accumulated benefit obligation	**$ 388**	$ 379
Fair value of plan assets	**-**	-
Underfunded accumulated benefit obligation	**$ (388)**	$ (379)

The ABO for all defined benefit pension plans was $3.7 billion and $3.9 billion at December 31, 2015 and 2014, respectively.

Assumptions – The weighted-average actuarial assumptions used to determine benefit obligations at December 31:

	Pension		*OPEB*	
Percentages	***2015***	*2014*	***2015***	*2014*
Discount rate	**4.37%**	3.94%	**4.16%**	3.74%
Compensation increase	**4.10%**	4.00%	**N/A**	N/A
Health care cost trend rate (employees under 65)	**N/A**	N/A	**6.52%**	6.34%
Ultimate health care cost trend rate	**N/A**	N/A	**4.50%**	4.50%
Year ultimate trend rate reached	**N/A**	N/A	**2038**	2028

Expense

Both pension and OPEB expense are determined based upon the annual service cost of benefits (the actuarial cost of benefits earned during a period) and the interest cost on those liabilities, less the expected return on plan assets. The expected long-term rate of return on plan assets is applied to a calculated value of plan assets that recognizes changes in fair value over a five-year period. This practice is intended to reduce year-to-year volatility in pension expense, but it can have the effect of delaying the recognition of differences between actual returns on assets and expected returns based on long-term rate of return assumptions. Differences in actual experience in relation to assumptions are not recognized in net income immediately, but are deferred in accumulated other comprehensive income and, if necessary, amortized as pension or OPEB expense.

The components of our net periodic pension and OPEB cost/(benefit) were as follows for the years ended December 31:

	Pension			OPEB		
Millions	***2015***	*2014*	*2013*	***2015***	*2014*	*2013*
Net Periodic Benefit Cost:						
Service cost	**$ 106**	$ 70	$ 72	**$ 3**	$ 2	$ 3
Interest cost	**163**	158	134	**13**	14	12
Expected return on plan assets	**(255)**	(230)	(202)	**-**	-	-
Amortization of:						
Prior service cost/(credit)	**-**	-	-	**(10)**	(11)	(16)
Actuarial loss	**106**	71	106	**13**	10	15
Net periodic benefit cost/(benefit)	**$ 120**	$ 69	$ 110	**$ 19**	$ 15	$ 14

Assumptions – The weighted-average actuarial assumptions used to determine expense were as follows:

	Pension			OPEB		
Percentages	***2015***	*2014*	*2013*	***2015***	*2014*	*2013*
Discount rate	**3.94%**	4.72%	3.78%	**3.74%**	4.47%	3.48%
Expected return on plan assets	**7.50%**	7.50%	7.50%	**N/A**	N/A	N/A
Compensation increase	**4.00%**	4.00%	3.43%	**N/A**	N/A	N/A
Health care cost trend rate (employees under 65)	**N/A**	N/A	N/A	**6.34%**	6.49%	6.64%
Ultimate health care cost trend rate	**N/A**	N/A	N/A	**4.50%**	4.50%	4.50%
Year ultimate trend reached	**N/A**	N/A	N/A	**2028**	2028	2028

The discount rate was based on a yield curve of high quality corporate bonds with cash flows matching our plans' expected benefit payments. The expected return on plan assets is based on our asset allocation mix and our historical return, taking into account current and expected market conditions. The actual return on pension plan assets, net of fees, was approximately (1)% in 2015, 6% in 2014, and 17% in 2013.

Assumed health care cost trend rates have an effect on the expense and liabilities reported for health care plans. The assumed health care cost trend rate is based on historical rates and expected market conditions. The 2016 assumed health care cost trend rate for employees under 65 is 6.34%. It is assumed the rate will decrease gradually to an ultimate rate of 4.5% in 2028 and will remain at that level. A one-percentage point change in the assumed health care cost trend rates would have the following effects on OPEB:

Millions	*One % pt. Increase*	*One % pt. Decrease*
Effect on total service and interest cost components	$ 1	$ (1)
Effect on accumulated benefit obligation	17	(14)

Cash Contributions

The following table details our cash contributions for the qualified pension plans and the benefit payments for the non-qualified (supplemental) pension and OPEB plans:

	Pension		
Millions	*Qualified*	*Non-qualified*	*OPEB*
2014	$ 200	$ 33	$ 25
2015	100	19	23

Our policy with respect to funding the qualified plans is to fund at least the minimum required by law and not more than the maximum amount deductible for tax purposes. All contributions made to the qualified pension plans in 2015 were voluntary and were made with cash generated from operations.

The non-qualified pension and OPEB plans are not funded and are not subject to any minimum regulatory funding requirements. Benefit payments for each year represent supplemental pension payments and claims paid for medical and life insurance. We anticipate our 2016 supplemental pension and OPEB payments will be made from cash generated from operations.

Benefit Payments

The following table details expected benefit payments for the years 2016 through 2025:

Millions	*Pension*	*OPEB*
2016	$ 191	$ 23
2017	194	23
2018	198	23
2019	202	23
2020	205	22
Years 2021 - 2025	1,077	102

Asset Allocation Strategy

Our pension plan asset allocation at December 31, 2015 and 2014, and target allocation for 2016, are as follows:

		Percentage of Plan Assets December 31,	
	Target Allocation 2016	***2015***	*2014*
Equity securities	60% to 70%	**67%**	68%
Debt securities	20% to 30%	**23**	23
Real estate	2% to 8%	**6**	4
Commodities	4% to 6%	**4**	5
Total		**100%**	100%

The investment strategy for pension plan assets is to maintain a broadly diversified portfolio designed to achieve our target average long-term rate of return of 7.5%. While we believe we can achieve a long-term average rate of return of 7.5%, we cannot be certain that the portfolio will perform to our expectations. Assets are strategically allocated among equity, debt, and other investments in order to achieve a diversification level that reduces fluctuations in investment returns. Asset allocation target ranges for equity, debt, and other portfolios are evaluated at least every three years with the assistance of an independent consulting firm. Actual asset allocations are monitored monthly, and rebalancing actions are executed at least quarterly, if needed.

The pension plan investments are held in a Master Trust. The majority of pension plan assets are invested in equity securities because equity portfolios have historically provided higher returns than debt and other asset classes over extended time horizons and are expected to do so in the future. Correspondingly, equity investments also entail greater risks than other investments. Equity risks are balanced by investing a significant portion of the plans' assets in high quality debt securities. The average credit rating of the debt portfolio exceeded A as of December 31, 2015 and A+ as of December 31, 2014. The debt portfolio is also broadly diversified and invested primarily in U.S. Treasury, mortgage, and corporate securities. The weighted-average maturity of the debt portfolio was 12 years at both December 31, 2015 and 2014.

The investment of pension plan assets in securities issued by UPC is explicitly prohibited by the plan for both the equity and debt portfolios, other than through index fund holdings.

Fair Value Measurements

The pension plan assets are valued at fair value. The following is a description of the valuation methodologies used for the investments measured at fair value, including the general classification of such instruments pursuant to the valuation hierarchy.

Temporary Cash Investments – These investments consist of U.S. dollars and foreign currencies held in master trust accounts at The Northern Trust Company (the Trustee). Foreign currencies held are reported in terms of U.S. dollars based on currency exchange rates readily available in active markets. These temporary cash investments are classified as Level 1 investments.

Registered Investment Companies – Registered Investment Companies are real estate investments and bond investments registered with the Securities and Exchange Commission. The real estate investments are traded actively on public exchanges. The share prices for these investments are published at the close of each business day. The Plan's holdings of real estate investments are classified as Level 1 investments. The bond investments are not traded publicly, but the underlying assets held in these funds are traded on active markets and the prices for these assets are readily observable. The Plan's holdings in bond investments are classified as Level 2 investments.

Federal Government Securities – Federal Government Securities consist of bills, notes, bonds, and other fixed income securities issued directly by the U.S. Treasury or by government-sponsored enterprises. These assets are valued using a bid evaluation process with bid data provided by independent pricing sources. Federal Government Securities are classified as Level 2 investments.

Bonds and Debentures – Bonds and debentures consist of fixed income securities issued by U.S. and non-U.S. corporations as well as state and local governments. These assets are valued using a bid evaluation process with bid data provided by independent pricing sources. Corporate, state, and municipal bonds and debentures are classified as Level 2 investments.

Corporate Stock – This investment category consists of common and preferred stock issued by U.S. and non-U.S. corporations. Most common shares are traded actively on exchanges and price quotes for these shares are readily available. Common stock is classified as a Level 1 investment. Preferred shares included in this category are valued using a bid evaluation process with bid data provided by independent pricing sources. Preferred stock is classified as a Level 2 investment.

Venture Capital and Buyout Partnerships – This investment category is comprised of interests in limited partnerships that invest primarily in privately-held companies. Due to the private nature of the partnership investments, pricing inputs are not readily observable. Asset valuations are developed by the general partners that manage the partnerships. These valuations are based on the application of public market multiples to private company cash flows, market transactions that provide valuation information for comparable companies, and other methods. The fair value recorded by the Plan is calculated using each partnership's net asset value (NAV), which is derived from the valuation method described here. The Plan's holdings of limited partnership interests are classified as Level 3 investments.

Real Estate Partnerships – Most of the Plan's real estate investments are partnership interests. The Real Estate Partnership category also includes real estate investments held in similar structures such as private real estate investment trusts and limited liability companies. Valuations for the holdings in this category are not based on readily observable inputs and are primarily derived from property appraisals. The fair value recorded by the Plan is calculated using the NAV for each investment, which is derived from the valuation methods described here. The Plan's interests in private real estate partnerships, investment trusts, and limited liability companies are classified as Level 3 investments.

Collective Trust and Other Funds – Collective trust funds are comprised of shares or units in commingled funds that are not publicly traded. The underlying assets in these funds (U.S. stock funds, non-U.S. stock funds, commodity funds, and short term investment funds) are publicly traded on exchanges and price quotes for the assets held by these funds are readily available. The Plan's holdings of common trust funds are classified as Level 2 investments.

This category also includes investments in limited liability companies that invest in publicly-traded securities. The limited liability company investments are funds that invest in both long and short positions in convertible securities, stocks, commodities, and fixed income securities. The underlying securities held by the funds are traded actively on public exchanges and price quotes for these investments are readily available. Interests in the limited liability companies are classified as Level 2 investments.

As of December 31, 2015, the pension plan assets measured at fair value on a recurring basis were as follows:

Millions	*Quoted Prices in Active Markets for Identical Inputs (Level 1)*	*Significant Other Observable Inputs (Level 2)*	*Significant Unobservable Inputs (Level 3)*	*Total*
Plan assets:				
Temporary cash investments	$ 13	$ -	$ -	$ 13
Registered investment companies	179	270	-	449
Federal government securities	-	125	-	125
Bonds & debentures	-	383	-	383
Corporate stock	1,034	7	-	1,041
Venture capital and buyout partnerships	-	-	256	256
Real estate partnerships	-	-	199	199
Collective trust and other funds	-	1,075	-	1,075
Total plan assets at fair value	$ 1,226	$ 1,860	$ 455	3,541
Other assets [a]				3
Total plan assets				$ 3,544

[a] Other assets include accrued receivables and pending broker settlements.

As of December 31, 2014, the pension plan assets measured at fair value on a recurring basis were as follows:

Millions	*Quoted Prices in Active Markets for Identical Inputs (Level 1)*	*Significant Other Observable Inputs (Level 2)*	*Significant Unobservable Inputs (Level 3)*	*Total*
Plan assets:				
Temporary cash investments	$ 22	$ -	$ -	$ 22
Registered investment companies	12	282	-	294
Federal government securities	-	163	-	163
Bonds & debentures	-	381	-	381
Corporate stock	1,076	15	-	1,091
Venture capital and buyout partnerships	-	-	234	234
Real estate partnerships	-	-	139	139
Collective trust and other funds	-	1,340	-	1,340
Total plan assets at fair value	$ 1,110	$ 2,181	$ 373	3,664
Other assets [a]				(10)
Total plan assets				$ 3,654

[a] Other assets include accrued receivables and pending broker settlements.

For the years ended December 31, 2015 and 2014, there were no significant transfers in or out of Levels 1, 2, or 3.

The following table presents a reconciliation of the beginning and ending balances of the fair value measurements using significant unobservable inputs (Level 3 investments) during 2015:

Millions	*Venture Capital and Buyout Partnerships*	*Real Estate Partnerships*	*Total*
Beginning balance - January 1, 2015	$ 234	$ 139	$ 373
Realized gain	18	5	23
Unrealized gain	13	8	21
Purchases	54	74	128
Sales	(63)	(27)	(90)
Ending balance - December 31, 2015	$ 256	$ 199	$ 455

The following table presents a reconciliation of the beginning and ending balances of the fair value measurements using significant unobservable inputs (Level 3 investments) during 2014:

Millions	*Venture Capital and Buyout Partnerships*	*Real Estate Partnerships*	*Total*
Beginning balance - January 1, 2014	$ 213	$ 139	$ 352
Realized gain	17	8	25
Unrealized gain	5	6	11
Purchases	54	19	73
Sales	(55)	(33)	(88)
Ending balance - December 31, 2014	$ 234	$ 139	$ 373

Other Retirement Programs

401(k)/Thrift Plan – We provide a defined contribution plan (401(k)/thrift plan) to eligible non-union and union employees for whom we make matching contributions. We match 50 cents for each dollar contributed by employees up to the first six percent of compensation contributed. Our plan contributions were $20 million in 2015, $19 million in 2014, and $18 million in 2013.

Railroad Retirement System – All Railroad employees are covered by the Railroad Retirement System (the System). Contributions made to the System are expensed as incurred and amounted to approximately $749 million in 2015, $711 million in 2014, and $670 million in 2013.

Collective Bargaining Agreements – Under collective bargaining agreements, we participate in multi-employer benefit plans that provide certain postretirement health care and life insurance benefits for eligible union employees. Premiums paid under these plans are expensed as incurred and amounted to $46 million in 2015, $52 million in 2014, and $57 million in 2013.

7. Other Income

Other income included the following for the years ended December 31:

Millions	***2015***	*2014*	*2013*
Net gain on non-operating asset dispositions [a]	**$ 144**	$ 69	$ 32
Rental income [b]	**96**	96	106
Interest income	**5**	4	4
Non-operating environmental costs and other [c]	**(19)**	(18)	(14)
Total	**$ 226**	$ 151	$ 128

[a] 2015 includes $113 million related to a real estate sale.
[b] 2013 includes $17 million related to a land lease contract settlement.
[c] 2014 includes $14 million related to the sale of a permanent easement.

8. Income Taxes

Components of income tax expense were as follows for the years ended December 31:

Millions	***2015***	*2014*	*2013*
Current tax expense:			
Federal	**$ 1,901**	$ 2,019	$ 1,727
State	**210**	239	199
Foreign	**8**	10	11
Total current tax expense	**2,119**	2,268	1,937
Deferred and other tax expense:			
Federal	**644**	753	605
State	**121**	142	118
Total deferred and other tax expense	**765**	895	723
Total income tax expense	**$ 2,884**	$ 3,163	$ 2,660

For the years ended December 31, reconciliations between statutory and effective tax rates are as follows:

Tax Rate Percentages	***2015***	*2014*	*2013*
Federal statutory tax rate	**35.0 %**	35.0 %	35.0 %
State statutory rates, net of federal benefits	**3.1**	3.1	3.1
Tax credits	**(0.5)**	(0.4)	(0.2)
Deferred tax adjustments	**-**	-	(0.1)
Other	**0.1**	0.2	(0.1)
Effective tax rate	**37.7 %**	37.9 %	37.7 %

Deferred tax assets and liabilities are recorded for the expected future tax consequences of events that are reported in different periods for financial reporting and income tax purposes. The majority of our deferred tax assets relate to deductions that already have been claimed for financial reporting purposes but not for tax purposes. The majority of our deferred tax liabilities relate to differences between the tax bases and financial reporting amounts of our land and depreciable property, due to accelerated tax depreciation (including bonus depreciation), revaluation of assets in purchase accounting transactions, and differences in capitalization methods.

Deferred income tax (liabilities)/assets were comprised of the following at December 31:

Millions		***2015***		*2014*
Deferred income tax liabilities:				
Property	**$**	**(16,079)**	$	(15,173)
Other		**(352)**		(411)
Total deferred income tax liabilities		**(16,431)**		(15,584)
Deferred income tax assets:				
Accrued wages		**76**		74
Accrued casualty costs		**237**		228
Stock compensation		**72**		69
Debt and leases		**149**		86
Retiree benefits		**204**		392
Credits		**156**		164
Other		**296**		168
Total deferred income tax assets [a]	**$**	**1,190**	$	1,181
Net deferred income tax liability	**$**	**(15,241)**	$	(14,403)

[a] Prior to the adoption of Accounting Standard Update (ASU) 2015-17, deferred tax assets were required to be presented as current and non-current on the Consolidated Statement of Financial Position. In 2015, UP adopted ASU 2015-17 retrospectively. Current deferred income tax assets at December 31, 2014 of $277 million were reclassified from current to non-current for 2015 presentation.

When appropriate, we record a valuation allowance against deferred tax assets to reflect that these tax assets may not be realized. In determining whether a valuation allowance is appropriate, we consider whether it is more likely than not that all or some portion of our deferred tax assets will not be realized based on management's judgments using available evidence for purposes of estimating whether future taxable income will be sufficient to realize a deferred tax asset. In 2015 and 2014, there were no valuation allowances.

Tax benefits are recognized only for tax positions that are more likely than not to be sustained upon examination by tax authorities. The amount recognized is measured as the largest amount of benefit that is greater than 50 percent likely to be realized upon settlement. Unrecognized tax benefits are tax benefits claimed in our tax returns that do not meet these recognition and measurement standards.

A reconciliation of changes in unrecognized tax benefits liabilities/(assets) from the beginning to the end of the reporting period is as follows:

Millions		***2015***		*2014*		*2013*
Unrecognized tax benefits at January 1	**$**	**151**	$	59	$	115
Increases for positions taken in current year		**38**		92		24
Increases for positions taken in prior years		**13**		22		15
Decreases for positions taken in prior years		**(87)**		(14)		(35)
Payments to and settlements with taxing authorities		**(13)**		(8)		(58)
Increases/(decreases) for interest and penalties		**(5)**		1		-
Lapse of statutes of limitations		**(3)**		(1)		(2)
Unrecognized tax benefits at December 31	**$**	**94**	$	151	$	59

We recognize interest and penalties as part of income tax expense. Total accrued liabilities for interest and penalties were $2 million and $6 million at December 31, 2015 and 2014, respectively. Total interest and penalties recognized as part of income tax expense (benefit) were $(3) million for 2015, $9 million for 2014, and $7 million for 2013.

Internal Revenue Service (IRS) examinations have been completed and settled for all years prior to 2011, and the statute of limitations bars any additional tax assessments. UPC is not currently under audit by the Internal Revenue Service.

In the third quarter of 2015, UPC and the IRS signed a closing agreement resolving all tax matters for tax

years 2009-2010. The settlement had an immaterial effect on our income tax expense. In connection with the settlement, UPC paid $10 million in the fourth quarter of 2015.

In the fourth quarter of 2014, UPC and the IRS signed a closing agreement resolving all tax matters for tax years 2005-2008. The settlement had an immaterial effect on our income tax expense. In connection with the settlement, UPC paid $11 million in 2014.

Several state tax authorities are examining our state income tax returns for years 2006 through 2012.

We do not expect our unrecognized tax benefits to change significantly in the next 12 months. At December 31, 2015, we had a net unrecognized tax benefit liability of $94 million.

The portion of our unrecognized tax benefits that relates to permanent changes in tax and interest would reduce our effective tax rate, if recognized. The remaining unrecognized tax benefits relate to tax positions for which only the timing of the benefit is uncertain. Recognition of the tax benefits with uncertain timing would reduce our effective tax rate only through a reduction of accrued interest and penalties. The unrecognized tax benefits that would reduce our effective tax rate are as follows:

Millions		***2015***		*2014*		*2013*
Unrecognized tax benefits that would reduce the effective tax rate	**$**	**31**	$	33	$	34
Unrecognized tax benefits that would not reduce the effective tax rate		**63**		118		25
Total unrecognized tax benefits	**$**	**94**	$	151	$	59

9. Earnings Per Share

The following table provides a reconciliation between basic and diluted earnings per share for the years ended December 31:

Millions, Except Per Share Amounts		***2015***		*2014*		*2013*
Net income	**$**	**4,772**	$	5,180	$	4,388
Weighted-average number of shares outstanding:						
Basic		**866.2**		897.1		926.5
Dilutive effect of stock options		**1.5**		2.1		2.4
Dilutive effect of retention shares and units		**1.7**		1.9		2.6
Diluted		**869.4**		901.1		931.5
Earnings per share – basic	**$**	**5.51**	$	5.77	$	4.74
Earnings per share – diluted	**$**	**5.49**	$	5.75	$	4.71

Common stock options totaling 1.1 million, 0.4 million, and 0.5 million for 2015, 2014, and 2013, respectively, were excluded from the computation of diluted earnings per share because the exercise prices of these options exceeded the average market price of our common stock for the respective periods, and the effect of their inclusion would be anti-dilutive.

10. Accumulated Other Comprehensive Income/(Loss)

Reclassifications out of accumulated other comprehensive income/(loss) were as follows (net of tax):

Millions	*Defined benefit plans*	*Foreign currency translation*	*Total*
Balance at January 1, 2015	$ (1,161)	$ (49)	$ (1,210)
Other comprehensive income/(loss) before reclassifications	(4)	(43)	(47)
Amounts reclassified from accumulated other comprehensive income/(loss) [a]	62	-	62
Net year-to-date other comprehensive income/(loss), net of taxes of $(8) million	58	(43)	15
Balance at December 31, 2015	$ (1,103)	$ (92)	$ (1,195)
Balance at January 1, 2014	$ (713)	$ (37)	$ (750)
Other comprehensive income/(loss) before reclassifications	10	(12)	(2)
Amounts reclassified from accumulated other comprehensive income/(loss) [a]	(458)	-	(458)
Net year-to-date other comprehensive income/(loss), net of taxes of $291 million	(448)	(12)	(460)
Balance at December 31, 2014	$ (1,161)	$ (49)	$ (1,210)

[a] The accumulated other comprehensive income/(loss) reclassification components are 1) prior service cost/(benefit) and 2) net actuarial loss which are both included in the computation of net periodic pension cost. See Note 6 Retirement Plans for additional details.

11. Accounts Receivable

Accounts receivable includes freight and other receivables reduced by an allowance for doubtful accounts. The allowance is based upon historical losses, credit worthiness of customers, and current economic conditions. At both December 31, 2015, and 2014, our accounts receivable were reduced by $5 million. Receivables not expected to be collected in one year and the associated allowances are classified as other assets in our Consolidated Statements of Financial Position. At December 31, 2015, and 2014, receivables classified as other assets were reduced by allowances of $11 million and $16 million, respectively.

Receivables Securitization Facility – The Railroad maintains a $650 million, 3-year receivables securitization facility maturing in July 2017 under which it sells most of its eligible third-party receivables to Union Pacific Receivables, Inc. (UPRI), a consolidated, wholly-owned, bankruptcy-remote subsidiary that may subsequently transfer, without recourse, an undivided interest in accounts receivable to investors. The investors have no recourse to the Railroad's other assets except for customary warranty and indemnity claims. Creditors of the Railroad do not have recourse to the assets of UPRI.

The amount outstanding under the facility was $400 million at both December 31, 2015, and December 31, 2014. The facility was supported by $0.9 billion and $1.2 billion of accounts receivable as collateral at December 31, 2015, and December 31, 2014, respectively, which, as a retained interest, is included in accounts receivable, net in our Consolidated Statements of Financial Position.

The outstanding amount the Railroad is allowed to maintain under the facility, with a maximum of $650 million, may fluctuate based on the availability of eligible receivables and is directly affected by business volumes and credit risks, including receivables payment quality measures such as default and dilution ratios. If default or dilution ratios increase one percent, the allowable outstanding amount under the facility would not materially change.

The costs of the receivables securitization facility include interest, which will vary based on prevailing benchmark and commercial paper rates, program fees paid to participating banks, commercial paper issuance costs, and fees of participating banks for unused commitment availability. The costs of the

receivables securitization facility are included in interest expense and were $5 million, $4 million and $5 million for 2015, 2014, and 2013, respectively.

12. Properties

The following tables list the major categories of property and equipment, as well as the weighted-average estimated useful life for each category (in years):

Millions, Except Estimated Useful Life *As of December 31, 2015*	*Cost*	*Accumulated Depreciation*	*Net Book Value*	*Estimated Useful Life*
Land	$ 5,195	$ N/A	$ 5,195	N/A
Road:				
Rail and other track material	15,236	5,495	9,741	37
Ties	9,439	2,595	6,844	33
Ballast	5,024	1,350	3,674	34
Other roadway [a]	17,374	3,021	14,353	47
Total road	47,073	12,461	34,612	N/A
Equipment:				
Locomotives	9,027	3,726	5,301	19
Freight cars	2,203	962	1,241	24
Work equipment and other	897	191	706	19
Total equipment	12,127	4,879	7,248	N/A
Technology and other	919	358	561	11
Construction in progress	1,250	-	1,250	N/A
Total	$ 66,564	$ 17,698	$ 48,866	N/A

Millions, Except Estimated Useful Life *As of December 31, 2014*	*Cost*	*Accumulated Depreciation*	*Net Book Value*	*Estimated Useful Life*
Land	$ 5,194	$ N/A	$ 5,194	N/A
Road:				
Rail and other track material	14,588	5,241	9,347	33
Ties	9,102	2,450	6,652	33
Ballast	4,826	1,264	3,562	34
Other roadway [a]	16,476	2,852	13,624	47
Total road	44,992	11,807	33,185	N/A
Equipment:				
Locomotives	8,276	3,694	4,582	20
Freight cars	2,116	968	1,148	25
Work equipment and other	684	153	531	18
Total equipment	11,076	4,815	6,261	N/A
Technology and other	872	320	552	10
Construction in progress	1,080	-	1,080	N/A
Total	$ 63,214	$ 16,942	$ 46,272	N/A

[a] Other roadway includes grading, bridges and tunnels, signals, buildings, and other road assets.

Property and Depreciation – Our railroad operations are highly capital intensive, and our large base of homogeneous, network-type assets turns over on a continuous basis. Each year we develop a capital program for the replacement of assets and for the acquisition or construction of assets that enable us to enhance our operations or provide new service offerings to customers. Assets purchased or constructed throughout the year are capitalized if they meet applicable minimum units of property criteria. Properties and equipment are carried at cost and are depreciated on a straight-line basis over their estimated service lives, which are measured in years, except for rail in high-density traffic corridors (i.e., all rail lines except for those subject to abandonment, yard and switching tracks, and electronic yards) for which lives are measured in millions of gross tons per mile of track. We use the group method of depreciation in

which all items with similar characteristics, use, and expected lives are grouped together in asset classes, and are depreciated using composite depreciation rates. The group method of depreciation treats each asset class as a pool of resources, not as singular items. We currently have more than 60 depreciable asset classes, and we may increase or decrease the number of asset classes due to changes in technology, asset strategies, or other factors.

We determine the estimated service lives of depreciable railroad assets by means of depreciation studies. We perform depreciation studies at least every three years for equipment and every six years for track assets (i.e., rail and other track material, ties, and ballast) and other road property. Our depreciation studies take into account the following factors:

- Statistical analysis of historical patterns of use and retirements of each of our asset classes;
- Evaluation of any expected changes in current operations and the outlook for continued use of the assets;
- Evaluation of technological advances and changes to maintenance practices; and
- Expected salvage to be received upon retirement.

For rail in high-density traffic corridors, we measure estimated service lives in millions of gross tons per mile of track. It has been our experience that the lives of rail in high-density traffic corridors are closely correlated to usage (i.e., the amount of weight carried over the rail). The service lives also vary based on rail weight, rail condition (e.g., new or secondhand), and rail type (e.g., straight or curve). Our depreciation studies for rail in high-density traffic corridors consider each of these factors in determining the estimated service lives. For rail in high-density traffic corridors, we calculate depreciation rates annually by dividing the number of gross ton-miles carried over the rail (i.e., the weight of loaded and empty freight cars, locomotives and maintenance of way equipment transported over the rail) by the estimated service lives of the rail measured in millions of gross tons per mile. For all other depreciable assets, we compute depreciation based on the estimated service lives of our assets as determined from the analysis of our depreciation studies. Changes in the estimated service lives of our assets and their related depreciation rates are implemented prospectively.

Under group depreciation, the historical cost (net of salvage) of depreciable property that is retired or replaced in the ordinary course of business is charged to accumulated depreciation and no gain or loss is recognized. The historical cost of certain track assets is estimated using (i) inflation indices published by the Bureau of Labor Statistics and (ii) the estimated useful lives of the assets as determined by our depreciation studies. The indices were selected because they closely correlate with the major costs of the properties comprising the applicable track asset classes. Because of the number of estimates inherent in the depreciation and retirement processes and because it is impossible to precisely estimate each of these variables until a group of property is completely retired, we continually monitor the estimated service lives of our assets and the accumulated depreciation associated with each asset class to ensure our depreciation rates are appropriate. In addition, we determine if the recorded amount of accumulated depreciation is deficient (or in excess) of the amount indicated by our depreciation studies. Any deficiency (or excess) is amortized as a component of depreciation expense over the remaining service lives of the applicable classes of assets.

For retirements of depreciable railroad properties that do not occur in the normal course of business, a gain or loss may be recognized if the retirement meets each of the following three conditions: (i) is unusual, (ii) is material in amount, and (iii) varies significantly from the retirement profile identified through our depreciation studies. A gain or loss is recognized in other income when we sell land or dispose of assets that are not part of our railroad operations.

When we purchase an asset, we capitalize all costs necessary to make the asset ready for its intended use. However, many of our assets are self-constructed. A large portion of our capital expenditures is for replacement of existing track assets and other road properties, which is typically performed by our employees, and for track line expansion and other capacity projects. Costs that are directly attributable to capital projects (including overhead costs) are capitalized. Direct costs that are capitalized as part of self-constructed assets include material, labor, and work equipment. Indirect costs are capitalized if they clearly relate to the construction of the asset.

General and administrative expenditures are expensed as incurred. Normal repairs and maintenance are also expensed as incurred, while costs incurred that extend the useful life of an asset, improve the safety of our operations or improve operating efficiency are capitalized. These costs are allocated using

appropriate statistical bases. Total expense for repairs and maintenance incurred was $2.5 billion for 2015, $2.4 billion for 2014, and $2.3 billion for 2013.

Assets held under capital leases are recorded at the lower of the net present value of the minimum lease payments or the fair value of the leased asset at the inception of the lease. Amortization expense is computed using the straight-line method over the shorter of the estimated useful lives of the assets or the period of the related lease.

13. Accounts Payable and Other Current Liabilities

Millions	***Dec. 31, 2015***	*Dec. 31, 2014*
Accounts payable	**$ 743**	$ 877
Income and other taxes payable	**434**	412
Accrued wages and vacation	**391**	409
Interest payable	**208**	178
Accrued casualty costs	**181**	249
Equipment rents payable	**105**	100
Dividends payable [a]	**-**	438
Other	**550**	640
Total accounts payable and other current liabilities	**$ 2,612**	$ 3,303

[a] Beginning in 2015, the timing of the dividend declaration and payable dates was aligned to occur within the same quarter. The 2015 dividends paid amount includes the fourth quarter 2014 dividend of $438 million, which was paid on January 2, 2015, the first quarter 2015 dividend of $484 million, which was paid on March 30, 2015, the second quarter 2015 dividend of $479 million, which was paid on June 30, 2015, the third quarter 2015 dividend of $476 million, which was paid on September 30, 2015, as well as the fourth quarter 2015 dividend of $467 million, which was paid on December 30, 2015.

14. Financial Instruments

Strategy and Risk – We may use derivative financial instruments in limited instances for other than trading purposes to assist in managing our overall exposure to fluctuations in interest rates and fuel prices. We are not a party to leveraged derivatives and, by policy, do not use derivative financial instruments for speculative purposes. Derivative financial instruments qualifying for hedge accounting must maintain a specified level of effectiveness between the hedging instrument and the item being hedged, both at inception and throughout the hedged period. We formally document the nature and relationships between the hedging instruments and hedged items at inception, as well as our risk-management objectives, strategies for undertaking the various hedge transactions, and method of assessing hedge effectiveness. Changes in the fair market value of derivative financial instruments that do not qualify for hedge accounting are charged to earnings. We may use swaps, collars, futures, and/or forward contracts to mitigate the risk of adverse movements in interest rates and fuel prices; however, the use of these derivative financial instruments may limit future benefits from favorable interest rate and fuel price movements.

Market and Credit Risk – We address market risk related to derivative financial instruments by selecting instruments with value fluctuations that highly correlate with the underlying hedged item. We manage credit risk related to derivative financial instruments, which is minimal, by requiring high credit standards for counterparties and periodic settlements. At December 31, 2015, and 2014, we were not required to provide collateral, nor had we received collateral, relating to our hedging activities.

Interest Rate Fair Value Hedges – We manage our overall exposure to fluctuations in interest rates by adjusting the proportion of fixed and floating rate debt instruments within our debt portfolio over a given period. We generally manage the mix of fixed and floating rate debt through the issuance of targeted amounts of each as debt matures or as we require incremental borrowings. We employ derivatives, primarily swaps, as one of the tools to obtain the targeted mix. In addition, we also obtain flexibility in managing interest costs and the interest rate mix within our debt portfolio by evaluating the issuance of and managing outstanding callable fixed-rate debt securities.

Swaps allow us to convert debt from fixed rates to variable rates and thereby hedge the risk of changes in the debt's fair value attributable to the changes in interest rates. We account for swaps as fair value hedges using the short-cut method; therefore, we do not record any ineffectiveness within our

Consolidated Financial Statements. As of December 31, 2015, and 2014, we had no interest rate fair value hedges outstanding.

Interest Rate Cash Flow Hedges – We report changes in the fair value of cash flow hedges in accumulated other comprehensive loss until the hedged item affects earnings. As of December 31, 2015, and 2014, we had no interest rate cash flow hedges outstanding.

Earnings Impact – Our use of derivative financial instruments had no impact on pre-tax income for the years ended December 31, 2015, 2014, and 2013.

Fair Value of Financial Instruments – The fair value of our short- and long-term debt was estimated using a market value price model, which utilizes applicable U.S. Treasury rates along with current market quotes on comparable debt securities. All of the inputs used to determine the fair market value of the Corporation's long-term debt are Level 2 inputs and obtained from an independent source. At December 31, 2015, the fair value of total debt was $15.2 billion, approximately $1.0 billion more than the carrying value. At December 31, 2014, the fair value of total debt was $13.0 billion, approximately $1.5 billion more than the carrying value. The fair value of the Corporation's debt is a measure of its current value under present market conditions. It does not impact the financial statements under current accounting rules. At December 31, 2015, and 2014, approximately $155 million and $163 million, respectively, of debt securities contained call provisions that allow us to retire the debt instruments prior to final maturity, with the payment of fixed call premiums, or in certain cases, at par. The fair value of our cash equivalents approximates their carrying value due to the short-term maturities of these instruments.

15. Debt

Total debt as of December 31, 2015, and 2014, is summarized below:

Millions		***2015***		*2014*
Notes and debentures, 1.8% to 7.9% due through 2065	**$**	**11,964**	$	9,266
Capitalized leases, 3.1% to 8.4% due through 2028		**1,268**		1,520
Equipment obligations, 2.8% to 6.7% due through 2031		**963**		597
Receivables Securitization (Note 11)		**400**		400
Term loans - floating rate, due in 2016		**200**		200
Mortgage bonds, 4.8% due through 2030		**57**		57
Medium-term notes, 9.3% to 10.0% due through 2020		**23**		23
Tax-exempt financings - floating rate, due in 2015		**-**		8
Unamortized discount and deferred issuance costs [a]		**(674)**		(658)
Total debt		**14,201**		11,413
Less: current portion		**(594)**		(461)
Total long-term debt	**$**	**13,607**	$	**10,952**

[a] Includes deferred debt issuance costs of $89 million and $67 million as of December 31, 2015, and 2014, respectively, as a result of the retrospective adoption of Accounting Standard Update (ASU) 2015-03 on December 31, 2015. Prior to the ASU adoption, deferred debt issuance costs were presented in other assets.

Debt Maturities – The following table presents aggregate debt maturities as of December 31, 2015, excluding market value adjustments:

Millions		
2016	$	594
2017		1,052
2018		566
2019		637
2020		1,034
Thereafter		10,318
Total debt	$	14,201

Equipment Encumbrances – Equipment with a carrying value of approximately $2.6 billion and $2.8 billion at December 31, 2015, and 2014, respectively, served as collateral for capital leases and other

types of equipment obligations in accordance with the secured financing arrangements utilized to acquire such railroad equipment.

As a result of the merger of Missouri Pacific Railroad Company (MPRR) with and into UPRR on January 1, 1997, and pursuant to the underlying indentures for the MPRR mortgage bonds, UPRR must maintain the same value of assets after the merger in order to comply with the security requirements of the mortgage bonds. As of the merger date, the value of the MPRR assets that secured the mortgage bonds was approximately $6.0 billion. In accordance with the terms of the indentures, this collateral value must be maintained during the entire term of the mortgage bonds irrespective of the outstanding balance of such bonds.

Credit Facilities – At December 31, 2015, we had $1.7 billion of credit available under the facility, which is designated for general corporate purposes and supports the issuance of commercial paper. We did not draw on the facility during 2015. Commitment fees and interest rates payable under the facility are similar to fees and rates available to comparably rated, investment-grade borrowers. The facility allows for borrowings at floating rates based on London Interbank Offered Rates, plus a spread, depending upon credit ratings for our senior unsecured debt. The facility matures in May 2019 under a five-year term and requires UPC to maintain a debt-to-net-worth coverage ratio.

The definition of debt used for purposes of calculating the debt-to-net-worth coverage ratio includes, among other things, certain credit arrangements, capital leases, guarantees and unfunded and vested pension benefits under Title IV of ERISA. At December 31, 2015, the debt-to-net-worth coverage ratio allowed us to carry up to $41.4 billion of debt (as defined in the facility), and we had $14.3 billion of debt (as defined in the facility) outstanding at that date. Under our current capital plans, we expect to continue to satisfy the debt-to-net-worth coverage ratio; however, many factors beyond our reasonable control could affect our ability to comply with this provision in the future. The facility does not include any other financial restrictions, credit rating triggers (other than rating-dependent pricing), or any other provision that could require us to post collateral. The facility also includes a $125 million cross-default provision and a change-of-control provision.

During 2015, we did not issue or repay any commercial paper, and at December 31, 2015, and 2014, we had no commercial paper outstanding. Our revolving credit facility supports our outstanding commercial paper balances, and, unless we change the terms of our commercial paper program, our aggregate issuance of commercial paper will not exceed the amount of borrowings available under the facility.

Dividend Restrictions – Our revolving credit facility includes a debt-to-net worth covenant (discussed in the Credit Facilities section above) that, under certain circumstances, restricts the payment of cash dividends to our shareholders. The amount of retained earnings available for dividends was $13.6 billion and $15.4 billion at December 31, 2015, and 2014, respectively.

Shelf Registration Statement and Significant New Borrowings – We filed a new shelf registration statement with the SEC that became effective on February 9, 2015. The Board of Directors authorized the issuance of up to $4.0 billion of debt securities, replacing the $4.0 billion authorized under our shelf registration filed in February 2013, which was fully utilized after our January 2015 debt offering noted below. Under our current shelf registration, we may issue, from time to time, any combination of debt securities, preferred stock, common stock, or warrants for debt securities or preferred stock in one or more offerings.

During 2015, we issued the following unsecured, fixed-rate debt securities under our shelf registrations:

Date	*Description of Securities*
January 29, 2015	$250 million of 1.80% Notes due February 1, 2020
	$450 million of 3.375% Notes due February 1, 2035
	$450 million of 3.875% Notes due February 1, 2055
June 19, 2015	$400 million of 2.250% Notes due June 19, 2020
	$300 million of 3.250% Notes due August 15, 2025
October 29, 2015	$200 million of reopened 3.250% Notes due August 15, 2025
	$500 million of 4.050% Notes due November 15, 2045
	$400 million of 4.375% Notes due November 15, 2065

We used the net proceeds from the offerings for general corporate purposes, including the repurchase of common stock pursuant to our share repurchase program. These debt securities include change-of-control provisions. At December 31, 2015, we had remaining authority to issue up to $2.2 billion of debt securities under our shelf registration.

Equipment Trust – On May 12, 2015, UPRR consummated a pass-through (P/T) financing, whereby a P/T trust was created, which issued $399 million of P/T trust certificates with a stated interest rate of 2.695%. The P/T trust certificates will mature on May 12, 2027. The proceeds from the issuance of the P/T trust certificates were used to purchase equipment trust certificates to be issued by UPRR to finance the acquisition of 182 locomotives. The equipment trust certificates are secured by a lien on the locomotives. The $399 million is classified as debt due after one year in our Consolidated Statements of Financial Position.

Debt Exchange – On August 21, 2013, we exchanged $1,170 million of various outstanding notes and debentures due between 2016 and 2040 (the Existing Notes) for $439 million of 3.646% notes (the New 2024 Notes) due February 15, 2024 and $700 million of 4.821% notes (the New 2044 Notes) due February 1, 2044, plus cash consideration of approximately $280 million in addition to $8 million for accrued and unpaid interest on the Existing Notes. In accordance with ASC 470-50-40, Debt-Modifications and Extinguishments-Derecognition, this transaction was accounted for as a debt exchange, as the exchanged debt instruments are not considered to be substantially different. The cash consideration was recorded as an adjustment to the carrying value of debt, and the balance of the unamortized discount and issue costs from the Existing Notes is being amortized as an adjustment of interest expense over the terms of the New 2024 Notes and the New 2044 Notes. No gain or loss was recognized as a result of the exchange. Costs related to the debt exchange that were payable to parties other than the debt holders totaled approximately $9 million and were included in interest expense during the year ended December 31, 2013.

The following table lists the outstanding notes and debentures that were exchanged:

Millions	*Principal amount exchanged*
The 2024 Offers	
7.000% Debentures due 2016	$ 8
5.650% Notes due 2017	38
5.750% Notes due 2017	70
5.700% Notes due 2018	103
7.875% Notes due 2019	20
6.125% Notes due 2020	238
The 2044 Offers	
7.125% Debentures due 2028	73
6.625% Debentures due 2029	177
6.250% Debentures due 2034	19
6.150% Debentures due 2037	138
5.780% Notes due 2040	286
Total	$ 1,170

Receivables Securitization Facility – As of both December 31, 2015 and 2014, we recorded $400 million of borrowings under our receivables securitization facility, as secured debt. (See further discussion of our receivables securitization facility in Note 11).

16. Variable Interest Entities

We have entered into various lease transactions in which the structure of the leases contain variable interest entities (VIEs). These VIEs were created solely for the purpose of doing lease transactions (principally involving railroad equipment and facilities) and have no other activities, assets or liabilities outside of the lease transactions. Within these lease arrangements, we have the right to purchase some or all of the assets at fixed prices. Depending on market conditions, fixed-price purchase options available in the leases could potentially provide benefits to us; however, these benefits are not expected to be significant.

We maintain and operate the assets based on contractual obligations within the lease arrangements, which set specific guidelines consistent within the railroad industry. As such, we have no control over activities that could materially impact the fair value of the leased assets. We do not hold the power to direct the activities of the VIEs and, therefore, do not control the ongoing activities that have a significant impact on the economic performance of the VIEs. Additionally, we do not have the obligation to absorb losses of the VIEs or the right to receive benefits of the VIEs that could potentially be significant to the VIEs.

We are not considered to be the primary beneficiary and do not consolidate these VIEs because our actions and decisions do not have the most significant effect on the VIE's performance and our fixed-price purchase options are not considered to be potentially significant to the VIEs. The future minimum lease payments associated with the VIE leases totaled $2.6 billion as of December 31, 2015.

17. Leases

We lease certain locomotives, freight cars, and other property. The Consolidated Statements of Financial Position as of December 31, 2015 and 2014 included $2,273 million, net of $1,189 million of accumulated depreciation, and $2,454 million, net of $1,210 million of accumulated depreciation, respectively, for properties held under capital leases. A charge to income resulting from the depreciation for assets held under capital leases is included within depreciation expense in our Consolidated Statements of Income. Future minimum lease payments for operating and capital leases with initial or remaining non-cancelable lease terms in excess of one year as of December 31, 2015, were as follows:

Millions	*Operating Leases*	*Capital Leases*
2016	$ 491	$ 217
2017	446	220
2018	371	198
2019	339	184
2020	282	193
Later years	1,501	575
Total minimum lease payments	$ 3,430	$ 1,587
Amount representing interest	N/A	(319)
Present value of minimum lease payments	N/A	$ 1,268

Approximately 95% of capital lease payments relate to locomotives. Rent expense for operating leases with terms exceeding one month was $590 million in 2015, $593 million in 2014, and $618 million in 2013. When cash rental payments are not made on a straight-line basis, we recognize variable rental expense on a straight-line basis over the lease term. Contingent rentals and sub-rentals are not significant.

18. Commitments and Contingencies

Asserted and Unasserted Claims – Various claims and lawsuits are pending against us and certain of our subsidiaries. We cannot fully determine the effect of all asserted and unasserted claims on our consolidated results of operations, financial condition, or liquidity. To the extent possible, we have recorded a liability where asserted and unasserted claims are considered probable and where such claims can be reasonably estimated. We do not expect that any known lawsuits, claims, environmental costs, commitments, contingent liabilities, or guarantees will have a material adverse effect on our consolidated results of operations, financial condition, or liquidity after taking into account liabilities and insurance recoveries previously recorded for these matters.

Personal Injury – The cost of personal injuries to employees and others related to our activities is charged to expense based on estimates of the ultimate cost and number of incidents each year. We use an actuarial analysis to measure the expense and liability, including unasserted claims. The Federal Employers' Liability Act (FELA) governs compensation for work-related accidents. Under FELA, damages are assessed based on a finding of fault through litigation or out-of-court settlements. We offer a comprehensive variety of services and rehabilitation programs for employees who are injured at work.

Our personal injury liability is not discounted to present value due to the uncertainty surrounding the timing of future payments. Approximately 94% of the recorded liability is related to asserted claims and

approximately 6% is related to unasserted claims at December 31, 2015. Because of the uncertainty surrounding the ultimate outcome of personal injury claims, it is reasonably possible that future costs to settle these claims may range from approximately $318 million to $345 million. We record an accrual at the low end of the range as no amount of loss within the range is more probable than any other. Estimates can vary over time due to evolving trends in litigation.

Our personal injury liability activity was as follows:

Millions	***2015***	*2014*	*2013*
Beginning balance	**$ 335**	$ 294	$ 334
Current year accruals	**89**	96	87
Changes in estimates for prior years	**(3)**	9	(38)
Payments	**(103)**	(64)	(89)
Ending balance at December 31	**$ 318**	$ 335	$ 294
Current portion, ending balance at December 31	**$ 63**	$ 111	$ 82

In conjunction with the liability update performed in 2015, we also reassessed our estimated insurance recoveries. We have recognized an asset for estimated insurance recoveries at December 31, 2015, and 2014.

Asbestos – We are a defendant in a number of lawsuits in which current and former employees and other parties allege exposure to asbestos. We assess our potential liability using a statistical analysis of resolution costs for asbestos-related claims. This liability is updated annually and excludes future defense and processing costs. The liability for resolving both asserted and unasserted claims was based on the following assumptions:

- The ratio of future claims by alleged disease would be consistent with historical averages adjusted for inflation.
- The number of claims filed against us will decline each year.
- The average settlement values for asserted and unasserted claims will be equivalent to historical averages.
- The percentage of claims dismissed in the future will be equivalent to historical averages.

Our liability for asbestos-related claims is not discounted to present value due to the uncertainty surrounding the timing of future payments. Approximately 22% of the recorded liability related to asserted claims and approximately 78% related to unasserted claims at December 31, 2015. Because of the uncertainty surrounding the ultimate outcome of asbestos-related claims, it is reasonably possible that future costs to settle these claims may range from approximately $120 million to $129 million. We record an accrual at the low end of the range as no amount of loss within the range is more probable than any other.

Our asbestos-related liability activity was as follows:

Millions	***2015***	*2014*	*2013*
Beginning balance	**$ 126**	$ 131	$ 139
Accruals/(Credits)	**-**	1	2
Payments	**(6)**	(6)	(10)
Ending balance at December 31	**$ 120**	$ 126	$ 131
Current portion, ending balance at December 31	**$ 6**	$ 8	$ 9

In conjunction with the liability update performed in 2015, we also reassessed our estimated insurance recoveries. We have recognized an asset for estimated insurance recoveries at December 31, 2015, and 2014. The amounts recorded for asbestos-related liabilities and related insurance recoveries were based on currently known facts. However, future events, such as the number of new claims filed each year, average settlement costs, and insurance coverage issues, could cause the actual costs and insurance recoveries to be higher or lower than the projected amounts. Estimates also may vary in the future if strategies, activities, and outcomes of asbestos litigation materially change; federal and state laws governing asbestos litigation increase or decrease the probability or amount of compensation of

claimants; and there are material changes with respect to payments made to claimants by other defendants.

Environmental Costs – We are subject to federal, state, and local environmental laws and regulations. We have identified 290 sites at which we are or may be liable for remediation costs associated with alleged contamination or for violations of environmental requirements. This includes 31 sites that are the subject of actions taken by the U.S. government, 19 of which are currently on the Superfund National Priorities List. Certain federal legislation imposes joint and several liability for the remediation of identified sites; consequently, our ultimate environmental liability may include costs relating to activities of other parties, in addition to costs relating to our own activities at each site.

When we identify an environmental issue with respect to property owned, leased, or otherwise used in our business, we perform, with assistance of our consultants, environmental assessments on the property. We expense the cost of the assessments as incurred. We accrue the cost of remediation where our obligation is probable and such costs can be reasonably estimated. Our environmental liability is not discounted to present value due to the uncertainty surrounding the timing of future payments.

Our environmental liability activity was as follows:

Millions		***2015***		*2014*		*2013*
Beginning balance	**$**	**182**	$	171	$	170
Accruals		**61**		56		58
Payments		**(53)**		(45)		(57)
Ending balance at December 31	**$**	**190**	$	182	$	171
Current portion, ending balance at December 31	**$**	**52**	$	60	$	53

The environmental liability includes future costs for remediation and restoration of sites, as well as ongoing monitoring costs, but excludes any anticipated recoveries from third parties. Cost estimates are based on information available for each site, financial viability of other potentially responsible parties, and existing technology, laws, and regulations. The ultimate liability for remediation is difficult to determine because of the number of potentially responsible parties, site-specific cost sharing arrangements with other potentially responsible parties, the degree of contamination by various wastes, the scarcity and quality of volumetric data related to many of the sites, and the speculative nature of remediation costs. Estimates of liability may vary over time due to changes in federal, state, and local laws governing environmental remediation. Current obligations are not expected to have a material adverse effect on our consolidated results of operations, financial condition, or liquidity.

Insurance – The Company has a consolidated, wholly-owned captive insurance subsidiary (the captive), that provides insurance coverage for certain risks including FELA claims and property coverage which are subject to reinsurance. The captive entered into annual reinsurance treaty agreements that insure workers compensation, general liability, auto liability and FELA risk. The captive cedes a portion of its FELA exposure through the treaty and assumes a proportionate share of the entire risk. The captive receives direct premiums, which are netted against the Company's premium costs in other expenses in the Consolidated Statements of Income. The treaty agreements provide for certain protections against the risk of treaty participants' non-performance, and we do not believe our exposure to treaty participants' non-performance is material at this time. In the event the Company leaves the reinsurance program, the Company is not relieved of its primary obligation to the policyholders for activity prior to the termination of the treaty agreements. We record both liabilities and reinsurance receivables using an actuarial analysis based on historical experience in our Consolidated Statements of Financial Position.

Guarantees – At December 31, 2015, and 2014, we were contingently liable for $53 million and $82 million in guarantees, respectively. We have recorded liabilities of $0 and $0.3 million for the fair value of these obligations as of December 31, 2015, and 2014, respectively. We entered into these contingent guarantees in the normal course of business, and they include guaranteed obligations related to our affiliated operations. The final guarantee expires in 2022. We are not aware of any existing event of default that would require us to satisfy these guarantees. We do not expect that these guarantees will have a material adverse effect on our consolidated financial condition, results of operations, or liquidity.

Indemnities – We are contingently obligated under a variety of indemnification arrangements, although in some cases the extent of our potential liability is limited, depending on the nature of the transactions and

the agreements. Due to uncertainty as to whether claims will be made or how they will be resolved, we cannot reasonably determine the probability of an adverse claim or reasonably estimate any adverse liability or the total maximum exposure under these indemnification arrangements. We do not have any reason to believe that we will be required to make any material payments under these indemnity provisions.

Gain Contingency – UPRR and Santa Fe Pacific Pipelines (SFPP, a subsidiary of Kinder Morgan Energy Partners, L.P.) currently are engaged in a proceeding to resolve the fair market rent payable to UPRR commencing on January 1, 2004, for pipeline easements on UPRR rights-of-way (*Union Pacific Railroad Company vs. Santa Fe Pacific Pipelines, Inc., SFPP, L.P., Kinder Morgan Operating L.P. "D" Kinder Morgan G.P., Inc., et al., Superior Court of the State of California for the County of Los Angeles, filed July 28, 2004*). In February 2007, a trial began to resolve this issue, and in May 2012, the trial judge rendered an opinion establishing the fair market rent and entering judgment for back rent, including prejudgment interest. SFPP appealed the judgment. On November 5, 2014, the Second District Circuit Court of Appeal in California issued an opinion holding that UPRR was not entitled to collect rent from SFPP for easements on the portions of the property acquired solely through federal government land grants issued during the 1800s. The Appellate Court also reversed the award of prejudgment interest and remanded the case to the trial court. A favorable final judgment may materially affect UPRR's results of operations in the period of any monetary recoveries. Due to the uncertainty regarding the amount and timing of any recovery or any subsequent proceedings, we consider this a gain contingency and have not recognized any amounts in the Consolidated Financial Statements as of December 31, 2015.

19. Share Repurchase Program

Effective January 1, 2014, our Board of Directors authorized the repurchase of up to 120 million shares of our common stock by December 31, 2017, replacing our previous repurchase program. As of December 31, 2015, we repurchased a total of $16.0 billion of our common stock since the commencement of our repurchase programs in 2007. The table below represents shares repurchased under this repurchase program.

	Number of Shares Purchased		*Average Price Paid*	
	2015	*2014*	***2015***	*2014*
First quarter	**6,881,455**	7,640,000	**$ 117.28**	$ 89.43
Second quarter	**7,975,100**	8,320,000	**104.62**	96.84
Third quarter	**13,800,700**	8,347,000	**89.65**	102.54
Fourth quarter	**6,646,899**	7,736,400	**88.19**	113.77
Total	**35,304,154**	32,043,400	**$ 98.14**	$ 100.65
Remaining number of shares that may be repurchased under current authority				52,652,446

Management's assessments of market conditions and other pertinent factors guide the timing and volume of all repurchases. Repurchased shares are recorded in treasury stock at cost, which includes any applicable commissions and fees.

From January 1, 2016, through February 4, 2016, we repurchased 3.7 million shares at an aggregate cost of approximately $268 million.

20. Related Parties

UPRR and other North American railroad companies jointly own TTX Company (TTX). UPRR has a 36.79% economic and voting interest in TTX while the other North American railroads own the remaining interest. In accordance with ASC 323 *Investments - Equity Method and Joint Venture*, UPRR applies the equity method of accounting to our investment in TTX.

TTX is a railcar pooling company that owns railcars and intermodal wells to serve North America's railroads. TTX assists railroads in meeting the needs of their customers by providing railcars in an efficient, pooled environment. All railroads have the ability to utilize TTX railcars through car hire by renting railcars at stated rates.

UPRR had $830 million and $795 million recognized as investments related to TTX in our consolidated statements of financial position as of December 31, 2015 and 2014, respectively. TTX car hire expenses

of $376 million in 2015, $350 million in 2014, and $326 million in 2013 are included in equipment and other rents in our consolidated statements of income. In addition, UPRR had accounts payable to TTX of $61 million and $53 million as of December 31, 2015 and 2014, respectively.

21. Selected Quarterly Data (Unaudited)

Millions, Except Per Share Amounts				
2015	*Mar. 31*	*Jun. 30*	*Sep. 30*	*Dec. 31*
Operating revenues	$ 5,614	$ 5,429	$ 5,562	$ 5,208
Operating income	1,977	1,949	2,208	1,918
Net income	1,151	1,204	1,300	1,117
Net income per share:				
Basic	1.31	1.38	1.51	1.31
Diluted	1.30	1.38	1.50	1.31

Millions, Except Per Share Amounts				
2014	*Mar. 31*	*Jun. 30*	*Sep. 30*	*Dec. 31*
Operating revenues	$ 5,638	$ 6,015	$ 6,182	$ 6,153
Operating income	1,854	2,196	2,330	2,373
Net income	1,088	1,291	1,370	1,431
Net income per share:				
Basic	1.20	1.43	1.53	1.62
Diluted	1.19	1.43	1.53	1.61

Per share net income for the four quarters combined may not equal the per share net income for the year due to rounding.

Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure

None.

Item 9A. Controls and Procedures

As of the end of the period covered by this report, the Corporation carried out an evaluation, under the supervision and with the participation of the Corporation's management, including the Corporation's Chief Executive Officer (CEO) and Executive Vice President – Finance and Chief Financial Officer (CFO), of the effectiveness of the design and operation of the Corporation's disclosure controls and procedures pursuant to Exchange Act Rules 13a-15 and 15d-15. In designing and evaluating the disclosure controls and procedures, management recognized that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving the desired control objectives. Based upon that evaluation, the CEO and the CFO concluded that, as of the end of the period covered by this report, the Corporation's disclosure controls and procedures were effective to provide reasonable assurance that information required to be disclosed in our Exchange Act reports is recorded, processed, summarized and reported within the time periods specified by the SEC, and that such information is accumulated and communicated to management, including the CEO and CFO, as appropriate, to allow timely decisions regarding required disclosure.

Additionally, the CEO and CFO determined that there were no changes to the Corporation's internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) during the last fiscal quarter that materially affected, or are reasonably likely to materially affect, the Corporation's internal control over financial reporting.

MANAGEMENT'S ANNUAL REPORT ON INTERNAL CONTROL OVER FINANCIAL REPORTING

The management of Union Pacific Corporation and Subsidiary Companies (the Corporation) is responsible for establishing and maintaining adequate internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)). The Corporation's internal control system was designed to provide reasonable assurance to the Corporation's management and Board of Directors regarding the preparation and fair presentation of published financial statements.

All internal control systems, no matter how well designed, have inherent limitations. Therefore, even those systems determined to be effective can provide only reasonable assurance with respect to financial statement preparation and presentation.

The Corporation's management assessed the effectiveness of the Corporation's internal control over financial reporting as of December 31, 2015. In making this assessment, it used the criteria set forth by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) in *Internal Control – Integrated Framework (2013)*. Based on our assessment, management believes that, as of December 31, 2015, the Corporation's internal control over financial reporting is effective based on those criteria.

The Corporation's independent registered public accounting firm has issued an attestation report on the effectiveness of the Corporation's internal control over financial reporting. This report appears on the next page.

February 4, 2016

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Board of Directors and Shareholders of Union Pacific Corporation
Omaha, Nebraska

We have audited the internal control over financial reporting of Union Pacific Corporation and Subsidiary Companies (the Corporation) as of December 31, 2015, based on criteria established in *Internal Control — Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission. The Corporation's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying *Management's Annual Report on Internal Control Over Financial Reporting*. Our responsibility is to express an opinion on the Corporation's internal control over financial reporting based on our audit.

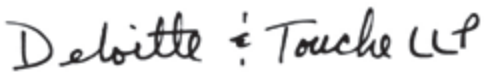
We conducted our audit in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

A company's internal control over financial reporting is a process designed by, or under the supervision of, the company's principal executive and principal financial officers, or persons performing similar functions, and effected by the company's board of directors, management, and other personnel to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of the inherent limitations of internal control over financial reporting, including the possibility of collusion or improper management override of controls, material misstatements due to error or fraud may not be prevented or detected on a timely basis. Also, projections of any evaluation of the effectiveness of the internal control over financial reporting to future periods are subject to the risk that the controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

In our opinion, the Corporation maintained, in all material respects, effective internal control over financial reporting as of December 31, 2015, based on the criteria established in *Internal Control — Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission.

We have also audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States), the consolidated financial statements and financial statement schedule as of and for the year ended December 31, 2015 of the Corporation and our report dated February 5, 2016 expressed an unqualified opinion on those financial statements and financial statement schedule.



Omaha, Nebraska
February 5, 2016

Item 9B. Other Information

None.

PART III

Item 10. Directors, Executive Officers, and Corporate Governance

(a) Directors of Registrant.

Information as to the names, ages, positions and offices with UPC, terms of office, periods of service, business experience during the past five years and certain other directorships held by each director or person nominated to become a director of UPC is set forth in the Election of Directors segment of the Proxy Statement and is incorporated herein by reference.

Information concerning our Audit Committee and the independence of its members, along with information about the audit committee financial expert(s) serving on the Audit Committee, is set forth in the Audit Committee segment of the Proxy Statement and is incorporated herein by reference.

(b) Executive Officers of Registrant.

Information concerning the executive officers of UPC and its subsidiaries is presented in Part I of this report under Executive Officers of the Registrant and Principal Executive Officers of Subsidiaries.

(c) Section 16(a) Compliance.

Information concerning compliance with Section 16(a) of the Securities Exchange Act of 1934 is set forth in the Section 16(a) Beneficial Ownership Reporting Compliance segment of the Proxy Statement and is incorporated herein by reference.

(d) Code of Ethics for Chief Executive Officer and Senior Financial Officers of Registrant.

The Board of Directors of UPC has adopted the UPC Code of Ethics for the Chief Executive Officer and Senior Financial Officers (the Code). A copy of the Code may be found on the Internet at our website www.up.com/investor/governance. We intend to disclose any amendments to the Code or any waiver from a provision of the Code on our website.

Item 11. Executive Compensation

Information concerning compensation received by our directors and our named executive officers is presented in the Compensation Discussion and Analysis, Summary Compensation Table, Grants of Plan-Based Awards in Fiscal Year 2015, Outstanding Equity Awards at 2015 Fiscal Year-End, Option Exercises and Stock Vested in Fiscal Year 2015, Pension Benefits at 2015 Fiscal Year-End, Nonqualified Deferred Compensation at 2015 Fiscal Year-End, Potential Payments Upon Termination or Change in Control and Director Compensation in Fiscal Year 2015 segments of the Proxy Statement and is incorporated herein by reference. Additional information regarding compensation of directors, including Board committee members, is set forth in the By-Laws of UPC and the Stock Unit Grant and Deferred Compensation Plan for the Board of Directors, both of which are included as exhibits to this report. Information regarding the Compensation and Benefits Committee is set forth in the Compensation Committee Interlocks and Insider Participation and Compensation Committee Report segments of the Proxy Statement and is incorporated herein by reference.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters

Information as to the number of shares of our equity securities beneficially owned by each of our directors and nominees for director, our named executive officers, our directors and executive officers as a group, and certain beneficial owners is set forth in the Security Ownership of Certain Beneficial Owners and Management segment of the Proxy Statement and is incorporated herein by reference.

The following table summarizes the equity compensation plans under which UPC common stock may be issued as of December 31, 2015:

	(a)	*(b)*	*(c)*
Plan Category	*Number of securities to be issued upon exercise of outstanding options, warrants and rights*	*Weighted-average exercise price of outstanding options, warrants and rights*	*Number of securities remaining available for future issuance under equity compensation plans (excluding securities reflected in column (a))*
Equity compensation plans approved by security holders	7,720,201 [1]	$ 66.67 [2]	76,548,520
Total	7,720,201	$ 66.67	76,548,520

[1] Includes 2,148,833 retention units that do not have an exercise price. Does not include 2,048,765 retention shares that have been issued and are outstanding.

[2] Does not include the retention units or retention shares described above in footnote 1.

Item 13. Certain Relationships and Related Transactions and Director Independence

Information on related transactions is set forth in the Certain Relationships and Related Transactions and Compensation Committee Interlocks and Insider Participation segments of the Proxy Statement and is incorporated herein by reference. We do not have any relationship with any outside third party that would enable such a party to negotiate terms of a material transaction that may not be available to, or available from, other parties on an arm's-length basis.

Information regarding the independence of our directors is set forth in the Director Independence segment of the Proxy Statement and is incorporated herein by reference.

Item 14. Principal Accountant Fees and Services

Information concerning the fees billed by our independent registered public accounting firm and the nature of services comprising the fees for each of the two most recent fiscal years in each of the following categories: (i) audit fees, (ii) audit-related fees, (iii) tax fees, and (iv) all other fees, is set forth in the Independent Registered Public Accounting Firm's Fees and Services segment of the Proxy Statement and is incorporated herein by reference.

Information concerning our Audit Committee's policies and procedures pertaining to pre-approval of audit and non-audit services rendered by our independent registered public accounting firm is set forth in the Audit Committee segment of the Proxy Statement and is incorporated herein by reference.

PART IV

Item 15. Exhibits, Financial Statement Schedules

(a) Financial Statements, Financial Statement Schedules, and Exhibits:

(1) Financial Statements

The financial statements filed as part of this filing are listed on the index to the Financial Statements and Supplementary Data, Item 8, on page 50.

(2) Financial Statement Schedules

Schedule II - Valuation and Qualifying Accounts

Schedules not listed above have been omitted because they are not applicable or not required or the information required to be set forth therein is included in the Financial Statements and Supplementary Data, Item 8, or notes thereto.

(3) Exhibits

Exhibits are listed in the exhibit index beginning on page 93. The exhibits include management contracts, compensatory plans and arrangements required to be filed as exhibits to the Form 10-K by Item 601 (10) (iii) of Regulation S-K.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized, on this 5th day of February, 2016.

UNION PACIFIC CORPORATION

By /s/ Lance M. Fritz
Lance M. Fritz,
Chairman, President and
Chief Executive Officer
Union Pacific Corporation

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below, on this 5th day of February, 2016, by the following persons on behalf of the registrant and in the capacities indicated.

PRINCIPAL EXECUTIVE OFFICER
AND DIRECTOR:

By /s/ Lance M. Fritz
Lance M. Fritz,
Chairman, President and
Chief Executive Officer
Union Pacific Corporation

PRINCIPAL FINANCIAL OFFICER:

By /s/ Robert M. Knight, Jr.
Robert M. Knight, Jr.,
Executive Vice President - Finance
and Chief Financial Officer

PRINCIPAL ACCOUNTING OFFICER:

By /s/ Todd M. Rynaski
Todd M. Rynaski,
Vice President and Controller

DIRECTORS:

Andrew H. Card, Jr.*
Erroll B. Davis, Jr.*
David B. Dillon*
Judith Richards Hope*
Charles C. Krulak*
Michael R. McCarthy*
Michael W. McConnell*
Thomas F. McLarty III*
Steven R. Rogel*
Jose H. Villarreal*

* By James J. Theisen, Jr.
James J. Theisen, Jr., Attorney-in-fact

SCHEDULE II – VALUATION AND QUALIFYING ACCOUNTS
Union Pacific Corporation and Subsidiary Companies

Millions, for the Years Ended December 31,		***2015***		*2014*		*2013*
Allowance for doubtful accounts:						
Balance, beginning of period	**$**	**21**	$	23	$	37
Charges/(reduction) to expense		**1**		5		(4)
Net recoveries/(write-offs)		**(6)**		(7)		(10)
Balance, end of period	**$**	**16**	$	21	$	23
Allowance for doubtful accounts are presented in the Consolidated Statements of Financial Position as follows:						
Current	**$**	**5**	$	5	$	1
Long-term		**11**		16		22
Balance, end of period	**$**	**16**	$	21	$	23
Accrued casualty costs:						
Balance, beginning of period	**$**	**757**	$	702	$	734
Charges to expense		**227**		256		188
Cash payments and other reductions		**(248)**		(201)		(220)
Balance, end of period	**$**	**736**	$	757	$	702
Accrued casualty costs are presented in the Consolidated Statements of Financial Position as follows:						
Current	**$**	**181**	$	249	$	207
Long-term		**555**		508		495
Balance, end of period	**$**	**736**	$	757	$	702

UNION PACIFIC CORPORATION
Exhibit Index

Exhibit No.	Description
Filed with this Statement	
10(a)	Form of Performance Stock Unit Agreement dated February 4, 2016.
10(b)	Form of Stock Unit Agreement for Executives dated February 4, 2016.
10(c)	Form of Non-Qualified Stock Option Agreement for Executives dated February 4, 2016.
12	Ratio of Earnings to Fixed Charges.
21	List of the Corporation's significant subsidiaries and their respective states of incorporation.
23	Independent Registered Public Accounting Firm's Consent.
24	Powers of attorney executed by the directors of UPC.
31(a)	Certifications Pursuant to Rule 13a-14(a), of the Exchange Act, as Adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 - Lance M. Fritz.
31(b)	Certifications Pursuant to Rule 13a-14(a), of the Exchange Act, as Adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002 - Robert M. Knight, Jr.
32	Certifications Pursuant to 18 U.S.C. Section 1350, as Adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002 - Lance M. Fritz and Robert M. Knight, Jr.
101	eXtensible Business Reporting Language (XBRL) documents submitted electronically: 101.INS (XBRL Instance Document), 101.SCH (XBRL Taxonomy Extension Schema Document), 101.CAL (XBRL Calculation Linkbase Document), 101.LAB (XBRL Taxonomy Label Linkbase Document), 101.DEF (XBRL Taxonomy Definition Linkbase Document) and 101.PRE (XBRL Taxonomy Presentation Linkbase Document). The following financial and related information from Union Pacific Corporation's Annual Report on Form 10-K for the year ended December 31, 2015 (filed with the SEC on February 5, 2016), is formatted in XBRL and submitted electronically herewith: (i) Consolidated Statements of Income for the years ended December 31, 2015, 2014 and 2013, (ii) Consolidated Statements of Comprehensive Income for the years ended December 31, 2015, 2014, and 2013, (iii) Consolidated Statements of Financial Position at December 31, 2015 and December 31, 2014, (iv) Consolidated Statements of Cash Flows for the years ended December 31, 2015, 2014 and 2013, (v) Consolidated Statements of Changes in Common Shareholders' Equity for the years ended December 31, 2015, 2014 and 2013, and (vi) the Notes to the Consolidated Financial Statements.
Incorporated by Reference	
3(a)	Restated Articles of Incorporation of UPC, as amended and restated through June 27, 2011, and as further amended May 15, 2014, are incorporated herein by reference to Exhibit 3(a) to the Corporation's Quarterly Report on Form 10-Q for the quarter ended June 30, 2014.
3(b)	By-Laws of UPC, as amended, effective November 19, 2015, are incorporated herein by reference to Exhibit 3.2 to the Corporation's Current Report on Form 8-K dated November 19, 2015.
4(a)	Indenture, dated as of December 20, 1996, between UPC and Wells Fargo Bank, National Association, as successor to Citibank, N.A., as Trustee, is incorporated herein by reference to Exhibit 4.1 to UPC's Registration Statement on Form S-3

	(No. 333-18345).
4(b)	Indenture, dated as of April 1, 1999, between UPC and The Bank of New York, as successor to JP Morgan Chase Bank, formerly The Chase Manhattan Bank, as Trustee, is incorporated herein by reference to Exhibit 4.2 to UPC's Registration Statement on Form S-3 (No. 333-75989).
4(c)	Form of 2.250% Note due 2020 is incorporated by reference to Exhibit 4.1 to the Corporation's Current Report on Form 8-K dated June 19, 2015.
4(d)	Form of 3.250% Note due 2025 is incorporated by reference to Exhibit 4.2 to the Corporation's Current Report on Form 8-K dated June 19, 2015.
4(e)	Form of 3.250% Note due 2025 is incorporated herein by reference to Exhibit 4.1 to the Corporation's Current Report on Form 8-K dated October 29, 2015.
4(f)	Form of 4.050% Note due 2045 is incorporated herein by reference to Exhibit 4.2 to the Corporation's Current Report on Form 8-K dated October 29, 2015.
4(g)	Form of 4.375% Note due 2065 is incorporated herein by reference to Exhibit 4.3 to the Corporation's Current Report on Form 8-K dated October 29, 2015.
	Certain instruments evidencing long-term indebtedness of UPC are not filed as exhibits because the total amount of securities authorized under any single such instrument does not exceed 10% of the Corporation's total consolidated assets. UPC agrees to furnish the Commission with a copy of any such instrument upon request by the Commission.
10(d)	Supplemental Thrift Plan (409A Non-Grandfathered Component) of Union Pacific Corporation, as amended March 1, 2013, is incorporated herein by reference to Exhibit 10(c) to the Corporation's Quarterly Report on Form 10-Q for the quarter ended March 31, 2013.
10(e)	Supplemental Thrift Plan (409A Grandfathered Component) of Union Pacific Corporation, as amended March 1, 2013, is incorporated herein by reference to Exhibit 10(d) to the Corporation's Quarterly Report on Form 10-Q for the quarter ended March 31, 2013.
10(f)	Supplemental Pension Plan for Officers and Managers (409A Non-Grandfathered Component) of Union Pacific Corporation and Affiliates, as amended February 1, 2013, and March 1, 2013, is incorporated herein by reference to Exhibit 10(e) to the Corporation's Quarterly Report on Form 10-Q for the quarter ended March 31, 2013.
10(g)	Supplemental Pension Plan for Officers and Managers (409A Grandfathered Component) of Union Pacific Corporation and Affiliates, as amended February 1, 2013, and March 1, 2013 is incorporated herein by reference to Exhibit 10(f) to the Corporation's Quarterly Report on Form 10-Q for the quarter ended March 31, 2013.
10(h)	Union Pacific Corporation Key Employee Continuity Plan, as amended February 5, 2015, is incorporated herein by reference to Exhibit 10(d) to the Corporation's Annual Report on Form 10-K for the year ended December 31, 2013.
10(i)	Union Pacific Corporation Executive Incentive Plan, effective May 5, 2005, amended and restated effective January 1, 2009, is incorporated herein by reference to Exhibit 10(g) to the Corporation's Annual Report on Form 10-K for the year ended December 31, 2008.
10(j)	Deferred Compensation Plan (409A Grandfathered Component) of Union Pacific Corporation, as amended March 1, 2013, is incorporated herein by reference to Exhibit 10(b) to the Corporation's Quarterly Report on Form 10-Q for the quarter ended March 31, 2013.

10(k)	Deferred Compensation Plan (409A Non-Grandfathered Component) of Union Pacific Corporation, as amended December 17, 2013, is incorporated herein by reference to the Corporation's Annual Report on Form 10-K for the year ended December 31, 2013.
10(l)	1992 Restricted Stock Plan for Non-Employee Directors of Union Pacific Corporation, as amended as of January 28, 1993, is incorporated herein by reference to Exhibit 10(a) to the Corporation's Current Report on Form 8-K dated March 16, 1993.
10(m)	Union Pacific Corporation 2000 Directors Plan, effective as of April 21, 2000, as amended November 16, 2006, January 30, 2007 and January 1, 2009 is incorporated herein by reference to Exhibit 10(j) to the Corporation's Annual Report on Form 10-K for the year ended December 31, 2008.
10(n)	Union Pacific Corporation Stock Unit Grant and Deferred Compensation Plan for the Board of Directors (409A Non-Grandfathered Component), effective as of January 1, 2009 is incorporated herein by reference to Exhibit 10(k) to the Corporation's Annual Report on Form 10-K for the year ended December 31, 2008.
10(o)	Union Pacific Corporation Stock Unit Grant and Deferred Compensation Plan for the Board of Directors (409A Grandfathered Component), as amended and restated in its entirety, effective as of January 1, 2009 is incorporated herein by reference to Exhibit 10(l) to the Corporation's Annual Report on Form 10-K for the year ended December 31, 2008.
10(p)	Union Pacific Corporation 2013 Stock Incentive Plan, effective May 16, 2013, is incorporated herein by reference to Exhibit 4.3 to the Corporation's Form S-8 dated May 17, 2013.
10(q)	UPC 2004 Stock Incentive Plan amended March 1, 2013, is incorporated herein by reference to Exhibit 10(g) to the Corporation's Quarterly Report on Form 10-Q for the quarter ended March 31, 2013.
10(r)	Amended and Restated Registration Rights Agreement, dated as of July 12, 1996, among UPC, UP Holding Company, Inc., Union Pacific Merger Co. and Southern Pacific Rail Corporation (SP) is incorporated herein by reference to Annex J to the Joint Proxy Statement/Prospectus included in Post-Effective Amendment No. 2 to UPC's Registration Statement on Form S-4 (No. 33-64707).
10(s)	Agreement, dated September 25, 1995, among UPC, UPRR, Missouri Pacific Railroad Company (MPRR), SP, Southern Pacific Transportation Company (SPT), The Denver & Rio Grande Western Railroad Company (D&RGW), St. Louis Southwestern Railway Company (SLSRC) and SPCSL Corp. (SPCSL), on the one hand, and Burlington Northern Railroad Company (BN) and The Atchison, Topeka and Santa Fe Railway Company (Santa Fe), on the other hand, is incorporated by reference to Exhibit 10.11 to UPC's Registration Statement on Form S-4 (No. 33 64707).
10(t)	Supplemental Agreement, dated November 18, 1995, between UPC, UPRR, MPRR, SP, SPT, D&RGW, SLSRC and SPCSL, on the one hand, and BN and Santa Fe, on the other hand, is incorporated herein by reference to Exhibit 10.12 to UPC's Registration Statement on Form S-4 (No. 33 64707).
10(u)	The Pension Plan for Non-Employee Directors of UPC, as amended January 25, 1996, is incorporated herein by reference to Exhibit 10(w) to the Corporation's Annual Report on Form 10-K for the year ended December 31, 1995.
10(v)	Charitable Contribution Plan for Non-Employee Directors of Union Pacific Corporation is incorporated herein by reference to Exhibit 10(z) to the Corporation's Annual Report on Form 10-K for the year ended December 31,

	1995.
10(w)	Form of Non-Qualified Stock Option Agreement for Executives is incorporated herein by reference to Exhibit 10(c) to the Corporation's Annual Report on Form 10-K for the year ended December 31, 2012.
10(x)	Form of Stock Unit Agreement for Executives is incorporated herein by reference to Exhibit 10(b) to the Corporation's Annual Report on Form 10-K for the year ended December 31, 2012.
10(y)	Form of Non-Qualified Stock Option Agreement for Executives is incorporated herein by reference to Exhibit 10(c) to the Corporation's Annual Report on Form 10-K for the year ended December 31, 2013.
10(z)	Form of Stock Unit Agreement for Executives is incorporated herein by reference to Exhibit 10(b) to the Corporation's Annual Report on Form 10-K for the year ended December 31, 2013.
10(aa)	Form of 2013 Long Term Plan Stock Unit Agreement is incorporated herein by reference to Exhibit 10(a) to the Corporation's Annual Report on Form 10-K for the year ended December 31, 2012.
10(bb)	Form of 2014 Long Term Plan Stock Unit Agreement is incorporated herein by reference to Exhibit 10(a) to the Corporation's Annual Report on Form 10-K for the year ended December 31, 2013.
10(cc)	Form of 2015 Long Term Plan Stock Unit Agreement is incorporated herein by reference to Exhibit 10(a) to the Corporation's Annual Report on Form 10-K for the year ended December 31, 2014.
10(dd)	Form of Non-Qualified Stock Option Agreement for Directors is incorporated herein by reference to Exhibit 10(d) to the Corporation's Quarterly Report on Form 10-Q for the quarter ended September 30, 2004.
10(ee)	Executive Incentive Plan (2005) – Deferred Compensation Program, dated December 21, 2005 is incorporated herein by reference to Exhibit 10(g) to the Corporation's Annual Report on Form 10-K for the year ended December 31, 2005.
99	Form of U.S. $1,700,000,000 5-Year Revolving Credit Agreement dated as of May 21, 2014, is incorporated herein by reference to Exhibit 99(a) to the Corporation's Quarterly Report on Form 10-Q for the quarter ended June 30, 2014.

RATIO OF EARNINGS TO FIXED CHARGES
Union Pacific Corporation and Subsidiary Companies

Millions, Except for Ratios	***2015***	*2014*	*2013*	*2012*	*2011*
Fixed charges:					
Interest expense including					
amortization of debt discount	**$ 622**	$ 561	$ 526	$ 535	$ 572
Portion of rentals representing an interest factor	**93**	101	121	132	135
Total fixed charges	**$ 715**	$ 662	$ 647	$ 667	$ 707
Earnings available for fixed charges:					
Net income	**$ 4,772**	$ 5,180	$ 4,388	$ 3,943	$ 3,292
Equity earnings net of distributions	**(63)**	(59)	(57)	(55)	(38)
Income taxes	**2,884**	3,163	2,660	2,375	1,972
Fixed charges	**715**	662	647	667	707
Earnings available for fixed charges	**$ 8,308**	$ 8,946	$ 7,638	$ 6,930	$ 5,933
Ratio of earnings to fixed charges	**11.6**	13.5	11.8	10.4	8.4

Exhibit 21

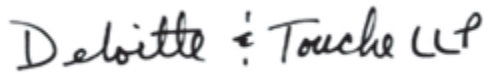
SIGNIFICANT SUBSIDIARIES OF UNION PACIFIC CORPORATION

Name of Corporation	State of Incorporation
Union Pacific Railroad Company	Delaware

Exhibit 23

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the incorporation by reference in Post-Effective Amendment No. 1 to Registration Statement No. 33-12513, Registration Statement No. 33-53968, Registration Statement No. 33-49785, Registration Statement No. 33-49849, Registration Statement No. 333-10797, Registration Statement No. 333-88709, Registration Statement No. 333-42768, Registration Statement No. 333-106707, Registration Statement No. 333-106708, Registration Statement No. 333-105714, Registration Statement No. 333-105715, Registration Statement No. 333-116003, Registration Statement No. 333-132324, Registration Statement No. 333-155708, Registration Statement No. 333-170209, Registration Statement No. 333-170208, and Registration No. 333-188671 on Form S-8 and Registration Statement No. 333-201958 on Form S-3 of our reports dated February 5, 2016, relating to the consolidated financial statements and financial statement schedule of Union Pacific Corporation and Subsidiary Companies (the Corporation) and the effectiveness of the Corporation's internal control over financial reporting appearing in this Annual Report on Form 10-K of Union Pacific Corporation and Subsidiary Companies for the year ended December 31, 2015.



Omaha, Nebraska
February 5, 2016

UNION PACIFIC CORPORATION
Powers of Attorney

Each of the undersigned directors of Union Pacific Corporation, a Utah corporation (the Company), do hereby appoint each of Lance M. Fritz, Diane K. Duren, and James J. Theisen, Jr. his or her true and lawful attorney-in-fact and agent, to sign on his or her behalf the Company's Annual Report on Form 10-K, for the year ended December 31, 2015, and any and all amendments thereto, and to file the same, with all exhibits thereto, with the Securities and Exchange Commission.

IN WITNESS WHEREOF, the undersigned have executed this Power of Attorney as of February 4, 2016.

/s/ Andrew H. Card, Jr.	/s/ Michael R. McCarthy
Andrew H. Card, Jr.	Michael R. McCarthy
/s/ Erroll B. Davis, Jr.	/s/ Michael W. McConnell
Erroll B. Davis, Jr.	Michael W. McConnell
/s/ David B. Dillon	/s/ Thomas F. McLarty III
David B. Dillon	Thomas F. McLarty III
/s/ Judith Richards Hope	/s/ Steven R. Rogel
Judith Richards Hope	Steven R. Rogel
/s/ Charles C. Krulak	/s/ Jose H. Villarreal
Charles C. Krulak	Jose H. Villarreal

Exhibit 31(a)

CERTIFICATION OF PRINCIPAL EXECUTIVE OFFICER

I, Lance M. Fritz, certify that:

1. I have reviewed this annual report on Form 10-K of Union Pacific Corporation;

2. Based on my knowledge, this report does not contain any untrue statement of material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

(a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

(b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

(c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

(d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 5, 2016

/s/ Lance M. Fritz
Lance M. Fritz
Chairman, President and
Chief Executive Officer

Exhibit 31(b)

CERTIFICATION OF PRINCIPAL FINANCIAL OFFICER

I, Robert M. Knight, Jr., certify that:

1. I have reviewed this annual report on Form 10-K of Union Pacific Corporation;

2. Based on my knowledge, this report does not contain any untrue statement of material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

(a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

(b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

(c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

(d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: February 5, 2016

/s/ Robert M. Knight, Jr.
Robert M. Knight, Jr.
Executive Vice President – Finance and
Chief Financial Officer

Exhibit 32

CERTIFICATION OF CHIEF EXECUTIVE OFFICER PURSUANT TO 18 U.S.C. SECTION 1350, AS ADOPTED PURSUANT TO SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the accompanying Annual Report of Union Pacific Corporation (the Corporation) on Form 10-K for the period ending December 31, 2015, as filed with the Securities and Exchange Commission on the date hereof (the Report), I, Lance M Fritz, Chairman, President and Chief Executive Officer of the Corporation, certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, to the best of my knowledge, that:

(1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Corporation.

By: /s/ Lance M. Fritz
Lance M. Fritz
Chairman, President and
Chief Executive Officer
Union Pacific Corporation

February 5, 2016

A signed original of this written statement required by Section 906 has been provided to the Corporation and will be retained by the Corporation and furnished to the Securities and Exchange Commission or its staff upon request.

CERTIFICATION OF CHIEF FINANCIAL OFFICER PURSUANT TO 18 U.S.C. SECTION 1350, AS ADOPTED PURSUANT TO SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the accompanying Annual Report of Union Pacific Corporation (the Corporation) on Form 10-K for the period ending December 31, 2015, as filed with the Securities and Exchange Commission on the date hereof (the Report), I, Robert M. Knight, Jr., Executive Vice President - Finance and Chief Financial Officer of the Corporation, certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, to the best of my knowledge, that:

(1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Corporation.

By: /s/ Robert M. Knight, Jr.
Robert M. Knight, Jr.
Executive Vice President - Finance and
Chief Financial Officer
Union Pacific Corporation

February 5, 2016

A signed original of this written statement required by Section 906 has been provided to the Corporation and will be retained by the Corporation and furnished to the Securities and Exchange Commission or its staff upon request.

UNP 4.05 11/15/45 $↓95.832 +.033 150.2 bp vs T 2.875 08/15/2045
At 12:11d Vol 5.0MM Source TRAC

UNP 4.05 11/15/45 Corp — Page 1/11 Security Description: Bond

94) Notes | 95) Buy | 96) Sell | 97) Settings

21) Bond Description | 22) Issuer Description

Pages
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2) Addtl Info
3) Covenants
4) Guarantors
5) Bond Ratings
6) Identifiers
7) Exchanges
8) Inv Parties
9) Fees, Restrict
10) Schedules
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35) CACS Corp Action
36) CF Prospectus
37) CN Sec News
38) HDS Holders
39) VPRD Underly Info

66) Send Bond

Issuer Information

Name	UNION PACIFIC CORP
Industry	Railroad

Security Information

Mkt Iss	US Domestic		
Country	US	Currency	USD
Rank	Sr Unsecured	Series	
Coupon	4.050000	Type	Fixed
Cpn Freq	S/A		
Day Cnt	30/360	Iss Price	99.53300
Maturity	11/15/2045		

MAKE WHOLE @20.000000 until 05/15/45/ CAL...
Iss Sprd 120.00bp vs T 3 05/15/45

Calc Type	(1)STREET CONVENTION
Announcement Date	10/26/2015
Interest Accrual Date	10/29/2015
1st Settle Date	10/29/2015
1st Coupon Date	05/15/2016

Identifiers

ID Number	QJ3820546
CUSIP	907818EF1
ISIN	US907818EF15

Bond Ratings

Moody's	A3
S&P	A
Composite	A-

Issuance & Trading

Amt Issued/Outstanding
USD 500,000.00 (M) /
USD 500,000.00 (M)
Min Piece/Increment
1,000.00 / 1,000.00

Par Amount	1,000.00
Book Runner	JOINT LEADS
Reporting	TRACE

UNION PACIFIC CORPORATION
1400 Douglas Street, 19th Floor
Omaha, Nebraska 68179

P 402 544 3295
F 402 501 2121
rmknight@up.com

Robert M. Knight, Jr. Executive Vice President-Finance and Chief Financial Officer

CORPORATE GUARANTEE

Guarantee made this March 2, 2016, by Union Pacific Corporation, a business corporation organized under the laws of the State of Utah, herein referred to as guarantor. This guarantee is made to the Texas Commission on Environmental Quality (TCEQ) on behalf of Union Pacific Railroad Company of 1400 Douglas Street, Omaha, Nebraska 68179, which is our subsidiary.

RECITALS

1. Guarantor meets or exceeds the financial test criteria and agrees to comply with the reporting requirements for guarantors as specified in 30 Texas Administrative Code (TAC) §37.251 (relating to Financial Test) and §37.261 (relating to Corporate Guarantee).
2. Union Pacific Railroad Company owns or operates the following facility(ies) covered by this guarantee:

   Union Pacific Railroad Company

   - Englewood Yard, Permit No. HW-50343-000, EPA ID No. TXD000820266, Hazardous Waste Program, 4910 Liberty Road, Houston, Texas 77026-5263, post closure and corrective action.

3. "Closure or post closure plans" as used below refer to the plans maintained as required for the closure or post closure of the facilities as identified above.
4. For value received from Union Pacific Railroad Company, $10.00 and other valuable goods and consideration, guarantor guarantees to TCEQ that in the event that Union Pacific Railroad Company fails to perform closure, post closure, or corrective action of the above facility(ies) in accordance with the closure plans, post closure plans, or corrective action, permits, and other applicable requirements whenever required to do so, the guarantor shall do so or establish a trust fund as specified in 30 TAC §37.201 (relating to Trust Fund), in the name of Union Pacific Railroad Company in the amount of the current cost estimate.
5. Guarantor agrees that if, at the end of any fiscal year before termination of this guarantee, the guarantor fails to meet the financial test criteria, guarantor shall send within 90 days, by certified mail, notice to the TCEQ executive director and to Union Pacific Railroad Company that the guarantor intends to provide alternate financial assurance as specified in 30 TAC Chapter 37 (relating to Financial Assurance), as applicable, in the name of Union Pacific Railroad Company. Within 120 days after the end of such fiscal year, the guarantor shall establish such financial assurance unless Union Pacific Railroad Company has done so.

6. The guarantor agrees to notify the TCEQ executive director by certified mail, of a voluntary or involuntary proceeding under Title 11 (Bankruptcy), U.S. Code, naming guarantor as debtor, within 10 days after commencement of the proceeding.
7. Guarantor agrees that within 30 days after being notified by the TCEQ executive director of a determination that guarantor no longer meets the financial test criteria or is disallowed from continuing as a guarantor of closure, post closure, or corrective action, guarantor shall establish alternate financial assurance as specified in Subchapter C of 30 TAC Chapter 37 (relating to Financial Assurance Mechanisms for Closure, Post Closure, and Corrective Action), in the name of Union Pacific Railroad Company unless Union Pacific Railroad Company has done so.
8. Guarantor agrees to remain bound under this guarantee notwithstanding any or all of the following: amendment or modification of the closure or post closure plans, or corrective action requirements, amendment or modification of the permit, the extension or reduction of the time of performance, or any other modification or alteration of an obligation of the owner or operator.
9. Guarantor agrees to remain bound under this guarantee for so long as Union Pacific Railroad Company must comply with the applicable financial assurance requirements of 30 TAC Chapter 37 for the above-listed facilities, except as provided in paragraph 10 of this agreement.
10. Guarantor may terminate this guarantee by sending notice by certified mail to the TCEQ executive director and to Union Pacific Railroad Company, provided that this guarantee may not be terminated unless and until Union Pacific Railroad Company obtains, and the TCEQ executive director approves, alternate financial assurance.
11. Guarantor agrees that if Union Pacific Railroad Company fails to provide alternate financial assurance as specified in 30 TAC Chapter 37, as applicable, and obtain written approval of such assurance from the TCEQ executive director within 90 days after a notice of termination by the guarantor is received by the TCEQ executive director from guarantor, guarantor shall provide such alternate financial assurance in the name of the Union Pacific Railroad Company.
12. Guarantor expressly waives notice of acceptance of this guarantee by the TCEQ or by Union Pacific Railroad Company. Guarantor also expressly waives notice of amendments or modifications of the closure plans, post closure plans, or corrective action requirements, and of amendments or modifications of the permit(s).

I hereby certify that the wording of this guarantee is identical to the wording specified in 30 Texas Administrative Code §37.361 as such regulations were constituted on the date first above written.

Effective date: March 2, 2016

(Name of guarantor) Union Pacific Corporation

(Authorized signature for guarantor) 

(Type name of person signing) Robert M. Knight

(Title of person signing) Executive Vice President-Finance and Chief Financial Officer Union Pacific Corporation

Signature of witness or notary: 

UNION PACIFIC CORPORATION
1400 Douglas Street, 19th Floor
Omaha, Nebraska 68179

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Robert M. Knight, Jr. Executive Vice President-Finance and Chief Financial Officer

FINANCIAL TEST
LETTER FROM CHIEF FINANCIAL OFFICER

Executive Director
Texas Commission on Environmental Quality
Financial Assurance Section, MC 184
P.O. Box 13087
Austin, TX 78711-3087

Dear Executive Director:

I am the Chief Financial Officer of the Union Pacific Corporation, 1400 Douglas Street, Omaha, Nebraska 68179. This letter is in support of this firm's use of the financial test to demonstrate financial assurance for closure, post closure, or corrective action as specified in 30 Texas Administrative Code (TAC) Chapter 37 (relating to Financial Assurance).

1. This firm is the owner or operator of the following facilities in Texas for which financial assurance for closure, post closure, or corrective action is being demonstrated through a financial test specified in 30 TAC Chapter 37. The current cost estimate covered by the test is shown for each facility: None

2. This firm guarantees, through a corporate guarantee specified in 30 TAC Chapter 37, the cost for closure, post closure, or corrective action of the following facilities owned or operated by the guaranteed party. The current cost estimates so guaranteed are shown for each facility:

   Union Pacific Railroad Company

   - Englewood Yard, Permit No. HW-50343-000, EPA ID No. TXD000820266, Hazardous Waste Program, 4910 Liberty Road, Houston, Texas 77026-5263, current post closure cost estimate of $322,000, corrective action cost estimate of $231,000.

The firm identified above is the direct parent corporation of the owner or operator.

3. In States where TCEQ is not administering the financial requirements of 30 TAC Chapter 37, this firm, as owner, operator, or guarantor, is demonstrating financial assurance for the closure, post closure, or corrective action of the following facilities through the use of a test equivalent to a financial test specified in 30 TAC Chapter 37. The current cost estimates covered by such a test are shown for each facility:

- EPA ID No. NED981713829, Bruno Co-op Association/Associated Properties, Fremont & Railroad Streets, Bruno, Nebraska 68014, current closure cost estimate of $1,089,603.
- EPA ID No. NED981499312, Cleburn Street Well Site OU5, North Front Street, Grand Island, NE 68801, current closure cost estimate of $588,975.
- EPA ID No. TXD990707010, Crystal Chemical Company, 3502 Rogerdale Road, Houston, Texas 77042, current closure cost estimate of $13,179,412.
- EPA ID No. UTD000716407, Ogden Rail Yard Site, located in Ogden, Weber County, Utah, current closure cost estimate of $2,689,256.
- CERCLIS ID# NESFN0703481, Site/Spill ID Number 07ZY, Omaha Lead Site, located in Omaha, Douglas County, Nebraska, cost of work estimate of $2,179,653.
- EPA ID No. NED000829754, Union Pacific Railroad Omaha Shops, 9th and Cass Street, Omaha, Nebraska 68102, current closure cost estimate of $10,447,142.
- EPA ID No. MOD095046306, Missouri Pacific Railroad Sedalia Shops, 601 South Marshall, Sedalia, Missouri 65301, current closure cost estimate of $1,390,249 and a current post closure cost estimate of $315,966.
- Site ID No. 99-0606-N-EJL, Union Pacific Railroad Wallace Branch Line, Idaho, current closure cost estimate of $31,253,948.
- EPA Site ID No. CAT00618728, Gosford Station, Bakersfield, California, current post closure cost estimate of $774,080.
- EPA Site ID No. CAD980496863, Asbestos Landfill-II, West Lucille Ave. & Elm Ave., Coalinga, California, current post closure cost estimate of $490,135.
- ODEQ ECSI No. 297, UPRR Klamath Falls Yard, 1585 Oak Street, Klamath Falls, Oregon, current closure cost estimate of $435,307.
- ODEQ Site ID No, ELCI No. 631, Union Pacific Railroad La Grande Railyard, 1150 Jefferson Street, La Grande, Oregon 97850, current closure cost estimate of $1,516,647.
- EPA Site ID No. WYD061112470, Baxter/Union Pacific Railroad Tie Treating Site, 221 Hodgeman, Laramie, Wyoming 82070, current closure cost estimate of $3,996,299 and a current post-closure cost estimate of $19,927,286.
- EPA Site ID No. CAD000628131, Southern Pacific Railroad Taylor Yard, 2800 Kerr Street, Los Angeles, California 90039, current closure cost estimate of $9,879,983.
- EPA Site ID No. CAD000628198, Bobo's Junkyard/West Oakland Railyard (I-880), 1851B Fifth Street, Oakland, California 94604, current post closure cost estimate of $636,988.
- EPA Site ID No. CAD006913206, Liquid Gold, State Highway 17 & Central Avenue, Richmond, California, current closure cost estimate of $3,287,257.

- EPA Site ID No. CAD000628255, Southern Pacific Railroad Roseville Yard, Church & Cedar Street, Roseville, California 95678, current closure cost estimate of $3,062,467.
- Roseville Yard Area A Operable Unit, Church & Cedar Street, Roseville, California 95678, current closure cost estimate of $1,200,705.
- Roseville WWTP Surface Impoundment Requirements, Church & Cedar Street, Roseville, California 95678, current corrective action cost estimate of $2,233,590 and a current closure cost estimate of $3,429,663.
- EPA Site ID No. CAD073772030, Sacramento Yard, 401 I Street, Sacramento, California 95814, current closure cost estimate of $49,477,303 and a current post closure cost estimate of $13,547,357.
- EPA Site ID No. CAD980816417, Berman Steel, Highway 1901 and Spencer Road, Salinas, California, current post-closure cost estimate of $304,826.
- Stockton Yard Asbestos 2, 833 East 8th Street, Stockton, California 95206, current post closure cost estimate of $834,543.
- EPA Site ID CAD089186928, Suisun Marsh Phosphorous Car Derailment, Solano County, California, current post-closure cost estimate of $758,318.
- EPA Site ID ORD009049412, Union Pacific Railroad Company Tie Treating Plant, 2443 Tie Plant Road, The Dalles, Oregon 97058, current closure cost estimate of $9,745,379.
- WDEQ Site ID# 2051, Union Pacific Railroad Green River Fueling Facility, 301 East Railroad Street, Green River, WY 82935, current closure cost estimate of $1,433,393.
- WDEQ Site ID# VRP58.040, Union Pacific Cheyenne Fueling Facility, 121 West 15th Street, Cheyenne, Wyoming 82001, current closure cost estimate of $617,936.
- WDEQ Site ID# VRP58.040, Union Pacific Cheyenne Turntable PCE and MTBE Release, 121 West 15th Street, Cheyenne, Wyoming 82001, current closure cost estimate of $5,132,134.

4. The firm identified above owns or operates the following facilities for which financial assurance for closure, post closure, or corrective action costs, is not demonstrated through the financial test or any other financial assurance mechanisms specified in 30 TAC Chapter 37 or equivalent State mechanisms to TCEQ, a federal agency, or another state. The current cost estimates not covered by such financial assurance are shown for each facility: $ None.

5. This firm is the owner or operator or guarantor of the following facilities for which financial assurance is being demonstrated under other EPA regulations or state programs authorized by EPA through a financial test or guarantee. The following amounts have not been included in Paragraphs 1- 4.

   (a) Municipal solid waste management facilities under 30 TAC Chapter 330, 40 CFR Part 258 or equivalent $ None

(b) Underground injection control facilities under 30 TAC Chapter 331, 40 CFR Part 144 or equivalent $ None

(c) Petroleum underground storage tank facilities under 30 TAC Chapter 334, and 40 CFR Part 280 or equivalent $ 1,000,000

(d) PCB storage facilities under 40 CFR Part 761 or equivalent $ None

(e) Hazardous waste treatment, storage, and disposal facilities under 30 TAC Chapter 335, 40 CFR Parts 264 and 265 or equivalent $ None

(f) Additional environmental obligations not shown above $ 133,782,210 . As of this letter's date, the Union Pacific Railroad Company had 296 sites with estimated environmental liability for which financial assurance is not demonstrated through a financial test. The sum of these sites' current estimated liability is $133,782,210. A schedule of these site locations and name is included as exhibit A.

Total (a)-(f) $ 134,782,210

This guarantor has not received an adverse opinion, a disclaimer of opinion, or a "going concern" qualification from an independent auditor on its financial statements for the latest completed fiscal year.

This firm is required to file a Form 10K with the Securities and Exchange Commission (SEC) for the latest fiscal year. The fiscal year of this firm ends on December 31. The figures for the following items marked with an asterisk are derived from this firm's independently audited, year-end financial statements for the latest completed fiscal year, ended December 31, 2015.

ALTERNATIVE II

1. (a) Sum of current closure, post closure, and corrective action costs (total of all cost estimates shown in the five paragraphs above) $ 331,221,010

(b) Amount of annual aggregate liability coverage to be demonstrated

by a financial test or corporate guarantee $ 2,000,000

(c) Total of lines (a) and (b) $ 333,221,010

2. Current bond rating of most recent issuance of this firm and name of rating service
A by Standard & Poor's
A3 by Moody's Investor Service

3. Date of issuance of bond October 26, 2015

4. Date of maturity of bond November 15, 2045

*5. Tangible net worth (if any portion of the closure, post closure care, or corrective action cost estimate(s), is included in "total liabilities" on your firm's financial statements, you may add the amount of that portion to this line) $20,652,776,371

*6. Total assets in U.S. (required only if less than 90% of firm's assets are located in U.S.) N/A

Indicate either "yes" or "no" to the following questions.

7. Is line 5 at least $10 million? Yes

8. Is line 5 at least 6 times line 1(c)? Yes

*9. Are at least 90% of the firm's assets located in the U.S.? Yes
If not, complete line 10

10. Is line 6 at least 6 times line 1(c)? N/A

I hereby certify that the wording of this letter is identical to the wording specified in 30 Texas Administrative Code §37.351 as such regulations were constituted on the date shown immediately below.

Signature: _____

Name: Robert M. Knight

Title: Executive Vice President-Finance and Chief Financial Officer Union Pacific Corporation

Date: March 2, 2016

Exhibit A to Paragraph 5(f)

The Union Pacific Railroad Company owns or operates (or is otherwise a potential responsible party to) the following facilities for which financial assurance is not demonstrated through the financial test or any other financial assurance mechanisms. These additional environmental obligations are listed below:

1. Abilene, ks – Diesel Release December 5, 2014
2. Alamogordo, nm - Former EPSW Tie Plant
3. Altoona, wi - Fueling Facility
4. American Falls, id - February 10, 2016 Derailment
5. Anaconda, mt - RDU 8
6. Arvin, ca - Brown and Bryant
7. Ashland, or - Former SP Yard
8. Auburn, ca - Former Redwood Oil Lease Site
9. Auburn, ne - Dettmer Farm Services
10. Bakersfield, ca - Abandoned Bunker Fuel Pipeline
11. Beaumont, tx - December 31, 2014 Diesel Release
12. Belle Plaine, ia - May 22, 2015 Derailment
13. Bellevue, ne - Gilmore Property
14. Benecia, ca - IT Panoche Facility
15. Benedict, ks - January 15, 2015 Collision
16. Benton, Il - Webb Oil Lease Site
17. Beverly Hills, ca - BHLC at 9315 Civic Center Drive
18. Big Spring, tx - Former Fueling Facility
19. Bloomington, tx - January 2009 Tank Car Release
20. Braidwood, il - Buried Batteries
21. Brownsville, tx - Roundhouse Property
22. Burton, tx - Felder Oil Lease Site
23. Butte, mt - BPSOU, Consulting
24. Butte, mt - TPH Investigation and VCP
25. Byers, co - Abandoned Bulk Oil Lease Site
26. Caledonia, wi – January 19, 2014 Derailment
27. Calpella, ca - NWP Option Property
28. Caney, ok - October 23, 2008 Derailment
29. Cascade Locks, or - January 9, 2015 Lube Oil Release
30. Casper, wy - Fueling Facility
31. Cedar Rapids, ia - North Yard
32. Chicago Heights, il - Auto Facility Tie-up Track
33. Chicago, il - California Avenue UST
34. Chicago, il - Roosevelt Rd. Acquisition- 2
35. Cisco, tx - June 17, 2012 Derailment
36. Clarks Grove, mn - August 10, 2014 Diesel Fuel Release
37. Clinton, ia - Diesel Release February 26, 2015
38. Coffeyville, ks - Fueling Tracks
39. Colton, ca - November 14, 2014 Pump House Pipe Release
40. Commerce, tx - High Yield
41. Corsicana, tx - Hwy 31 Culvert
42. Corsicana, tx - October 24, 2015 Derailment
43. Cotulla, tx - May 16, 2015 Locomotive Fuel Release
44. Council Bluffs, ia - Drainage Ditch Diesel June 11, 2014
45. Crescent Lake, or - Former SP Yard 2
46. Crowley, la - Southwest Rice Mill Litigation
47. Dallas, tx – Miller Yard Service Track
48. Danbury, tx - Drainage Ditch Excavation
49. Dateland, az - April 6, 2015 MCAS Tanker Collision
50. Davis, ca - Wye VOCs
51. Deloge, mo - Big River Mine Tailings Superfund Site
52. Denison, tx - June 5, 2012 Derailment
53. Denison, tx - Tie Plant Waste Storage 2
54. Denver, co - Burnam Yard 2016 Site Assessment
55. Denver, co - Diesel Plume at 6th and Osage Street
56. Denver, co - North Yard Fueling Facility
57. Des Moines, ia - Fueling Facility - Bell
58. Dillon, mt - June 29, 2015 Car Accident
59. Dolores, ca - Fueling Facility
60. Dunsmuir, ca - North Fueling Facility
61. Dupo, il - MP Yard
62. East St. Louis, Il - A & S North Alcoa Property
63. El Paso, tx - Former Oglebay-Norton Lease Site
64. El Paso, tx - March 4, 2011 Diesel Release
65. El Paso, tx - Tower 196 Fueling Facility
66. Elko, nv - MP 555.5 TPH Release
67. Escanaba, mi - Tie Treating
68. Estherville, ia - Fueling Facility
69. Eunice, la - Derailment
70. Eureka, ca - Waterfront Lease
71. Evansville, in - EVCBA Litigation
72. Flatonia, tx - October 1, 2015 Crossing Accident
73. Fort Scott, ks - Double Circle Farm Supply Site
74. Fort Worth, tx - August 12, 2015 Locomotive Derailment
75. Fort Worth, tx - Centennial Yard
76. Fort Worth, tx - January 2, 2016 Locomotive Fuel Release
77. Fort Worth, tx - Jay's Salvage
78. Fort Worth, tx - July 16, 2015 Locomotive Fuel Release
79. Freeman, wa - Cenex Harvest Lease Site
80. Fremont, ca - Derailment Warm Springs II
81. Fremont, ne - DeBruce Grain Property

82. Galva, ks - September 25, 2014 Derailment
83. Galveston, tx - Wharves Lease Site
84. Gary, in - Gary Development Landfill
85. Gibsland, la - Wood Energy Tie Disposal
86. Glendale, ca - Glendale NPL
87. Goshen, ca - Goshen Junction VOCs
88. Granby, co - Former Ehnle Bulk Oil Facility
89. Grand Island, ne - NE Solvents Company 1200 Highway 30 East
90. Grand Junction, co - November 16, 2015 Fuel Line Release
91. Green River, wy - Trona Dump
92. Hays, ks - Janzen Oil East Folder 207-35
93. Henderson, tx - Rusk County Rail District Property Sale
94. Herington, ks - Sulfuric Acid Release - Enforcement Support
95. Hermiston, or - August 1, 2014 Derailment
96. Hinkle, or - July 23, 2014 Derailment
97. Hoisington, ks - Roto-Mix
98. Houston, tx - Edwards Street Litigation
99. Houston, tx - July 1, 2015 Sodium Hydrosulfide Release
100. Houston, tx - Sutherland Lumber
101. Houston, tx - USOR Superfund Site
102. Huron, ca - Escamilla and Sons Lease Site
103. Huron, sd - Former CNW Yard
104. Huron, sd - Former Pintsch Gas Facility
105. Joppa, il - Reilly Tar Tie Treating
106. Kansas City, ks - Doepke Holliday Dump
107. Kansas City, ks - Former Armstrong Yard Diesel Shop
108. Kansas City, ks - Glen Park Yard
109. Karnes City, tx - Former Bulk Oil Lease 1566-49 - 2
110. Keddie, ca - November 25, 2014 Derailment
111. Kingfisher, ok - Derailment
112. Kosse, tx - April 6, 2014 Derailment
113. Lake Charles, la - Tank Car PCE Release - Litigation Support
114. Lafayette, la - RCRA Citizen Lawsuit
115. Laramie, wy - Fueling Facility
116. Las Vegas, nv - Parcel 5 Soil Remediation
117. Lathrop, ca - RCCI Property Purchase
118. Lawtell, la - August 4, 2013 Derailment
119. Leadville, co - California Gulch, Slag
120. Long Beach, ca - July 22, 2015 Petroleum Pipeline Release
121. Los Angeles, ca - J-Yard
122. Los Angeles, ca - LATC
123. Los Angeles, ca - LATC Bozek Property
124. Los Angeles, ca - LATC UST
125. Los Angeles, ca - Lease Site - Cornfield II
126. Los Angeles, ca - MTA West Santa Ana Branch
127. Madison, wi - Former Spectrum Lease Site
128. Marfa, tx - Howard Petroleum Lease Site
129. Marshall, tx - Blanche Street Bridge
130. Marshall, tx - South Washington Avenue Property
131. Marshalltown, ia - Fueling Facility
132. Marysville, ks - Fueling Facility
133. Maxwell, ca - Lease Site - Barber Cashew II
134. McAlster, ok - Scrap Metal Lease Site
135. McNary, tx - Valentine Subdivision Double Track
136. Mentone, ca - Mentone-Crafton Protective Association
137. Mer Rouge, la - October 5, 2014 Derailment
138. Milpitas, ca - Auto Facility Oil Recovery System
139. Mira Loma, ca - Hadley Auto UST
140. Momence, il - November 21, 2005 Derailment
141. Monterey Park, ca - Operating Industries Inc.
142. Monterey, ca - Monterey Harbor Sediments
143. Mountain View, ca - Montwood VOCs (Former Subsidiary)
144. Mt. Vernon, il - Creosote Forest Products
145. Nampa, id - November 13, 2008 Oil Release
146. Navasota, tx - June 23, 2014 Derailment
147. Niles, ca - Crist Oil Company
148. Nisqually, wa - May 16, 2007 Derailment on BNSF Trackage
149. Norden, ca - Snow Shed
150. North Little Rock, ar - Baring Cross Tanks - 2
151. North Little Rock, ar - Mainline Fueling Facility May 2007
152. North Platte, ne - Buffalo Bill Overpass
153. North Platte, ne - Concrete Box Culvert at Lift Station 2
154. North Platte, ne - Diesel Release School Yard Track
155. North Platte, ne - Diesel Shop Fuel Line
156. North Platte, ne - Diesel Shop Tunnels
157. North Platte, ne - Westbound Fueling
158. Northlake, il - West Lake Street Property
159. Oakland, ca - 47th Ave. Lease
160. Oakland, ca - 700 73rd Avenue
161. Oakland, ca - 744 High Street
162. Oakland, ca - January 18, 2016 Locomotive Fuel Release
163. Oakland, ca - March 26, 2015 Locomotive Fuel Release
164. Oakland, ca - Storm Drain Response
165. Odessa,tx - July 19, 2015 Sulfuric Acid Spill
166. Oelwein, ia - AST-UST
167. Oelwein, ia - Fauser Oil Lease Properties
168. Ogden, ut - Former Ice House Building Fire
169. Ogden, ut - Former Lease Site 21790-02
170. Ogden, ut - January 28, 2016 Diesel Release
171. Oroville, ca - WP Yard
172. Osawatomie, ks - Former MP Yard

173. Osawatomie, ks - Fueling Facility & Shop
174. Palestine, tx - Car Shop Blasting Sand
175. Pando, co - Derailment - Soda Ash II
176. Parker ks – January 4, 2016 Derailment
177. Pendleton, or - March 29, 2015 Diesel Fuel Release
178. Phoenix, az - Motorola Superfund Site
179. Phoenix, az - Roosevelt Irrigation District Litigation
180. Phoenix, az - Walker Power System Site
181. Picacho, az - Former Bunker Oil UST
182. Plainville, ks - Plainville PWS # 1 Site
183. Pleasant Hill, ca - Hookston/Helix Property
184. Pleasanton, tx - Red Barn Agrichem
185. Pocatello, id - Compliance Schedule Order
186. Pocatello, id - January 30, 2016 Derailment
187. Pocatello, id - Main Line Fueling Facility
188. Portland, or - Brooklyn Yard Former Oil Pipeline
189. Portland, or - Portland Harbor NPL Site
190. Portola, ca - Former Fueling Facility
191. Portola, ca - January 2, 2016 Locomotive Fuel Release
192. Proviso, il - January 7, 2015 Diesel Release
193. Pueblo, co - 11/30/2006 WWTP Tank Failure
194. Rawlins, wy - Fueling Facility
195. Redwood City, ca - December 2, 2011 Locomotive Fuel Release
196. Reisor, la - September 8, 2105 Locomotive Fuel Release
197. Ridgefield, wa - Pacific Wood Treating
198. Riverton, wy - Tie Treating Plant
199. Rock River, wy - Trona Release
200. Roseburg, or - COPR Asbestos Notification
201. Roseport, mn - Tie-up Track
202. Sacramento, ca - Bannon Street Fill
203. Sacramento, ca - Blue Diamond Growers Litigation
204. Salem, or - September 12, 2014 Diesel Release
205. Salina, ks - Missouri Pacific Railroad Depot
206. Salina, ks - Service Track
207. Salinas, ca - Former Fueling Facility
208. Salt Lake City, ut - March 10, 2015 Northwest Oil Canal Incident
209. San Antonio, tx - East Yard Diesel Shop
210. San Antonio, tx - September 20, 2015 Diesel Release
211. San Francisco, ca - 25th Street Pier
212. San Jose, ca - Chestnut Street - 2
213. San Jose, ca - Lenzen Yard - PC JPB Maintenance Facility
214. San Mateo, ca - Former Dumbarton ROW
215. San Simon, az - Bunker C Vault II
216. Santa Barbara, ca - Casmalia Resources
217. Santa Barbara, ca - Plains Oil Pipeline Release
218. Santa Fe Springs, ca - Omega Chemicals Superfund
219. Santa Rosa, ca - 109 Chestnut Street
220. Santa Rosa, ca - 1105 Briggs Avenue
221. Santa Rosa, ca - 4th St and 6th St UST
222. Santa Rosa, ca - West Coast Metals
223. Schulenburg, tx - June 15, 2009 Derailment
224. Seattle, wa - Harbor Island NPL
225. Seattle, wa - Lower Duwamish Waterway NPL Site
226. Sidney, il - May 2, 2015 Locomotive Fuel Release
227. So. San Francisco, ca - 69 South Linden Avenue
228. So. San Francisco, ca - Fueling Tracks
229. South Pekin, il - Fueling Facility
230. Sparks, nv - Sparks Solvent/Fuel Site
231. St. Louis, mo - Thompson Chem. Lease
232. Stockton, ca - Peninsula Property Polanco Action
233. Stockton, ca - Southpointe Property Polanco Action
234. Storrie, ca - June 30, 2007 Derailment
235. Sulphur, la – Citgo Siding
236. Tacoma, wa - August 28, 2015 Diesel Release
237. Tacoma, wa - September 2, 2015 Locomotive Oil Release
238. Tacoma, wa - Thea Foss Waterway NRD
239. Tekoa, wa - Former Roundhouse Property
240. Tekoa, wa - Tekoa Br. Abandonment - 2
241. Texarkana, tx - September 8, 2015 Sideswipe Collision
242. Texarkana, tx - Swamp Poodle Creek Fuel Oil Seep
243. Topeka, ks - SE Jefferson and Sixth Streets 2
244. Torrance, ca - Plaza Del Amo
245. Tracy, ca - Maintenance Facility
246. Tracy, ca - Texaco - Gravel Pit
247. Tracy, ca - Texaco Renown
248. Trentwood, wa - Aluminum Dross II
249. Troutdale, or - Potential Disposal Sites
250. Tucson, az - 31st and 34th Street Pipeline Leaks
251. Tucson, az - Fueling Facility, 22nd Street
252. Tyler, tx - Abandoned Tie Pile
253. Tyler, tx - Tyler Fertilizer
254. Ukiah, ca - NWP Option Property
255. Various, az - Arizona Former Bunker Vault Removal Program
256. Various, az - Arizona Post Remediation Care Program
257. Various, il - Abandoned Tie Piles
258. Various, ks - Kansas Petroleum Tank Fund
259. Various, va - Asarco Litigation
260. Various, va - Asbestos Abatement Non Capital
261. Various, va - Data Management
262. Various, va - Former Bunker Oil Vault Program
263. Various, va - Fuel Spill Response
264. Various, va - General Incidence Response - Non operating
265. Various, va - General Incidence Response - Operating

266. Various, va - Laboratory Invoices
267. Various, va - Lease Site Environmental Review Program
268. Various, va - Real Estate Support
269. Various, va - Road Bed Program
270. Various, va - System Well Management 2
271. Various, va - Waste Disposal Facility Evaluation
272. Various, va - Western States Post Remediation Care Program
273. Vernon, ca - September 25, 2013 Derailment
274. Vineyard, ut - Ironton Branchline Sale
275. Waco, tx - Bellmead Yard
276. Watsonville, ca - Fueling Facility
277. Watsonville, ca - Granite Construction
278. Weed, ca - Milepost 369.45 UST
279. Wendover, nv - Old Auto Rack Derailment
280. West Covina, ca - BKK Corporation Landfill
281. Whittier, ca - Brea Chemical Industrial Lead
282. Wichita, ks - 29th and Grove
283. Wichita, ks - HRI (USPCI) Facility
284. Wichita, ks - NIC Plume
285. Wichita, ks - UST 1st and Waco
286. Willits, ca - NWP Option Property
287. Winterhaven, ca - November 1, 2014 Derailment
288. Wister, ca - MP 647.87 UST
289. Woolridge, mo - 1991 Derailment Site
290. Worthington, mn - January 16, 2015 Diesel Release
291. Worthington, mn - Oil Seep
292. Yates Center, ks - Former Bulk Fuel Facility
293. Yuba City, ca - 400 Bridge Street Polanco Action
294. Yuba City, ca - Yuba Industrial Lead - 2
295. Yukon, ok - September 20, 2015 Derailment
296. Yuma, az - Fueling Facility - Dieselville

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INDEPENDENT ACCOUNTANTS' REPORT ON APPLYING AGREED-UPON PROCEDURES

Union Pacific Corporation
Omaha, Nebraska

We have performed the procedures included in the Code of Federal Regulations (CFR) Title 40, Part 264, Section 143 (40 CFR 264.143), Section 145 (40 CFR 264.145), and Section 147 (40 CFR 264.147), which were agreed to by the Environmental Protection Agency, the Texas Commission on Environmental Quality, and Union Pacific Corporation, solely to assist the specified parties in evaluating Union Pacific Corporation's compliance with the financial test option as of December 31, 2015, included in the accompanying letter dated March 2, 2016, from Mr. Robert M. Knight, Chief Financial Officer of Union Pacific Corporation addressed to the Texas Commission on Environmental Quality. Management is responsible for Union Pacific Corporation's compliance with those requirements. This agreed-upon procedures engagement was conducted in accordance with attestation standards established by the American Institute of Certified Public Accountants. The sufficiency of these procedures is solely the responsibility of the parties specified in this report. Consequently, we make no representation regarding the sufficiency of the procedures described below either for the purpose for which this report has been requested or for any other purpose.

The procedures that we performed and related findings are as follows:

1. We compared the amount included in item 5, *Tangible net worth*, under the caption Alternative II in the letter referred to above with the corresponding amount derived from the accounting records supporting the audited consolidated financial statements of Union Pacific Corporation as of and for the year ended December 31, 2015, on which we have issued our report dated February 5, 2016, and after rounding, noted that such amount was in agreement.

2. We recomputed from, or reconciled to, the accounting records supporting the consolidated financial statements referred to in procedure 1 the information included in item 6, *Total assets in the U.S.*, and item 9, *Are at least 90% of firm's assets located in the U.S.*, under the caption Alternative II in the letter referred to above and noted no differences.

We were not engaged to, and did not, perform an audit, the objective of which would be the expression of an opinion on the accompanying letter dated March 2, 2016, from Union Pacific Corporation referred to above. Accordingly, we do not express such an opinion. Had we performed additional procedures, other matters might have come to our attention that would have been reported to you.

This report is intended solely for the information and use of the board of directors and management of Union Pacific Corporation, the Environmental Protection Agency, and the Texas Commission on Environmental Quality, and is not intended to be and should not be used by anyone other than these specified parties.

Deloitte & Touche LLP

March 15, 2016

Union Pacific Corporation
Financial Assurance Filing in 2016
For the year ended Dec. 31,

	2015	2014
Total Assets	54,600,497,183	52,716,353,960
Less MKT Goodwill	49,699,000	49,699,000
Total Tangible Assets	54,550,798,183	52,666,654,960
Total Liabilities	33,898,021,812	31,526,818,122
Tangible Net Worth	20,652,776,371	21,139,836,838

IX. Releases From Solid Waste Units And Corrective Action

The Preliminary Review Checklists are attached separately in the format required in Section IX.C.

The Texas Solid Waste Disposal Act, 30 TAC 335.167, 40 CFR 270.14(d) and Section 3004(u) of the Hazardous and Solid Waste Amendments of 1984 (HSWA) require that each hazardous waste management permit application review shall address corrective action for all releases of hazardous waste and hazardous constituents listed in 40 CFR 261, Appendix VIII, 40 CFR Part 264, Appendix IX, and/or other constituents of concern from any solid waste management unit (SWMU) and/ or Areas of Concern (AOCs) at a facility, regardless of the time at which waste was placed in such unit.[5] Current EPA interpretation of this requirement has resulted in a Corrective Action process that begins with a RCRA Facility Assessment (RFA) to determine if corrective action is necessary.

The first step in the RFA is the development of a Preliminary Review (PR) from all available documentation for a facility (including but not limited to all facility documents, Part A, and Part B of the permit application, TCEQ correspondence files and inspection reports, etc.). The PR compiles available information on every SWMU and/or AOC that has ever existed at the facility. A unit checklist is completed for each SWMU and/ or AOC. On a unit-by-unit basis, the PR may recommend no further action for:

- well-designed and well-managed units;
- units that have not managed hazardous wastes or wastes containing hazardous constituents;
- units already under corrective action by enforcement order; or
- units scheduled to be addressed in a compliance plan.

In addition, the unit checklists are summarized in a Facility Checklist. If there is a known release or potential for a release of hazardous waste or hazardous constituents from a unit/area, the PR may recommend a RCRA Facility Investigation (RFI), or an Affected Property Assessment (APA), if 30 TAC Chapter 350, Texas Risk Reduction Program (TRRP) applies, to determine the extent of the release for future corrective action, or stabilization as an appropriate and immediate corrective action.

The second step is a Visual Site Inspection (VSI) of the entire facility. The RFA is the combination of the PR and VSI documentation and any sample results. The RFA process should be scheduled so as to be completed during the latter stages of the Technical Review process or no later than one month in advance of the preparation of an initial draft permit for the facility. The RFA includes recommendations for whether further investigation or corrective action is warranted.

The requirements for an RFI or any other corrective action will be included in the permit, in the associated compliance plan which is mandatory for facilities with known groundwater contamination, or pursuant to 40 CFR 270.14(d)(3), the applicant may be required to start the RFI or other corrective action before the permit is issued. The RFI shall comply with all the applicable items contained in the U.S. EPA publication EPA/520-R-94-004, OSWER Directive 9902.3-2A, RCRA Corrective Action Plan (Final), May 1994, unless an alternate investigation approach is approved by the Executive Director. An RFI workplan may typically include a soil boring program, installation of monitoring wells, and sampling and analysis for 40

[5]For the purposes of HSWA Corrective Action, a SWMU may include, but is not limited to, any landfill, surface impoundment, land treatment unit, waste pile, underground injection well, incinerator, boiler, industrial furnace, tank, container storage area, drip pad, containment building, miscellaneous unit; any units exempt from hazardous waste permitting requirements, such as wastewater treatment units, elementary neutralization units, totally enclosed treatment units, waste recycle/reuse units, and 90-day accumulation time units; or process units or areas which may have routine and/or systematic releases to the environment (e.g., process drainage ditches or product storage tanks).

CFR 261 Appendix VIII and 40 CFR 264 Appendix IX hazardous constituents for surface soils, subsurface strata, surface water, groundwater, and/or air.

The permittee shall perform the RFI or APA and report the results. Corrective Action under 30 TAC Chapter 350 consists of an APA, determination of protective concentration levels, selection of a remedy standard (if necessary), development and implementation of a response action (if necessary), and submittal of required report according to 30 TAC Chapter 350.

If the RFI report indicates releases of hazardous waste or hazardous constituents for SWMUs and/or AOCs that have been grandfathered under 30 TAC Chapter 335 Subchapters A and S, Corrective Action shall consists of, if necessary, Interim Corrective Measures, Baseline Risk Assessment (BLRA)/Corrective Measures Study (CMS) Report, and Corrective Measures Implementation (CMI).

For grandfathered SWMUs and/or AOCs, the permittee may continue to complete the Corrective Action requirements under 30 TAC Chapter 335, Subchapter A and S, provided the permittee complies with the notification and schedule requirements pursuant to 30 TAC 335.8 and 350.(2)(m).

This report shall evaluate the risk, identify and evaluate corrective measure alternatives, and recommend appropriate corrective measure(s) to protect human health and the environment. The BLRA/CMS Report shall address all of the applicable items in 30 TAC 350, 30 TAC 335 Subchapter S, and the U.S. EPA publication EPA/520-R-94-004, OSWER Directive 9902.3-2A, RCRA Corrective Action Plan (Final), May 1994.

Upon approval of the BLRA/CMS Report by the TCEQ, the permittee shall submit a CMI Workplan to address all of the items for CMI Workplan contained in the U.S. EPA publication EPA/520-R-94-004, OSWER Directive 9902.3-2A, RCRA Corrective Action Plan (Final), May 1994. For projects conducted under TRRP, the risk assessment process shall be addressed in the Affected Property Assessment Report (APAR), and the evaluation of corrective measures shall be conducted as part of the remedy standard selection process provided in the Response Action Plan (RAP). If the CMI or RAP does not propose a permanent remedy, then a CMI Workplan or RAP shall be submitted as part of a new compliance plan application or as a modification/amendment application to an existing compliance plan. The workplan or RAP shall contain detailed final engineering design, monitoring plans, and schedules necessary to implement the selected remedy. Implementation of the corrective measures shall be addressed through a new and/or a modified/amended compliance plan. Upon installation of a corrective action system based upon the approved CMI Workplan or RAP, the permittee shall submit a CMI Report or RAP which includes as-built drawings of the corrective action system. To report the progress of the corrective measures, the permittee shall submit periodic CMI Progress Reports or Response Action Effectiveness Reports to the TCEQ in accordance with the schedule specified in the compliance plan. Upon completion of the corrective action requirements, the permittee shall submit CMI Report or Response Action Completion Reports for review and approval.

Please note that the applicant/permittee may perform voluntary corrective action, stabilization, or "interim measures" at any time prior to or during the RFA/RFI/CMS/CMI or the APAR/RAP process without prior TCEQ approval. The TCEQ strongly supports these actions when undertaken to mitigate releases or reduce or minimize exposure and releases to human health and the environment.

A. Preliminary Review Checklists

For all facility SWMUs (as defined previously) and/or AOCs, complete the accompanying forms entitled "Preliminary Review Facility Checklist" and "Preliminary Review Unit Checklist". Make additional copies as necessary. The following instructions are provided in same format as these forms:

Preliminary Review Facility Checklist Instructions

Facility Checklist - On the form provided, supply the following information:

Fill out the information block at the top of the page (the reviewer space should remain blank for the TCEQ authorized agent).

Facility: _____ City: _____

ISW Reg. No:_____ Date:_____

Permit No: _____ Reviewer:_____

EPA ID No: _____

Waste Management Units:

1. RCRA Regulated Units: List all units that received hazardous wastes after July 26, 1982 or for which closure was certified after January 26, 1983 with the appropriate information under the three provided column headings as explained in the Unit Checklist instructions. [40 CFR 264.90(a)(2)]
2. Solid Waste Management Units, and/or Areas of Concern (AOC): List all remaining SWMUs and/or AOCs.

Reviewed Documents:

1. Enter the appropriate information for sub-items 1-6, including document dates (item 6 should include company files).

Summary:

1. Provide an overall summary of the results of this Preliminary Review noting units and areas of concern.

Recommended Actions:

1. Summarize the Unit Checklist Recommended Actions and list those units recommended for further investigation including appropriate Unit No.

Preliminary Review Unit Checklist Instructions (Continued)

Unit Checklist - On the form provided, supply the following information for EACH unit or area of concern:

A. Waste Management Unit: Enter SWMU and/or AOC name and facility designated number (e.g., Tank 101)
B. N.O.R. No.: enter TCEQ Notice of Registration (N.O.R.) Number or, if unassigned, a letter designation (i.e., A-Z)
C. Description: enter type of unit (e.g., above-grade processing tank) and Process Code as listed below:

Process Types Table

Process Code	Unit Type	Process Code	Unit Type
	Disposal	T82	Lime Kiln
D79	Injection Well	T83	Aggregate Kiln
D80	Landfill	T84	Phosphate Kiln
D81	Land Application	T85	Coke Oven
D83	Surface Impoundment - Disposal	T86	Blast Furnace
D99	Other Disposal	T87	Smelting, Melting, or Refining Furnace
	Storage	T88	Titanium Dioxide Chloride Process Oxidation Reactor
S01	Container	T89	Methane Reforming Furnace
S02	Tank - Storage	T90	Pulping Liquor Recovery Furnace
S03	Waste Pile	T91	Combustion Device Used in Recovery of Sulfur Values from Spent Sulfuric Acid
S04	Surface Impoundment - Storage	T92	Halogen Acid Furnace
S05	Drip Pad	T93	Other Industrial Furnaces Listed in 40 CFR 260.10
S06	Containment Building - Storage	T94	Containment Building - Treatment
S99	Other Storage		Miscellaneous (Subpart X)
	Treatment	X01	Open Burning/Open Detonation
T01	Tank - Treatment	X02	Mechanical Processing
T02	Surface Impoundment - Treatment	X03	Thermal Unit
T03	Incinerator	X04	Geologic Repository
T04	Other Treatment	X99	Other Subpart X
T80	Boiler		
T81	Cement Kiln		

D. Dates of Operation: enter the date the unit was placed into service and any other dates the unit changed status (active, inactive, closed, post-closure) with the appropriate status designation.

E. Wastes Managed:

List all solid wastes ever managed in the unit and include the TCEQ NoR waste #, EPA Hazard Codes, and EPA waste codes. For each waste, list any hazardous constituent listed in 40 CFR 261 Appendix VIII and 264 Appendix IX, as appropriate.

F. Evidence of Release:

Completely describe the release, including time frame, waste amount, to what media, and any corrective measures taken.

G. Pollutant Dispersal Pathways:

Completely describe the possible and actual run-off pathways (i.e., to which tributary, creek, river, and bay or through subsoil to which aquifer with groundwater flow gradient, speed, and direction and any discharge point).

H. Summary:

Provide complete unit description including unit type, elements of construction, location, age, condition, dimensions, size, capacity (i.e., gallons, square feet, cubic yards, etc.), and potential for release.

I. Recommended Action:

Recommend No Further Action, Stabilization (interim measures), or Further Investigation and justify. Note, corrective action under another authority is justification for No Further Action.

Preliminary Review Unit Checklist

Facility: _____ City: _____

ISW Reg No: _____ Date: _____

Permit No: _____ Reviewer: _____

EPA ID No: _____

A. Waste Management Unit:
B. NoR No:
C. Description:
D. Dates of Operation:
E. Wastes Managed:
F. Evidence of Release:
G. Pollutant Dispersal Pathways:
H. Summary:
I. Recommended Action:

B. Appendices to Preliminary Review (PR)

The PR should also include Appendices I-IV to correspond to the Roman numerals in the Unit Checklist:

Appendix I. FACILITY and SWMU LOCATION MAPS

- Regional Location Map
- Site Location Map
- Facility SWMU Map - Use the Notice of Registration (NoR) number to show the location of each unit on a replicate of the topographic map required in Section V.A.1 of this application. Also, please note that the term "facility" includes the entire contiguous property under the control of the owner or operator, which in most cases is the area shown as the legal description of the site in the facility's Part A permit application.

Appendix II. WASTES MANAGED

- List all wastes managed and 40 CFR 261 Appendix VIII and 40 CFR 264 Appendix IX hazardous constituents. Provide pertinent health, safety, and risk data on each.

Appendix III. EVIDENCE of RELEASE

- Provide any applicable documentation on a release. Provide a map of release locations, SWMU identification, and paths traveled.

Appendix IV. POLLUTANT DISPERSAL PATHWAYS

- Provide a facility, local, and regional map identifying all possible and eventual pathways in which a release from any unit could or did travel. Provide a facility general cross-section to illustrate vertical pathways and lateral movements in groundwater, including discharges (i.e., seeps, creeks, etc.).

C. Preliminary Review Submittal Format

The PR should be bound with a cover page and contain a Table of Contents with the Facility Checklist entered first followed by all the Unit Checklists in unit NoR numerical order and alphabetical order.

IX. RELEASES FROM SOLID WASTE UNITS AND CORRECTIVE ACTION

RELEASES FROM SOLID WASTE UNITS AND CORRECTIVE ACTION
PART B PERMIT APPLICATION
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

TABLE OF CONTENTS

LIST OF APPENDICES

IX.A PRELIMINARY REVIEW FACILITY CHECKLIST

Facility: Houston Wood Preserving Works

City: Houston, Texas

ISW Reg No: 31547

Date: August 27, 2014

Permit No: 50343

Reviewer:

EPA ID No: TXD000820266

I. Waste Management Units:

1. RCRA Regulated Units:

NOR No.	Description	Status
001/SWMU 1	Closed Surface Impoundment	Post Closure Care
002/SWMU 7	Tank Car	Inactive
003	Sub-surface Tank	Inactive
004	Container Storage Area	Active (<90 day unit)
005	Waste Pile	Inactive
006	Miscellaneous Storage Containers	Closure Request

2. Solid Waste Management Units (SWMU)/Areas of Concern (AOC):

The information for the Solid Waste Management Units (SWMU) and Areas of Concern (AOC) included in Section IX were provided in the "RCRA Facility Assessment Report, Southern Pacific Transportation Company" (PRC, 1993) prepared for the U.S. Environmental Protection Agency dated October 1993.

Unit No.	Description	Status
SWMU 1/NOR 001	Surface Impoundment Area which is a closed RCRA-regulated surface impoundment	Post Closure Care
SWMU 2	Northern and Southern Drainage Ditches	Inactive
SWMU 3	Oil Drum Storage (ODS) Building	Inactive
SWMU 4	Recent Process Area	Inactive
SWMU 5	Original Process Area	Inactive
SWMU 6	Water Treatment and Boiler System	Inactive
SWMU 7/NOR 002	Tank Car Storage Area	Inactive
SWMU 8	Aboveground Storage Tank Area	Inactive
SWMU 9	Location of Former UST No. 44-023-05	Inactive
SWMU 10	Location of Former Sap Water Treatment Tank	Inactive
SWMU 11	Oil Water Separators	Inactive
SWMU 12	Railroad Tie Storage Area	Inactive
AOC 1	Diesel Storage Tank	Inactive
AOC 2	Hose House	Inactive
AOC 3	Contaminated Portion of City Water Line	Inactive
AOC 4	Location of Former Incinerator	Inactive
AOC 5	City Storm Sewer	Inactive

Unit No.	Description	Status
AOC 6	Inactive Wastewater Lagoon	Inactive
AOC 7	Location of Former UST No. 44-023-21	Closed
AOC 8	Former Fueling ASTs and Wastewater Lagoons	Inactive

II. Reviewed Documents:

1. RCRA: Part A X
Part B X
Permit X

2. Other Information:

Environmental Resources Management (ERM), 2000. *Affected Property Assessment Report (APAR), Union Pacific Railroad Houston Wood Preserving Works.* June 10.

ERM, 2003a. *RCRA Part A and Part B Permit Application, Renewal and Amendments, Union Pacific Railroad Houston Wood Preserving Works.* Prepared for Union Pacific Railroad Company, December 22.

ERM, 2003b. *Compliance Plan Application and Amendments, Union Pacific Railroad Houston Wood Preserving Works.* Prepared for Union Pacific Railroad Company, December 22.

ERM, 2004. *Revised Affected Property Assessment Report (APAR), Union Pacific Railroad Company, Houston Wood Preserving Works.* June 10.

Geo Associates, 1991. *Report of Soil Sampling, Closed Surface Impoundment, Southern Pacific Transportation Company.*

Pastor, Behling & Wheeler, LLC (PBW), 2009. *Affected Property Assessment Report Addendum, Union Pacific Railroad Company Houston Wood Preserving Works.* March 29.

Pastor, Behling & Wheeler, LLC (PBW), 2011. *Affected Property Assessment Report Addendum, Union Pacific Railroad Company Houston Wood Preserving Works.* March 25.

PRC Environmental Management, Inc. (PRC), 1993. *RCRA Facility Assessment Report, Southern Pacific Transportation Company, Houston, Texas, TXD 000820266.* October.

Rollins Environmental Services (FS) Inc., 1984. *Final Report on Closure Plan of RCRA Facility #31547.* April.

Southern Pacific Transportation Company (SPTCo), 1991. *Part B Permit Application – Post Closure Care and Compliance Plan for the Closed Surface Impoundment.* Volumes I-III. May 13.

SPTCo, 1993. *Response to PREC and the Environmental Protection Agency (EPA) Request for Information on SPTCo Liberty Road Facility, Houston, Texas.* September 9.

TCEQ, 2005. *Compliance Plan No. 50343.* June 10.

TCEQ, 2005. *Permit For Industrial Solid Waste Management Site, Permit No. 50343, Union Pacfic Railroad Company*. June 10.

III. Summary:

Based on the conclusions of a RCRA Facility Assessment (RFA) completed on behalf of the U.S. EPA (PRC Environmental Management, Inc., 1993), 11 solid waste management units (SWMUs) and six areas of concern (AOCs) were identified as subject to further investigation. On June 20, 1994, a RCRA Permit (Permit No. HW-50343-000) was issued to Southern Pacific Transportation Company (SPTCo), requiring completion of a RCRA Facility Investigation (RFI) for 10 of the SWMUs and the six AOCs to determine whether constituents of interest (referred to as constituents of potential concern in this report) have been released into the environment. The Compliance Plan (Compliance Plan No. CP-50343-000) was also issued to SPTCo in 1994 requiring completion of an Extent of Contamination (EOC) investigation in the area of SWMU No. 1, the closed surface impoundment. SWMU No. 1 is the only regulated unit at the facility.

Groundwater monitoring has taken place on a semi-annual basis since 1994. The site is currently in year 20 of the 30 years required for post-closure care.

IV. Recommended Action:

No further corrective action is recommended for the individual SWMUs and AOCs since the entire facility is entering into corrective action post-closure monitoring and will be regulated under the Compliance Plan. In order to accelerate the corrective action process at the UPRR HWPW Facility, a comprehensive site-wide approach to corrective action is proposed. The Site has been used for creosoting operations since 1899 with numerous operations at the Site over that time period. Historical material and waste handling practices have resulted in releases to soil and groundwater in many areas across the Site. These releases have resulted in commingled creosote dissolved-phase COC PCLE zones and creosote non-aqueous phase liquid (NAPL) that are not attributable to specific waste management units or areas of concern.

IX.A.1 PRELIMINARY REVIEW UNIT CHECKLIST – NOR 001/SWMU 1

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 27, 2014

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: 001/SWMU No. 1

B. Description: Landfill, D80

C. Dates of Operation: 1979-1982

II. Wastes Managed: Creosote-contaminated soil, sawdust, and tank bottoms.

III. Evidence of Release: No evidence of a release

IV. Pollutant Dispersal Pathways: Soil, groundwater

V. Summary: Solid Waste Management Unit (SWMU) 1 is an inactive surface impoundment (SI) and is a grass-covered section of land located at the southwest comer of the facility property. The SI is bordered on the southern side by an earthen berm, which is about 2 feet by 3 feet by about 80 to 100 feet long. The berm extends about 100 feet south of the southwest corner of the SI. A chain-link security fence is located along the northern and western margins of the SI. The original dimensions of the unit were about 180 feet by 106 feet at the surface, extending to a depth of about 7 feet bgs (SPTCo, 1991). Based on these dimensions, the SI would have a capacity of 133,560 cubic feet (about 4,950 cubic yards). According to SPTCo facility representatives, a clay liner was installed during the original construction of the SI. No information was available concerning the thickness and engineering properties of the liner. According to SPTCo representatives, the SI was built in 1979 for the disposal of contaminated surface soils remediated from an adjacent low-lying ponding area (AOC 6). Surface soils from the ponding area were remediated in response to a fire in 1979 and the discovery of contaminated soils. Installation of the SI was based on an agreement with the Texas Department of Water Resources (TDWR) for disposal of the soils.

In 1984, SPTCo closed the SI by excavating the soils and materials contained within. The visual hazardous material was removed along with apparent contaminated soil. An additional 3-inches of soil was then removed. The area was then divided into 50-foot grids which were randomly selected for sampling. Between 10 and 15 grab samples not more than 6-inches deep were homogenized and analyzed for K001 listed waste parameters and polynuclear aromatic hydrocarbons (PAHs). When soil confirmation sample concentrations were lower than those of background samples, the excavated area was backfilled with compacted clay and a groundwater monitoring system was installed (Rollins, 1984).

In 1991, a series of six soil borings were drilled within the same six grid areas that were sampled during the 1984 closure operations (Geo Associates, 1991). Four samples were collected from each of the borings from the following zones: the surficial clay fill, between the clay fill and the uppermost sand, the uppermost sand, and below the uppermost sand unit. These samples were analyzed for BTEX, TPH and semi-volatiles.

Bis (2-ethylhexyl) phthalate was detected in two samples at concentrations well below the TCEQ Texas Risk Reduction Program (TRRP) Protective Concentration Limits (PCL). Xylene, ethylbenzene and toluene were also detected, but at concentrations well below the PCL. The 1991 soil sampling results indicated that the source of contamination had been removed by the 1984 closure activities (SPTCo, 1991).

In 1984, the facility then began investigating and monitoring the shallow ground water in the vicinity of the SI. Between 1984 and 1991, nine groundwater monitoring wells were installed in the upper zone, and three piezometers were installed in the lower permeable zone. Hydrogeological data collected from these wells and piezometers indicate hydraulic conductivity between the zones. Analytical data compiled from 1984 until 1991 indicated that benzene, toluene, naphthalene, 2,4-dimethylphenol, and phenol were the most frequently detected parameters and that naphthalene was the parameter detected at the highest concentrations.

The facility entered into post-closure care in 1994, updated in 2005, and groundwater monitoring has taken place on a semi-annual basis since that time. Analytical results are compared to the TRRP PCLs. Since 2006, constituent concentrations have been below their respective PCLs.

VI. Recommended Action: No further action recommended. The surface impoundment was closed in 1984 with all waste and contaminated soils removed, is in post-closure care and has been regulated under a post-closure care permit. Additionally, concentrations in groundwater have been below PCLs for sixteen consecutive semi-annual monitoring events (8 years). Therefore, it is recommended to cease all post-closure care activities including inspection and groundwater monitoring. Upon TCEQ approval, the existing monitoring wells for SWMU No. 1 will be plugged and abandoned.

IX.A.2 PRELIMINARY REVIEW UNIT CHECKLIST – NOR 002/SWMU 7

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 27, 2014

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: 002/SWMU 7

B. Description: Tank Car Storage Area, S02

C. Dates of Operation: Unknown

II. Wastes Managed: Sap wastewater and tank bottoms

III. Evidence of Release: Surface spillage documented

IV. Pollutant Dispersal Pathways: Soil

V. Summary: The tank car storage area was located in the northeast corner of the facility in the vicinity of the AST (SWMU 8). Two tank cars, each having a capacity of 12,500 gallons, were located on the tracks near Liberty Road. The cars were removed from the facility.

VI. Recommended Action: No further action recommended. Completion of soil response action objectives are documented in the RACR and approved upon issuance of the December 5, 2014 Permit Renewal application, and as revised November 3, 2015, and July 29, 2016.

IX.A.3 PRELIMINARY REVIEW UNIT CHECKLIST – NOR 003

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 27, 2014

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: 003

B. Description: Tank (sub-surface), S02

C. Dates of Operation: Unknown

II. Wastes Managed: Unknown

III. Evidence of Release: See NOR 002/SWMU 7

IV. Pollutant Dispersal Pathways: Soil

V. Summary: No information regarding the sub-surface tank is available. The tank was reported to be the vicinity of SWMU 7.

VI. Recommended Action: No further action recommended. The unit is addressed in the facility-wide corrective action detailed in the Compliance Plan.

IX.A.4 PRELIMINARY REVIEW UNIT CHECKLIST – NOR 004

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 27, 2014

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: 004

B. Description: Container storage area, S01

C. Dates of Operation: 1995-Present

II. Wastes Managed:

TCEQ Waste Code	EPA Waste Code	Waste Description
00029032	Non-haz	General refuse from office & site operations
04003011	Non-haz	Petroleum contaminated solids generated as part of corrective action work performed on-site.
14773012	Non-haz	Petroleum contaminated soils generated as part of site investigation and corrective action
14781011	Non-haz	Petroleum contaminated purge water generated as part of groundwater monitoring and investigation
14791012	Non-haz	Petroleum-affected purge water generated as part of groundwater monitoring and investigation
14804062	Non-haz	Plastic and used personal protective equipment generated as a result of monitoring well and/or soil sampling
14841012	Non-haz	Petroleum contaminated purge water generated as part of groundwater monitoring and investigation
0001301H	F034, K001	Soil generated primarily by the boring of monitor wells around the closed wood preserving operation surface impoundment.
0909101H	K001, F034	Aqueous Waste with low surfactants. Groundwater generated from drilling activities for investigative purposes.
0912489H	F034, K001	Creosote sludge, soil mixture generated as part of corrective action performed on-site.
0914101H	F034, K001	Groundwater generated from purging of various monitor wells for investigative purposes.
0915301H	F034, K001	Soil derived from the boring of monitor wells for investigative purposes.
09163081	Non-haz	Empty drums previously used to contain monitor well purge water
0917406H	K001	Plastic and used personal protective equipment generated as a result of monitor well and/or soil sampling.
09133192	Non-haz	Contaminated clothing & personal protective equipment generated from corrective action work performed on-site
0918219H	F034, K001, U051	Recovered creosote NAPL from groundwater monitoring wells

TCEQ Waste Code	EPA Waste Code	Waste Description
1481514H	D002	Drilling mud from boring monitor wells for investigative purposes
1482110H	D002	Purge water generated as part of groundwater monitoring and investigation
14835142	Non-haz	Drilling mud from boring monitor wells for investigative purposes

III. Evidence of Release: No evidence of a release

IV. Pollutant Dispersal Pathways: Soil

V. Summary: The container storage area is an approximately 25 by 18 foot concrete pad surrounded by chain-link fencing and is used as a temporary drum storage.

VI. Recommended Action: No further action recommended. No evidence of a release has been identified at the unit. However, the unit is within the larger SWMU 5 – Original Process Area where evidence of historical releases have occurred.

IX.A.5 PRELIMINARY REVIEW UNIT CHECKLIST – NOR 005

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 27, 2014

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: 005

B. Description: Waste Pile, S03

C. Dates of Operation: 1907-2010

II. Wastes Managed:

TCEQ Waste Code	EPA Waste Code	Waste Description
09024882	Non-haz	Waste rail ties generated from operation & maintenance of the railroad & are generated intermittently
09103072	Non-haz	Ferrous scrap metal generated from operation & maintenance of the railroad & is generated on an intermittent basis
09113072	Non-haz	Non-Ferrous scrap metal generated from operation & maintenance of the railroad & is generated on an intermittent basis

III. Evidence of Release: No evidence of a release.

IV. Pollutant Dispersal Pathways: Soil

V. Summary: Ferrous and non-ferrous scrap metal and waste rail ties generated from operation and maintenance of the railroad was generated on an intermittent basis. The location of NOR 005 is in the vicinity of SWMU 12. UPRR will no longer store these wastes at this unit.

VI. Recommended Action: No further action. This unit has not managed hazardous wastes or wastes containing hazardous substances and no evidence of a release was reported.

IX.A.6 PRELIMINARY REVIEW UNIT CHECKLIST – NOR 006

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 27, 2014

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: 006

B. Description: Miscellaneous Storage Containers, S99 (location unknown)

C. Dates of Operation: 1995-2006 (approximate)

II. Wastes Managed:

TCEQ Waste Code	EPA Waste Code	Waste Description
2012061	Non-haz	Waste oil generated from 4 fork lifts operating on-site

III. Evidence of Release: No evidence of a release

IV. Pollutant Dispersal Pathways: Soil

V. Summary: Waste oil generated at this unit was derived from fork lifts on the property which, at maintenance intervals, had oil pumped directly out of their crankcases by a commercial recycler. In a letter to the Texas Natural Resource Conservation Commission dated August 8, 1995, Edward Hurst, the Director of Environmental Compliance for Southern Pacific Lines explained that the commercial recycler pumped the oil directly into a recycling truck and it was immediately removed from the property. None of these activities ar performed at the Site and this waste code will be removed from the NOR.

VI. Recommended Action: No further action. This unit has not managed hazardous wastes or wastes containing hazardous substances and no evidence of a release was reported.

IX.A.7 PRELIMINARY REVIEW UNIT CHECKLIST – SWMU 2

Facility: Houston Wood Preserving Works

City: Houston, Texas

ISW Reg No: 31547

Date: August 27, 2014

Permit No: 50343

Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: SWMU 2

B. Description: Northern and Southern Drainage Ditches, D99

C. Dates of Operation: Unknown

II. Wastes Managed: Creosote-contaminated wastewater and residual naphtha

III. Evidence of Release: The ditches released creosote contaminants to the soil and the inactive wastewater lagoon.

IV. Pollutant Dispersal Pathways: Soil and surface water (historically, when in operation)

V. Summary: The Northern Drainage Ditch (NDD) is located at the northwest corner of the SI and runs northward toward Ranch and Kashmere Streets. The Southern Drainage Ditch (SDD) was a wood-lined trench which was formerly located along the south side of the process area. The SDD paralleled railroad tracks from the eastern to western side of the facility and began near the AST area (SWMU 8). Near the southwest comer of the facility, the ditch was routed below railroad tracks via PVC piping. The piping led to a natural drainage ditch and low-lying area near the southwest comer of the SI, known as the inactive wastewater lagoon (AOC 6). The natural drainage ditch flowed off site to the west eventually into Buffalo Bayou (>8,500 feet from the Site). For the purpose of worker safety, the facility filled in the wood-lined portion of the ditch along the southern facility boundary. The PVC piping was plugged below the tracks at the southwestern end of the facility. While surface water was historically identified as a release pathway in the RCRA Facility Assessment (PRC, 1984), it is no longer considered a pollutant dispersal pathway since the Facility is no longer in operation and these areas have been dismantled and/or regraded.

VI. Recommended Action: No further action recommended. Completion of soil response action objectives are documented in the RACR and approved upon issuance of the December 5, 2014 Permit Renewal application, and as revised November 3, 2015, and July 29, 2016.

IX.A.8 PRELIMINARY REVIEW UNIT CHECKLIST – SWMU 3

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 27, 2014

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: SWMU 3

B. Description: Oil Drum Storage (ODS) Building, S06

C. Dates of Operation: Unknown

II. Wastes Managed: Lubricating oil

III. Evidence of Release: No known release

IV. Pollutant Dispersal Pathways: NA

V. Summary: SPTCo representatives were uncertain of the exact location of the oil drum storage (ODS) building. It may have been at the location of the former power house building or at the repair and sign shop. The ODS building was used to store unused oil and lubricant products for the process machinery (SPTCo, 1993). No maintenance work was conducted in the ODS building.

No evidence of the former power house was observed during the Visual Site Inspection (VSI), and the area has been re-graded with gravel. The repair and sign shop consisted of a metal and wood building, about 125 by 50 feet, with concrete flooring. It housed spare parts, field equipment, and reflective signs used by the SPTCo railroad. No subgrade structures were observed inside or surrounding the building (PRC, 1993).

VI. Recommended Action: No further action. This unit reportedly did not manage hazardous wastes or wastes containing hazardous substances. The location of SWMU 3 is within the Original Process Area (SWMU 5), where historical releases likely occurred.

IX.A.9 PRELIMINARY REVIEW UNIT CHECKLIST – SWMU 4

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 27, 2014

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: SWMU 4

B. Description: Recent Process Area, T04

C. Dates of Operation: Started sometime between 1955 and 1962 until mid-1980s

II. Wastes Managed: Naphtha, creosote and extenders (bunker C, diesel fuel, styrene tar and used vehicle oil)

III. Evidence of Release: Visible staining of area soils and surface water were documented by TWC. Elevated levels of phenols, pH and oil and grease were released to the sanitary sewer. Air quality violations related to the retort cylinders were cited from 1978 to 1980.

IV. Pollutant Dispersal Pathways: Soils, surface water and air

V. Summary: The recent process area was used by the facility from the early 1960s until the early to mid-1980s. The area occupied about 3 acres in the northeast section of the facility. It consisted of (1) a process building that measured 150 by 50 feet, (2) four retort cylinders that measured about 125 by 12 feet, (3) one retort cylinder that measured about 60 by 12 feet, located next to the process building that is on the west side, and (4) a drip area next to the western side of the retorts. According to facility representatives, the retort cylinders were housed in a slightly depressed area that was covered with gravel. The retort cylinders were braced and kept above ground by concrete brackets. Crossties were brought in and out of the process area via railroad tracks. No structures currently exist in the process area. The area was regraded with limestone or caliche gravel and used as a laydown yard for steel and PVC piping and treated crossties until the early 1990s. A concrete foundation was observed in the vicinity of the former process building during the RCRA Facility Assessment (PRC, 1993). The west side of the foundation appeared to have contained a subsurface sump or work area. The remains of a concrete retaining wall (part of SWMU 8), about 3 feet tall by 1 foot wide, were observed around the southern and eastern ends of the process area.

VI. Recommended Action: No further action recommended. Completion of soil response action objectives are documented in the RACR and approved upon issuance of the December 5, 2014 Permit Renewal application, and as revised November 3, 2015, and July 29, 2016.

IX.A.10 PRELIMINARY REVIEW UNIT CHECKLIST – SWMU 5

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 27, 2014

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: SWMU 5

B. Description: Original Process Area, T04

C. Dates of Operation: 1911 through sometime between 1955 and 1962

II. Wastes Managed: Specific waste listing was not available but wastes would likely have been similar to those generated at the recent process area (SWMU 4) which include naphtha, creosote and extenders (bunker C, diesel fuel, styrene tar and used vehicle oil)

III. Evidence of Release: Subsurface soil contamination discovered during excavation of UST No. 44-023-05 (SWMU 9) was determined to have originated from this area. Staining observed below diesel storage tank (AOC 1) indicated historical releases within this area.

IV. Pollutant Dispersal Pathways: Soil

V. Summary: The original process area was located in the south-central portion of the facility west of the recent process area. The original process area consisted of (1) one retort cylinder, about 150 by 12 feet, located in a covered shed at the north side of the area, and (2) three retort cylinders, each about 125 by 12 feet, located in a covered shed at the south side of the area. Located between the two retort sheds were, from east to west, (1) the former power house building, (2) a 5 by 41 foot cylinder, three underground brick tanks (42, 43, and 46 feet in diameter), and two 20-foot diameter steel ASTs used for product storage and mixing operations. A 15-foot-diameter AST and a 10-by-20-foot sump were located north of the large retort shed. A 9 by 150 foot concrete catch basin was located on the east side of the large retort shed. According to SPTCo representatives, the original process area was in operation from about 1911 until 1955 or 1962. The original process area is now a gravel-covered area containing a train track, and former diesel storage tank (AOC 1), former location of UST No. 44-023-05 (SWMU 9), Oil Drum Storage Building (SWMU 3), and current Container Storage Area (NOR 004).

VI. Recommended Action: No further action recommended. Completion of soil response action objectives are documented in the RACR and approved upon issuance of the December 5, 2014 Permit Renewal application, and as revised November 3, 2015, and July 29, 2016.

IX.A.11 PRELIMINARY REVIEW UNIT CHECKLIST – SWMU 6

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 27, 2014

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: SWMU 6

B. Description: Water Treatment and Boiler System, T80

C. Dates of Operation: Unknown

II. Wastes Managed: Boiler and cooling tower blow-down

III. Evidence of Release: The following releases were documented from this unit: (1) Boiler condensate (ran off-site via surface runoff), (2) oily storm sewer discharge, and (3) discharges of boiler and cooling tower blowdown into the storm sewer.

IV. Pollutant Dispersal Pathways: Soil and surface water (historically when in operation)

V. Summary (PRC, 1993): SPTCo used the water treatment and boiler system to (1) treat and distill municipal water, and (2) generate steam used in heating the wood-treatment retort cylinders. Steam and heated water from the retort cylinders were cooled in a cooling tower prior to discharge. SPTCo representatives did not have specific information concerning the design or processes of the system, and the system is now inactive. According to SPTCo representatives, some of the buildings and equipment associated with the system have been removed and the area has been re-graded with gravel. During the VSI, PRC observed the treatment building, the former location of a water storage AST, and the former location of the boiler equipment. No other structures pertaining to the system were observed during the VSI. The treatment building is located north of the retort area (SWMU 4). It consisted of a metal building, about 40 by 20 feet with concrete flooring. The building was open along the south side and wooden pallet debris was observed covering the floor. According to SPTCo representatives, the building may have been used to house pump equipment.

Next to and east of the treatment building was a concrete tank enclosed in a metal building. The tank was rectangular, measuring about 30 by 15 feet. The tank was above ground. It had cinder block walls, about 3 feet tall by 1 foot wide. The tank opening was covered with wooden planking; rolls of chain-link fencing were stored on top. The view inside the tank was obscured, but standing water and wood debris were observed inside the tank. PRC could not determine whether the tank extended below grade. A 2- to 4-inch diameter pipe was observed extending from the south wall of the tank. A hard, white, granular accumulation of an unknown substance was observed around the open end of the pipe. SPTCo

representatives did not know the nature or cause of the accumulation and did not have any information concerning the function of the tank in the water treatment system.

A circular concrete foundation, about 25 feet in diameter, was observed next to and west of the treatment building. SPTCo representatives assumed that this was the location of a former water storage AST used in the treatment system. A rectangular concrete foundation, partially covered with gravel, was observed about 20 feet east of the treatment building. According to SPTCo representatives, this was the former location of the boiler equipment and building. The cooling tower was formerly located in the AST area east of the wood-treatment facility. SPTCo representatives had no specific information concerning the construction or operation of the cooling tower. The cooling tower was removed and the area re-graded with gravel (PRC, 1993).

While surface water was historically identified as a release pathway in the RCRA Facility Assessment (PRC, 1984), it is no longer considered a pollutant dispersal pathway since the Facility is no longer in operation and these areas have been dismantled and/or regraded.

VI. Recommended Action: No further action recommended. Completion of soil response action objectives are documented in the RACR and approved upon issuance of the December 5, 2014 Permit Renewal application, and as revised November 3, 2015, and July 29, 2016.

IX.A.12 PRELIMINARY REVIEW UNIT CHECKLIST – SWMU 8

Facility: Houston Wood Preserving Works

City: Houston, Texas

ISW Reg No: 31547

Date: August 27, 2014

Permit No: 50343

Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: SWMU 8

B. Description: Aboveground Storage Tank Area, S02

C. Dates of Operation: Unknown

II. Wastes Managed: Tank bottoms (K001), creosote, extender mix and naphtha

III. Evidence of Release: A naphtha spill and a working tank explosion were documented

IV. Pollutant Dispersal Pathways: Soil, surface water (historically when in operation, groundwater

V. Summary: The AST area was formerly located east of the recent process area (SWMU 4) in the northeast comer of the facility. The area housed 14 ASTs and a below-grade product drop tank used to store creosote and extenders. In addition, a series of aboveground pipes and manifolds was used to transfer product and wastes between tanks and the process area retort cylinders. A 1981 site diagram of the wood-preserving works indicated that six of the tanks were classified as working tanks containing creosote and extenders pumped to and from the retort cylinders. The tanks, which were about 20 feet in diameter, were located next to the wood-treatment building. Three tanks classified as storage tanks were located along the south side of the recent process area. These tanks, which were about 30 feet in diameter, were used to store creosote pumped into the working tanks.

An AST, about 30 feet in diameter, and four naphtha storage tanks, about 10 feet in diameter, were located north of the working tanks. The naphtha tanks were used in the process of removing sap and moisture from untreated ties.

The product drop tank was a concrete tank, about 35 by 20 feet, located at the northeast corner of the AST area. SPTCo representatives stated that the tank was constructed of concrete and was about 12 feet deep. SPTCo representatives stated that the product drop tank was used for the off-loading of creosote and extenders from the railway prior to storage in the ASTs. The cooling tower was also located in the AST area.

Secondary containment consisted of a concrete retaining wall about 4 feet high by 1 foot wide. The facility

installed the wall to prevent surface water runoff into the storm sewers. Three circular concrete foundations were observed in the vicinity of the three creosote storage tanks. Remnants of the concrete retaining wall were also observed at the southeast and southwest comers of the AST area. The ASTs have been removed from the area and the area has been re-graded with gravel. Piping and commercially treated wood ties were observed being stored in the area.

While surface water was historically identified as a release pathway in the RCRA Facility Assessment (PRC, 1984), it is no longer considered a pollutant dispersal pathway since the Facility is no longer in operation and these areas have been dismantled and/or regraded.

VI. Recommended Action: No further action recommended. Completion of soil response action objectives are documented in the RACR and approved upon issuance of the December 5, 2014 Permit Renewal application, and as revised November 3, 2015, and July 29, 2016.

IX.A.13 PRELIMINARY REVIEW UNIT CHECKLIST – SWMU 9

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 27, 2014

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: SWMU 9

B. Description: Location of Former UST No. 44-023-05, S02

C. Dates of Operation: Unknown – removed June 1992

II. Wastes Managed: Gasoline

III. Evidence of Release: Visible contamination was observed in the tank pit during removal. Samples collected below the tank indicated TPH levels above TWC action levels.

IV. Pollutant Dispersal Pathways: Soil

V. Summary: UST 44-023-05 was a 2000-gallon capacity steel tank located at the south side of the facility, in the vicinity of the original process area (SWMU 5). The tank was 5.5 feet in diameter and 12 feet long. The UST has been removed and the area has been re-graded with gravel. The tank was reported to be empty and contain no holes when it was removed (SPTCo, 1993b).

VI. Recommended Action: No further action recommended. Completion of soil response action objectives are documented in the RACR and approved upon issuance of the December 5, 2014 Permit Renewal application, and as revised November 3, 2015, and July 29, 2016.

IX.A.14 PRELIMINARY REVIEW UNIT CHECKLIST – SWMU 10

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 27, 2014

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: SWMU 10

B. Description: Location of Former Sap Water Treatment Tank, T01

C. Dates of Operation: Unknown

II. Wastes Managed: Wastewater containing naphtha, creosote residue and extender

III. Evidence of Release: No evidence of a release was discovered.

IV. Pollutant Dispersal Pathways: Soil

V. Summary: The sap water treatment tank was formerly located next to the AST area (SWMU 8) in the northeast corner of the facility property. SPTCo representatives had no information regarding the construction or capacity of the tank. A 1981 site diagram of the wood-treatment facility indicated that the tank was about 25 by 10 feet. Several concrete corner pads were observed in the vicinity of the tank location. The pads were identified as the tank foundation.

VI. Recommended Action: No further action recommended. Completion of soil response action objectives are documented in the RACR and approved upon issuance of the December 5, 2014 Permit Renewal application, and as revised November 3, 2015, and July 29, 2016.

IX.A.15 PRELIMINARY REVIEW UNIT CHECKLIST – SWMU 11

Facility: Houston Wood Preserving Works

City: Houston, Texas

ISW Reg No: 31547

Date: August 27, 2014

Permit No: 50343

Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: SWMU 11

B. Description: Oil Water Separators, T04

C. Dates of Operation: 1979-1984

II. Wastes Managed: Wastewater containing naphtha, creosote residue and extender

III. Evidence of Release: Discharge of wastewater into the sanitary sewer was reported to exceed allowable levels of phenols, pH, temperature and oil and grease. Permit was not renewed.

IV. Pollutant Dispersal Pathways: Surface water

V. Summary: Two oil/water separators were located in the northeast portion of the facility site. The southern separator was located next to the location of the former sap wastewater treatment tank (SWMU 10). The northern separator was located north of the AST area (SWMU 8) in the vicinity of the northern fence boundary. Both separators were subsurface structures, measuring about 6 by 4 by 3 to 4 feet deep. Both were constructed of concrete with a three-compartment design.

VI. Recommended Action: No further action recommended. Completion of soil response action objectives are documented in the RACR and approved upon issuance of the December 5, 2014 Permit Renewal application, and as revised November 3, 2015, and July 29, 2016.

IX.A.16 PRELIMINARY REVIEW UNIT CHECKLIST – SWMU 12

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 27, 2014

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: SWMU 12

B. Description: Railroad Tie Storage Area, S99

C. Dates of Operation: 1911 through mid-1980s

II. Wastes Managed: Creosote and extender

III. Evidence of Release: No known release

IV. Pollutant Dispersal Pathways: Soil

V. Summary: Throughout the history of the site, most of the property not used for specific process areas was used to store treated railroad ties. Much of the previous storage area has been re-graded with gravel. NOR 005 is located in the same vicinity.

VI. Recommended Action: No further action recommended. The unit is addressed in a site wide Compliance Plan.

IX.A.17 PRELIMINARY REVIEW UNIT CHECKLIST – AOC 1

Facility: Houston Wood Preserving Works

City: Houston, Texas

ISW Reg No: 31547

Date: August 27, 2014

Permit No: 50343

Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: AOC 1

B. Description: Diesel Storage Tank, S02

C. Dates of Operation: Unknown

II. Wastes Managed: Diesel fuel

III. Evidence of Release: Stains and discoloration on underlying gravel observed during the VSI.

IV. Pollutant Dispersal Pathways: Soil

V. Summary: The diesel storage tank (DST) was an AST located in the south-central portion of the facility, in the vicinity of the original process area (SWMU 5). The DST was used by the facility to store diesel fuel for equipment use. It was of steel construction and supported above ground by steel bracing. SPTCo representatives did not know the age or capacity of the DST. The DST was surrounded by a concrete retaining wall, about 3 feet high and 1 foot thick. The bottom of the retaining area was covered with gravel. According to SPTCo representatives native soils were located below the gravel cover.

VI. Recommended Action: No further action recommended. Completion of soil response action objectives are documented in the RACR and approved upon issuance of the December 5, 2014 Permit Renewal application, and as revised November 3, 2015, and July 29, 2016.

IX.A.18 PRELIMINARY REVIEW UNIT CHECKLIST – AOC 2

Facility: Houston Wood Preserving Works

City: Houston, Texas

ISW Reg No: 31547

Date: August 27, 2014

Permit No: 50343

Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: AOC 2

B. Description: Hose House, S99

C. Dates of Operation: Unknown

II. Wastes Managed: NA

III. Evidence of Release: Signs of recent oil staining were visible inside hose house and minor staining was observed on the ground in the vicinity of a sewer drain.

IV. Pollutant Dispersal Pathways: Soil and surface water

V. Summary: The hose house was a metal building, measuring about 15 by 12 feet, with concrete flooring located southwest of the water treatment building. A 6 by 2 foot concrete slab was observed in the middle of the floor. An unidentified metal structure was observed on top of the concrete slab, and fresh oil staining was observed around the metal structure. The remains of a shower stall were observed at the eastern end of the building. An open sewer pipe, about 6 inches in diameter, was observed next to the building on the east side. A concrete ramp was located next to the sewer pipe, apparently to direct drainage from exposed piping observed extending from the eastern wall of the building.

VI. Recommended Action: No further action. This unit has not managed hazardous wastes or wastes containing hazardous substances.

IX.A.19 PRELIMINARY REVIEW UNIT CHECKLIST – AOC 3

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 27, 2014

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: AOC 3

B. Description: Contaminated Portion of City Water Line, D99

C. Dates of Operation: Unknown

II. Wastes Managed: Phenol

III. Evidence of Release: Analytical results from samples collected from the drinking water system indicated elevated levels of phenols.

IV. Pollutant Dispersal Pathways: Soil

V. Summary: In 1980, SPTCo discovered contamination in its drinking water system. Analytical results from samples collected from the drinking water system indicated elevated levels of phenols. SPTCo stated that "it was determined that the presence of contaminants was caused by a leak around a pump seal" (SPTCo, 1993b). SPTCo repaired the leak and flushed the system. According to SPTCo representatives, a new pipeline may have been installed next to the contaminated portion, which was probably left in place. SPTCo representatives did not know location of the leak or the new line.

VI. Recommended Action: No further action recommended. The unit is addressed in a site wide Compliance Plan.

IX.A.20 PRELIMINARY REVIEW UNIT CHECKLIST – AOC 4

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 27, 2014

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: AOC 4

B. Description: Location of Former Incinerator, T03

C. Dates of Operation: between 1955 and 1976

II. Wastes Managed: Untreated lumber remnants

III. Evidence of Release: No known release

IV. Pollutant Dispersal Pathways: NA

V. Summary: An incinerator was formerly located on the facility about 75 feet west of the adzing plant. According to SPTCo representatives the incinerator was used to dispose of untreated lumber remnants generated by the framing mill and adzing plant. The facility had no information concerning the construction or operation of the incinerator.

VI. Recommended Action: This unit has not managed hazardous wastes or wastes containing hazardous substances and no evidence of a release was reported. Completion of soil response action objectives are documented in the RACR and approved upon issuance of the December 5, 2014 Permit Renewal application, and as revised November 3, 2015, and July 29, 2016.

IX.A.21 PRELIMINARY REVIEW UNIT CHECKLIST – AOC 5

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 27, 2014

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: AOC 5

B. Description: City Storm Sewer, D99

C. Dates of Operation: NA

II. Wastes Managed: Boiler and cooling tower blowdown, potential runoff of creosote contaminated surface water from facility SWMU 1

III. Evidence of Release: Discharges were documented in 1980 and 1982.

IV. Pollutant Dispersal Pathways: Surface water and soil

V. Summary: The city storm sewer used to receive surface water runoff from the facility, including boiler and cooling tower blowdown and sap wastewater. A concrete retaining wall was built around the AST area (SWMU 8) to prevent potentially contaminated runoff from entering the sewer. Runoff features included several subsurface concrete boxes with steel grate tops located throughout the facility. Discharges to the storm sewer were reported in 1980 and 1982 resulting in the issuance of NOVs to the facility (SPTCo, 1993b). Details of the locations of the sewer lines were unavailable.

VI. Recommended Action: No further action recommended. The unit is addressed in a site wide Compliance Plan.

IX.A.22 PRELIMINARY REVIEW UNIT CHECKLIST – AOC 6

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 27, 2014

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: AOC 6

B. Description: Inactive Wastewater Lagoon, S99

C. Dates of Operation: NA

II. Wastes Managed: Sap wastewater and surface water runoff (historically when in operation) containing creosote residue

III. Evidence of Release: In 1979, a fire exposed the presence of creosote-contaminated soils. The contamination was determined to have resulted from pooling of facility wastewater in this area.

IV. Pollutant Dispersal Pathways: Soil and surface water

V. Summary: The inactive wastewater lagoon is a low-lying area, next to the inactive SI (SWMU 1). This area was periodically flooded and received discharges of sap wastewater and surface water runoff via the SDD (SWMU 2). In 1979, a fire in the area may have resulted from soil contamination within the area. The uppermost layer of soils in the lagoon area were scraped off and disposed of in the SI. The SDD was plugged to prevent further discharge into the area. The inactive wastewater lagoon was considered to be inactive following these actions. While surface water was historically identified as a release pathway in the RCRA Facility Assessment (PRC, 1984), it is no longer considered a pollutant dispersal pathway since the Facility is no longer in operation and these areas have been dismantled and/or regraded.

VI. Recommended Action: No further action recommended. Completion of soil response action objectives are documented in the RACR and approved upon issuance of the December 5, 2014 Permit Renewal application, and as revised November 3, 2015, and July 29, 2016.

IX.A.23 PRELIMINARY REVIEW UNIT CHECKLIST – AOC 7

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 27, 2014

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: AOC 7

B. Description: Location of Former UST 44-023-21, S02

C. Dates of Operation: NA

II. Wastes Managed: Gasoline

III. Evidence of Release: Total benzene, toluene, ethyl benzene, and xylene (BTEX) levels below the TWC action limit of 30 ppm were detected in soils sampled during tank removal.

IV. Pollutant Dispersal Pathways: Soil

V. Summary: UST 44-023-21 was formerly located next to the access road northeast of the existing diesel storage tank (DST) (AOC 1). The capacity of the tank was 200 gallons. It was used to store gasoline used by the facility. Details concerning the construction activities and installation date are unknown. According to SPTCo, TWC certified closure in 1990. Information on waste management practices was unavailable. However, analytical results of samples taken during the UST closure indicate that a release may have occurred from this UST. PRC has not received the closure report requested from SPTCo.

VI. Recommended Action: No further action. Completion of soil response action objectives are documented in the RACR and approved upon issuance of the December 5, 2014 Permit Renewal application, and as revised November 3, 2015, and July 29, 2016.

IX.A.24 PRELIMINARY REVIEW UNIT CHECKLIST – AOC 8

Facility: Houston Wood Preserving Works City: Houston, Texas

ISW Reg No: 31547 Date: August 01, 2020

Permit No: 50343 Reviewer:

EPA ID No: TXD000820266

I. Waste Management Unit:

A. NOR No: AOC 8

B. Description: Former Fueling ASTs and Wastewater Lagoons

C. Dates of Operation: NA

II. Wastes Managed: Unknown

III. Evidence of Release: Analytical results of soil and groundwater samples indicate petroleum hydrocarbon levels greater than TRRP PCLs. Metals (lead and arsenic) have been detected in soils above TRRP PCLs. Tar-like NAPL in shallow soils and surfacing has been documented.

IV. Pollutant Dispersal Pathways: Soil, Groundwater

V. Summary: Wastewater lagoons were formerly located on the northern side of the present-day Englewood Intermodal Yard. Aboveground storage tanks (ASTs) used for fueling operations (fuel oil) were formerly located on the northeastern side of the present-day Englewood Intermodal Yard. Details concerning the construction activities and installation date are unknown. Contents stored in wastewater lagoon and ASTs are unknown. Concrete pavement currently covers the area.

VI. Recommended Action: No further action recommended. The AOC is addressed in the facility-wide corrective action detailed in the Compliance Plan.

Appendix IX.II

WASTES MANAGED

Union Pacific Railroad Company
Houston Wood Preserving Works
Houston, Texas

APPENDIX II
SUMMARY OF WASTES MANAGED
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

NOR	Waste Description	Class	TCEQ Waste Code	EPA Waste Code	Disposition	Health, Safety and Risk Information
001/SWMU 1	Surface Impoundment Area	NA	219, 301, 488, 609	K001, F034, U051, U188	Removed from site	See NOR 004
002/SWMU 7	Tank car	Unknown	Unknown	Unknown	No longer generated	--
003	Sub-surface Tank	Unknown	Unknown	Unknown	No longer generated	--
004	Container Storage Area (Corrective Action Remediation Wastes)	1	00029032	Non-haz	Inactive	--
		1	04003011	Non-haz	Active	--
		2	14773012	Non-haz	Active	--
		1	14781011	Non-haz	Active	--
		2	14791012	Non-haz	Active	--
		2	14804062	Non-haz	Active	--
		2	14841012	Non-haz	Inactive	--
		1	09163081	Non-haz	Inactive	--
		H	0001301H	F034, K001	Active	Avoid all contact. If inhaled, provide fresh air, respiratory support. If in contact with skin, wash with soap and water. Rinse with water if contact with eyes. Seek medical attention. **F034, K001, and U051 (Creosote)**: Carcinogen; respiratory tract irritation, mild skin irritation, eye irritation; skin cancer. TWA 0.2 mg/m3; LC50 (*Oncorhynchus mykiss* 96 hr) 0.57 mg/L (very toxic to aquatic life); LD50 (rat oral) 2197 mg/kg; LC50 rat inhalation 4 hr) > 5 mg/L; LD50 (rabbit skin) > 2500 mg/kg; Reference: Koppers Safety Data Sheet Rev 2.03000 dated March 27, 2015. **U188 (Phenol)**: Central nervous system impairment, upper respiratory tract irritation, lung damage; TWA 5 ppm (19 mg/m3); LC50 (golden orfe 48-hr) 14 - 25 mg/L; LD50 (rat oral) 317 mg/kg; LC50 (rat inhalation 8-hr) 900 mg/m3; LD50 (rabbit dermal) 630 mg/kg Reference: Sigma-Aldrich Safety Data Sheet Revision 5.7 June 17, 2015.
		H	0909101H	F034, K001	Active	
		H	0912489H	F034, K001	Active	
		H	0914101H	F034, K001	Active	
		H	0915301H	F034, K001	Active	
		H	0917406H	K001	Active	
		H	0918219H	F034, K001, U051	Active	
		H	1481514H	D002	Active	
		H	1482110H	D002	Active	
		2	14835142	Non-haz	Active	--
		1	14884891	Non-haz	Active	--
		2	14863902	Non-haz	Active	--
		2	14851022	Non-haz	Active	--

APPENDIX II
SUMMARY OF WASTES MANAGED
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

NOR	Waste Description	Class	TCEQ Waste Code	EPA Waste Code	Disposition	Health, Safety and Risk Information
005	Waste Pile	2	09024882	Non-haz	No longer generated	--
		2	09103072	Non-haz	No longer generated	--
		2	09113072	Non-haz	No longer generated	--
006	Miscellaneous Storage Containers	1	2012061	Non-haz	No longer generated	--
SWMU 2	Northern and Southern Drainage Ditches	Unknown	Unknown	Unknown	No longer generated	--
SWMU 3	Oil Drum Storage (ODS) Building	Unknown	Unknown	Unknown	No longer generated	--
SWMU 4	Recent Process Area	Unknown	Unknown	Unknown	No longer generated	--
SWMU 5	Original Process Area	Unknown	Unknown	Unknown	No longer generated	--
SWMU 6	Water Treatment and Boiler System	Unknown	Unknown	Unknown	No longer generated	--
SWMU 8	Aboveground Storage Tank Area	Unknown	Unknown	Unknown	No longer generated	--
SWMU 9	Location of Former UST No. 44-023-05	Unknown	Unknown	Unknown	No longer generated	--
SWMU 10	Location of Former Sap Water Treatment Tank	Unknown	Unknown	Unknown	No longer generated	--
SWMU 11	Oil Water Separators	Unknown	Unknown	Unknown	No longer generated	--
SWMU 12	Railroad Tie Storage Area	Unknown	Unknown	Unknown	No longer generated	--
AOC 1	Diesel Storage Tank	Unknown	Unknown	Unknown	No longer generated	--
AOC 2	Hose House	Unknown	Unknown	Unknown	No longer generated	--
AOC 3	Contaminated Portion of City Water Line	Unknown	Unknown	Unknown	No longer generated	--
AOC 4	Location of Former Incinerator	Unknown	Unknown	Unknown	No longer generated	--
AOC 5	City Storm Sewer	Unknown	Unknown	Unknown	No longer generated	--
AOC 6	Inactive Wastewater Lagoon	Unknown	Unknown	Unknown	No longer generated	--
AOC 7	Location of Former UST No. 44-023-21	Unknown	Unknown	Unknown	No longer generated	--
AOC 8	Former Fueling ASTs and Wastewater Lagoons	Unknown	Unknown	Unknown	No longer generated	--

Appendix IX.III

EVIDENCE OF RELEASE

Union Pacific Railroad Company
Houston Wood Preserving Works
Houston, Texas

APPENDIX III – EVIDENCE OF RELEASE

SWMU No. 1

SWMU No. 1 is currently in the 20th year of the 30 years required for post-closure care monitoring. In 1984 the surface impoundment was clean closed by excavating the soils and materials contained within the unit. Attachment 1 contains correspondence from the State regarding closure of the surface impoundment. The facility then began investigating and monitoring the shallow groundwater in the vicinity of the surface impoundment. Between 1984 and 1991, nine groundwater monitoring wells were installed in the upper zone and three piezometers were installed in the lower permeable zone. Hydrogeological data collected from these wells and piezometers indicate hydraulic conductivity between the zones. Analytical data compiled from 1984 until 1991 indicated that benzene, toluene, naphthalene, 2,4-dimethylphenol, and phenol were the most frequently detected parameters and that naphthalene was the parameter detected at the highest concentrations.

The facility entered into post-closure care in 1994, updated in 2005, and groundwater monitoring of SWMU No. 1 has taken place on a semi-annual basis since that time. Analytical results are compared to the TCEQ Texas Risk Reduction Program Protective Concentration Levels (TRRP PCLs). Since 2006, constituent concentrations have been below their respective PCLs. SWMU 1 is currently under Corrective Action Monitoring; however, as detailed in Section VII and the Section XI (Attachment D), a request for No Further Action is included in this permit renewal for SWMU 1.

HWPW Facility

The initial APAR prepared for the facility was submitted to the TCEQ dated June 10, 2000 (ERM, 2000). A revised APAR was submitted to the TCEQ dated June 10, 2004. Pastor, Behling & Wheeler, LLC (PBW) prepared the APAR Addendum dated July 2009 (PBW, 2009). Following comments from the TCEQ, PBW submitted the Updated APAR Addendum dated October 2010, with response to comments dated March 29, 2011 (PBW, 2011). The TCEQ approved the APAR in a letter dated April 13, 2011.

As detailed in the APARs and subsequent submittal, the Affected Property consists of surface soils, subsurface soils, and groundwater affected by chemical of concern (COC) at the Site: The soil and groundwater exposure pathways were evaluated as part of the Site assessments and are considered to be complete and/or anticipated to be complete.

Site stratigraphy from the ground surface to a depth of approximately 135 feet is separated into the following units: Fill Material (0 to5 feet thick), A-Cohesive Zone (A-CZ) (8 to 15 feet thick); A-Transmissive Zone (A-TZ) (4 to 21 feet thick); B-Cohesive Zone (B-CZ) (6 to 19 feet thick); B-Transmissive Zone (B-TZ) (discontinuous, where present, 3 to 10 feet thick); C-Cohesive Zone (C-CZ) (8 to 20 feet thick); C-Transmissive Zone (C-TZ) (10 to 13 feet thick); D-Cohesive Zone (D-CZ) (17 to 36 feet thick); and D-Transmissive Zone (D-TZ).

As detailed in the Updated APAR Addendum (PBW, 2011), target COCs in soil and groundwater media were evaluated using the March 2010 TCEQ TRRP Residential PCLs, or Residential Assessment Levels (RALs) to establish the Affected Property. Surface and subsurface soil data collected from 1997 through June 2010, with subsequent sampling in 2013 and 2014 were evaluated to assess the Affected Property and PCL Exceedance (PCLE) Zone in surface and subsurface soils. Groundwater data from the most recent sampling events (July/August 2014) were evaluated to assess COC exceedances in groundwater. Details of the most recent groundwater sampling results are provided in the Response Action Plan (see Section XI - Compliance Plan, Attachment B).

ATTACHEMENT 1

AGENCY CORRESPONDNCE REGARDING
CLOSURE OF SURFACE IMPOUNDMENT

Union Pacific Railroad Company
Houston Wood Preserving Works
Houston, Texas

TEXAS DEPARTMENT OF WATER RESOURCES
1700 N. Congress Avenue
Austin, Texas

TEXAS WATER DEVELOPMENT BOARD
Louis A. Beecherl, Jr., Chairman
George W. McCleskey, Vice Chairman
Glen E. Roney
W. O. Bankston
Lonnie A. "Bo" Pilgrim
Louie Welch

Charles E. Nemir
Executive Director

TEXAS WATER COMMISSION
Paul Hopkins, Chairman
Lee B. M. Biggart
Ralph Roming

February 28, 1984

Mr. H. B. Berkshire
Southern Pacific Transportation Company
Southern Pacific Building
One Market Plaza
San Francisco, CA 94105

Dear Mr. Berkshire:

Re: Industrial Solid Waste Registration No. 31547
Closure of On-Site Hazardous Waste Landfill
Harris County, Texas

We have completed a review of the closure plan, submitted by your letter of November 29, 1983 and as amended by your letter of December 23, 1983. This closure represents full facility closure and was accordingly reviewed under 31 Texas Administrative Code (TAC) Sections 335.212-.216 and 31 TAC Section 335.286(b).

This letter constitutes approval by the Executive Director of the closure plan contained in the referenced letters, provided that all analytical results shall be submitted to the Central Office and the District 7 Office of the Department within 15 days of receipt by the company.

Upon completion of the closure, certification shall be submitted by the owner or operator of the subject facility and by an independent Registered Professional Engineer that the facility has been closed in accordance with the approved closure plan. Also, an Affidavit of Exclusion (see enclosed form) indicating that this facility meets the "Accumulation Time" requirements of 31 TAC Section 335.69 should be submitted along with the closure certification, if applicable.

If you have any questions, please contact our Solid Waste Section at AC512/475-2041.

Sincerely,

Charles E. Nemir
Executive Director

Enclosure
cc: TDWR District 7 Office - Deer Park
Frank Bozeman, Southern Pacific Transportation Company
Dr. Daniel W. Bridge, Rollins Environmental Services (TX) Inc.

AFFIDAVIT OF EXCLUSION FROM HAZARDOUS WASTE PERMITTING REQUIREMENT

Registration No. _____

Application No. _____ (Dept. Use Only)

Facility Name _____

County of _____

_____ being duly sworn, deposes and says:

I am _____ of _____
Title (Owner or Principal Officer) Facility Owner

_____.
and Address

This affidavit is being executed for the purpose of notifying the Executive Director of the Texas Department of Water Resources that the named facility does not require a hazardous waste permit because:

Check appropriate box(es):

- ☐ No hazardous waste is stored, processed or disposed on-site
- ☐ The facility qualifies for the "Accumulation Time" storage exclusion of Texas Administrative Code, Section 335.69
- ☐ The facility qualifies for the "Small Quantity Generator" exclusion of Texas Administrative Code, Section 335.2(e)
- ☐ The facility qualifies for the "Elementary Neutralization Unit" exclusion of Texas Administrative Code, Section 335.2(f)
- ☐ The facility qualifies for the "Wastewater Treatment Unit" exclusion of Texas Administrative Code, Section 335.2(f)
- ☐ Other (Explain with an attachment and reference TDWR rule)

_____
Signature

Sworn to before me this
_____ day of _____, 198___.

_____
Notary Public in and for

_____ County, _____

My commission expires _____

TEXAS WATER COMMISSION

July 11, 1990

Certified Mail
Return Receipt Requested

Mr. R.R. Mahon
Southern Pacific Transporation Company
Southern Pacific Building
One Market Plaza
San Francisco, Ca. 94105

Re: Southern Pacific Transporation Company - SWR 31547
Post Closure Care Permit Application

Dear Mr. Mahon:

The Texas Water Commission (TWC) Hazardous and Solid Waste Permits Section has reviewed a referral from the TWC Hazardous and Solid Waste Enforcement Section indicating that the facility will require a post-closure care permit and compliance plan.

Southern Pacific Transporation Company (SPTC) certified closure of a surface impoundment on June 4, 1984 (originally approved in a letter from the TWC dated February 28, 1984). By letter dated June 4, 1984, the TWC required SPTC to sample ground-water monitoring wells quaterly and submit the results to the TWC. Sample results submitted from 1985 to 1990 indicate the presence of hazardous constituents (2,4, dimethlyphenol, benzene, toluene, napthalene and phenol) in the ground-water. Therefore, it appears that the closure does not meet the permitting standards of 40 Code of Federal Regulations (CFR) 264.228 and a post-closure care permit will be required in accordance with 40 CFR 270.1.c.

In accordance with Title 31 Texas Administrative Code (TAC) Section 305.42, the Texas Water Commission (TWC) hereby requests submittal of Part B of your hazardous waste permit application. 40 CFR 270.14 establishes the information requirements for a RCRA permit application. Because of the inherent differences between an operating permit and a permit covering only post-closure care activities, some of the information requirements for an operating permit will not be applicable to a permit for the post-closure care period. Relevant information will be determined on a case-by-case basis. At a minimum, your response should include the information requirements set out in Attachment I.

The submittal should also include any necessary modifications or additions to the Part A application already on file. In revising your Part A application, ensure that each waste and facility unit is identified by the same waste classification code and facility sequence number that are listed in your TWC Notice of Registration (NOR). If the NOR does not accurately reflect current waste management activities at the facility, please make the necessary corrections and submit a revised copy to the Hazardous and Solid Waste Compliance Assistance Unit within 60 days of the receipt of this letter. In addition, please submit an updated list of affected landowners.

Your Part B application, including the new requirements mandated by the Hazardous and Solid Waste Amendments of 1984 (HSWA), must be received no later that six (6) months from the date of this letter. Since releases to ground water from hazardous waste disposal activities have occurred at your facility, you are also required to file an application for a Compliance Plan in conjunction with your Part B application. The submittal of a completed Compliance Plan application is required even if ground-water contamination is being addressed under an enforcement order.

If you determine that your facility is not subject to post-closure permitting requirements, please respond in writing to the Hazardous and Solid Waste Permits Section within 30 days from the receipt of this letter. Your response should include all available documentation that no hazardous waste disposal activity subject to any permitting requirements has been conducted at your facility.

Please note that HSWA established new requirements for which the state has not yet received full authorization. As a result, permits issued solely by the TWC cannot completely satisfy federal permit requirements and a separate permit issued by the EPA could be necessary. To minimize duplication of effort, the State and EPA have executed a joint permitting agreement. Pursuant to this arrangement, the TWC will take the lead in processing permit applications, thus serving as the primary contact for applicants. The TWC will also develop permits under State authorities which can be issued by both agencies. Since we will transmit one copy of the permit application to EPA Region VI and coordinate all subsequent permit processing steps with their office, all copies of the permit application should be submitted to the TWC.

Please submit the following materials with your response: (1) the original and four copies of your Part B and Compliance Plan application, (2) the original and four copies of all related reports, (3) six additional copies of Section I of the Part B application form, and (4) the appropriate application fee and notice fee established by 31 TAC 305.53 and described in Section X of the Part B permit application. Please note that your application will not be considered complete unless all material listed above is submitted. Additional information may be requested at a later date to supplement your application.

Communications related to Parts A and B of the permit application should be directed to Nancy E. Frank, Head, Permitting Unit One at (512) 463-8018. Communications relating to the Compliance Plan application should be directed to Paul S. Lewis, Head, RCRA Ground-Water Enforcement Unit at (512) 463-8425.

Mailing Address
Texas Water Commission
Hazardous & Solid Waste Permits Section
P.O. Box 13087
Capitol Station
Austin, TX 78711-3087

Delivery Address
Texas Water Commission
Stephen F. Austin Bldg.
Room 1157
1700 N. Congress Avenue
Austin, TX 78711-3087

Sincerely,

Minor Brooks Hibbs, Chief
Hazardous and Solid Waste Permits Section

NEF

Enclosures

cc: TWC District 7 - Houston
Paul Lewis, TWC Enforcement Section
Mark Stine, TWC Enforcement Section
Cheryl Wilson, TWC Reports and Information Management Unit

ATTACHMENT I

CHECKLIST - POST CLOSURE CARE PERMIT APPLICATION PART B REQUIREMENTS*

	PART B PAGE NO. Form	Instructions
I. General Information		
A. Applicant	1	4
B. Representative	1	4
C. Facility Name and Location	2	4
D. Facility Description	2	4
E. Deed Recordation	3	4
F. Waste Disposition	3	4
G. Updated Part A Information	4	4
H. Summary	4	4
I. Signature	5	4
II. Facility Management		
A. Security	6	5
B. Inspection Schedule	7	5
D. Waste Analysis Plan	25	12
E. Personnel Training Plan	27	14
III. Engineering Reports		
A. General	28	15
1a. Overall plan view of entire facility	28	15
2a.-k. Topographic maps	28	16
3a.-e. Flooding	28	18
G. Landfills**		
1. Description	44	47
2. Site Development	44	47
6.i.-l. Containment System (as applicable)	46	49
IV. Geology Report	52	58
V. Ground-Water and Unsaturated Zone Monitoring	56	62
VI. Closure and Post-Closure Plans	59	69
VII. Financial Assurance		
B. Post-Closure	62	76
VIII. Releases from Solid Waste Units and Corrective Action	63	77
X. Hazardous Waste Permit Application Fee	67	82

* Because of the inherent differences between an operating permit and a permit covering only post-closure care activities, some of the information requirements for an operating permit will not be applicable to a permit for the post-closure care period. Relevant information will be determined on a case-by case basis, however, at a minimum, it should include the information listed above.

** As required by Title 40 Code of Federal Regulations (CFR) 270.10.j.1. and 2., the owner or operator of any hazardous waste facility that stored, treated or disposed of hazardous waste in a surface impoundment or landfill must submit exposure information, in the form of an exposure assessment report, which addresses the requirements of 40 CFR 270.10.j.(1)i.-iii.

Appendix IX.IV

POLLUTANT DISPERSAL PATHWAYS

Union Pacific Railroad Company
Houston Wood Preserving Works
Houston, Texas

APPENDIX IV – POLLUTANT DISPERAL PATHWAYS

SWMU No. 1 is currently in the 20th year of the 30 years required for post-closure care monitoring. In 1984 the surface impoundment was clean closed by excavating the soils and materials contained within. Therefore, there is little potential for migration of constituents from the unit via air dispersion, surface water runoff, or surface water runoff. Horizontal and vertical migration of constituents in groundwater are the most likely dispersal pathways for the unit. The facility entered into post-closure care in 1994 because there had been a release to groundwater prior to the clean closure. The post-closure permit was updated in 2005 and groundwater monitoring has taken place on a semi-annual basis since that time. Analytical results are compared to the TCEQ Texas Risk Reduction Program Protective Concentration Limits (TRRP PCLs). Since 2006, constituent concentrations have been below their respective PCLs. SWMU 1 is currently under Corrective Action Monitoring; however, as detailed in Section VII and Section XI (Attachment D), a request for No Further Action is included in this permit renewal for SWMU 1.

Figures IX.1 and IX.2 in Appendix IX.I of this section provide local and regional maps for the facility. A map of the facility wide locations of former waste management units is included as Figure IX.3.

A facility wide investigation of the former waste management units has been on-going and the entire facility will be regulated under a Compliance Plan in the post-closure care permit. Soil and groundwater have been determined to be the exposure pathways for the facility. Figure IX.4 in Appendix IX.IV illustrates the extent of soil and groundwater exceeding PCLs identified at the facility. Figures IX.5a and IX.5b provide a conceptual site model, illustrating the relationship between hydrogeology, surface and subsurface features, and the generalized extent of contamination.

EXPLANATION

- UPRR Property Boundary
- Historic Structure and Feature
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- A-TZ Monitoring Well Location
- B-CZ/B-TZ Monitoring Well Location
- C-TZ Monitoring Well Location
- D-TZ Monitoring Well Location
- A-TZ Temporary Monitoring Well Location
- CPT with Rost Location
- CPT Location
- Hydropunch Sample Location
- Soil Boring Location
- Soil Affected Property
- Groundwater Affected Property

Note:
* Soil analytical data rejected by validator.

Approx. Scale in Feet
0 200 400

SWMU/AOC AREAS

No.	Description
SWMU 1	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 4	Recent Process Area
SWMU 5	Original Process Area
SWMU 6	Water Treatment and Boiler System
SWMU 7	Tank Car Storage Area
SWMU 8	Aboveground Storage Tank Area
SWMU 9	Location of Former UST No. 44-023-05
SWMU 10	Location of Former Sap Water Treatment Tank
SWMU 11	Oil/Water Separators
SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
AOC 3	Contaminated Portion of City Water Line
AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21

Note:
Locations of SWMU-9 and AOCs 1, 3, 5 and 7 area approximate.

Source:
Base map from ERM-Southwest, Inc APAR Addendum, Fig 3-1, dated June 2004.

UNION PACIFIC RAILROAD CO.

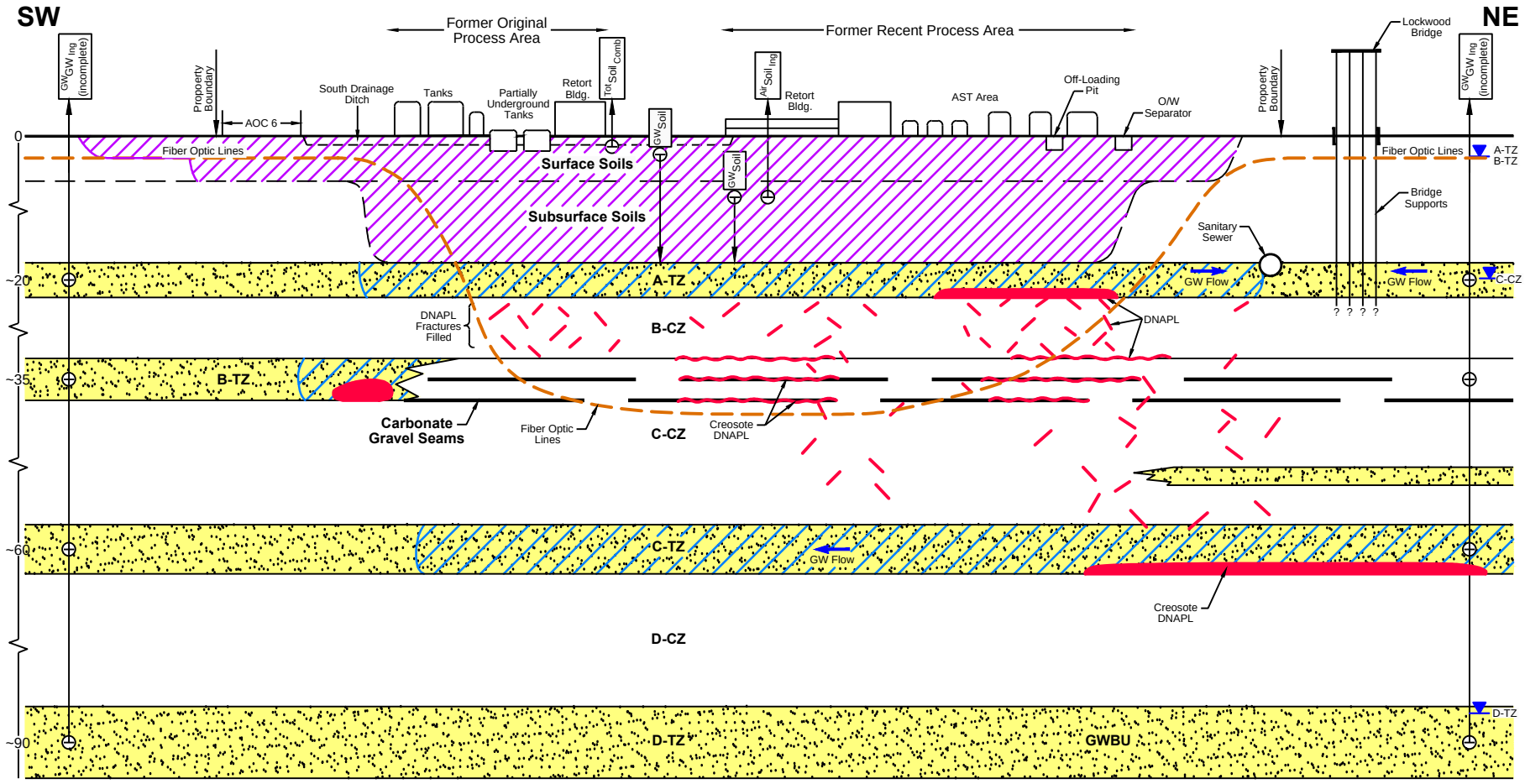
HOUSTON WOOD PRESERVING WORKS

Appendix IV Figure IX.4

AFFECTED PROPERTY MAP

PROJECT: 1358	BY: AJD	REVISIONS
DATE: NOV., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



Soil Affected Property

Groundwater Affected Property

UNION PACIFIC RAILROAD CO.

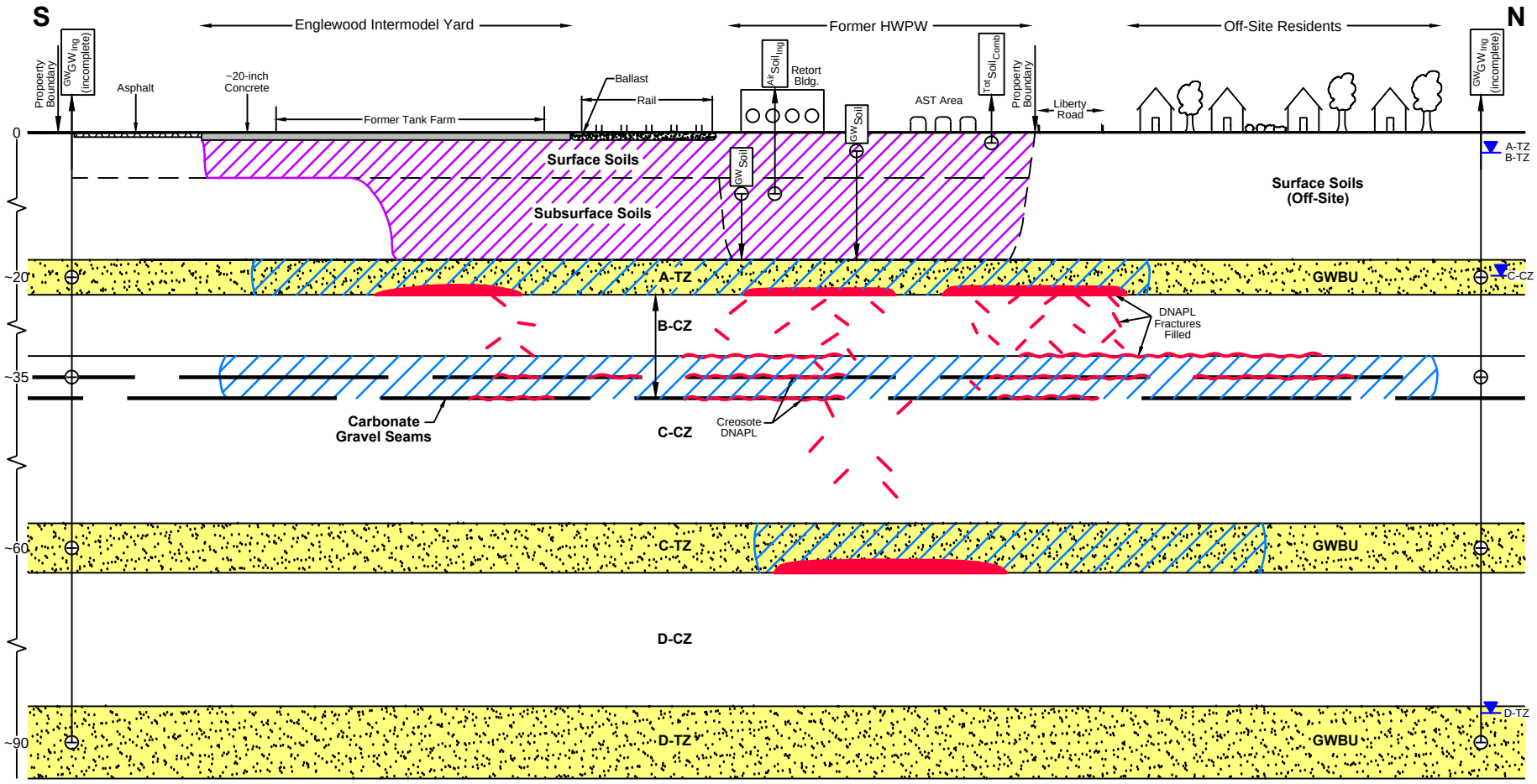
HOUSTON WOOD PRESERVING WORKS

Appendix IV Figure IX.5.a

CONCEPTUAL SITE MODEL
SW - NE

PROJECT: 1358	BY: AJD	REVISIONS
DATE: NOV., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



Soil Affected Property

Groundwater Affected Property

UNION PACIFIC RAILROAD CO.

HOUSTON WOOD PRESERVING WORKS

Appendix IX Figure IX.5.b

CONCEPTUAL SITE MODEL
S - N

PROJECT: 1358	BY: AJD	REVISIONS
DATE: NOV., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

X. Air Emission Standards **Not Applicable**

Sections X.A, X.B, and X.C apply to all permit applications, except post-closure permit applications. Permittees with "one stop" permits applying for an amendment, modification, or renewal should clearly state whether they wish to amend, modify, or renew the Air Permits Division portions of their combined one-stop permit, whether they intend to seek separate authorizations, as appropriate, from the Air Permits Division and subsequently delete these requirements from their hazardous waste permit, or whether they want consolidated permit processing as allowed by 30 TAC Chapter 33 - Consolidated Permit Processing.

A. Process Vents

For process vents and equipment subject to the requirements of 40 CFR Part 264 Subpart AA , please provide a report that includes all of the information required by 40 CFR 270.24. Indicate on a facility plot plan the approximate location of process vents.

1. For inclusion into a permit, complete Table X.A - Process Vents for all vents on waste management units that manage hazardous waste with an annual average total organics concentration of 10 ppmw or greater ("process vents"). Specifically include:
   a. process vents on distillation, fractionation, thin-film evaporation, solvent extraction, air or steam stripping operations, and vents on condensers serving these operations; and
   b. process vents on tanks (e.g., distillate receivers, bottom receivers, surge control tanks, separator tanks, and hot wells) associated with distillation, fractionation, thin-film evaporation, solvent extraction, and air or steam stripping processes if emissions from these process operations are vented through the tanks.

   Emissions caused by natural means such as daily temperature changes or by tank loading and unloading are not subject to control.

2. For process vents, include the following certification as part of the air emissions report:

   ■I, *owner or operator* , certify that the operating parameters used in the design analysis reasonably represent the conditions that exist when the hazardous waste management unit is or would be operating at the highest load or capacity level reasonably expected to occur.

   I further certify that the control device is designed to operate at an efficiency of 95 weight percent or greater.

   OR

   I further certify that the total organic emission limits of 40 CFR 264.1032(a) for affected process vents at the facility can be attained by a control device involving vapor recovery at an efficiency less than 95 weight percent.

   (Signature) *(Date)* .

B. Equipment Leaks

For equipment subject to the requirements of 40 CFR Part 264 Subpart BB , please provide a report that includes all of the information required by 40 CFR 270.25.

1. For inclusion into a permit, complete Table X.B. – Equipment Leaks for all valves, pumps, compressors, pressure relief devices, sampling connection systems, and open-ended valves or lines that contains or contacts hazardous waste streams with organic concentrations of 10% by

weight or greater. Equipment in vacuum service is not subject to control if identified in the facility operating record.

2. For equipment, include the following statement as part of the air emissions report:

> ■I, *owner or operator* , certify that the operating parameters used in the design analysis reasonably represent the conditions that exist when the hazardous waste management unit is operating at the highest load or capacity level reasonably expected to occur.
>
> I further certify that the control device is designed to operate at an efficiency of 95 weight percent or greater.
>
> *(signature)* *(date)* .

C. Tanks, Surface Impoundments, and Containers

For tanks, surface impoundment, and containers subject to the requirements of 40 CFR Part 264 Subpart CC, please provide a report that includes all of the information required by 40 CFR 270.27.

Include the following certification as part of the air emissions report:

> ■I, *(owner or operator)* , certify that the control device is designed to operate at the performance level documented by a design analysis as specified in 40 CFR 264.1089 (e)(1)(ii) or by performance tests as specified in 40 CFR 264.1089(e)(1)(iii) when the tank, surface impoundment, or container is or would be operating at capacity or the highest level reasonably expected to occur.
>
> *(signature)* *(date)* .

D. Optional TCEQ Office of Air Quality Information

In addition to the information requested in Section X.A, X.B, and X.C above, permittees having "one-stop" permits may elect to combine the air and waste management amendment, modification, or renewal of permitted waste management units. The combined amendment, modification, or renewal application will follow the application processing procedures for an industrial solid waste permit.

1. Area map (to scale) showing the location of the plant and land use in the vicinity of the facility including buildings, schools, residences, etc. within 3000 feet.

2. Plot plan (to scale) with latitude and longitude showing the plant layout, property boundary and location of all emission points of air contaminants. Emission points are to be numbered.

3. Specific chemical name of each air contaminant and emission rate in maximum pounds per hour, maximum tons per year and calculations used to determine emission rates. Fugitive emissions are to be included. Complete Table 1(a) entitled "Emission Sources."

4. Process description, operating schedule, and flow chart in sufficient detail that will explain the process and operation and a material balance for processes where applicable. The description should include a discussion of disposal methods for any generated residues and associated air emissions.

5. Design specifications about each emission control device using the appropriate OAQ table.

6. Volatile organic compound (VOC) concentrations in water or sludges or soil and volumes or weights of water, sludges or soils to be processed.

7. Exhaust stack or emission point parameters for each emission point including height, diameter, temperature, velocity and flow rate, except ground level fugitive emissions.

8. Best available control technology (BACT) documentation for all new and modified facilities.

9. Documentation of compliance with any applicable Federal New Source Performance Standard (NSPS) and Federal National Emission Standard for Hazardous Air Pollutants (NESHAPS).

10. Documentation as to whether a permit is required under new source review requirements of part C or D or Title I of the Federal Clean Air Act, 42 U.S.C. 7401 et seq., for a major source or major modification.

11. Information that demonstrates reliability of emission control systems including process instrumentation, equipment redundancy and operating procedures.

12. Results of atmospheric dispersion modeling certified to have been conducted in accordance with applicable TCEQ Office of Air Quality (OAQ) procedures. Model results must show maximum off-property 30-minute and annual ground level concentrations of each air contaminant. Dispersion modeling results must indicate compliance with all OAQ Rules and Regulations. Dimensions of buildings/structures that may influence dispersion modeling are to be furnished. Please consult with OAQ before beginning any modeling study.

13. Storage tank data including capacity in gallons, diameter, height, paint color, composition, density, vapor pressure and molecular weight of liquid stored, maximum hourly and annual throughput and number of turnovers per year. Complete Table 7 entitled “Storage Tank Summary” for each tank.

14. A statement addressing the applicability of each OAQ regulation.

15. All methods of calculating emissions must be properly referenced with justification for selecting the values used in any equation.

XI. Compliance Plan

Groundwater Monitoring and Corrective Action Requirements for Regulated Units

Owners or operators of facilities that process, store, or dispose of hazardous waste may be required to establish groundwater monitoring and response programs in accordance with the provisions of 30 TAC 335.157. There are three types of groundwater monitoring programs which may be addressed in a Compliance Plan Application for Regulated Units: i) detection monitoring, ii) compliance monitoring, and iii) corrective action monitoring. The applicability of these various monitoring programs and the associated application requirements are illustrated in Figure 2 of the Compliance Plan Application instructions and further outlined below. A Compliance Plan Application will be required to be submitted when establishing a new compliance plan or incorporating changes in an existing compliance plan.

- **Detection Monitoring**: An owner/operator required to conduct detection monitoring per the requirements of 30 TAC 335.164 must monitor for indicator parameters, such as specific conductance, total organic carbon, and total organic halogen, as well as chemical parameters and hazardous constituents specified in the facility permit. If a statistically significant increase in any parameter or hazardous constituent specified in the facility permit is detected in any monitoring well down-gradient of the compliance point, the owner/operator must sample the groundwater in all monitoring wells and analyze the samples for the presence of 40 CFR Part 264 Appendix IX hazardous constituents. As shown in the accompanying Flow Diagram (see Figure 2), if the analytical results confirm the presence of Appendix IX constituents down-gradient of the compliance point, the owner/operator must submit a Compliance Plan Application to establish a compliance monitoring program or corrective action program.

- **Compliance Monitoring**: The requirements for compliance monitoring programs are detailed in 30 TAC 335.165. Owners/operators required to establish a compliance monitoring program must monitor the groundwater to determine whether Regulated Units are in compliance with the Groundwater Protection Standard (GWPS) specified in the compliance plan (see 30 TAC 335.158 - .160). If a statistically significant increase above the GWPS in any chemical parameter or hazardous constituent specified in the compliance plan is confirmed, the owner/operator must submit a application to modify the compliance plan to establish a corrective action program in accordance with 30 TAC 335.166 (see Figure 2). If no such exceedence of the GWPS is detected for three consecutive years and the applicable compliance period has expired, the owner/operator must apply for modification of the compliance plan to re-establish a detection monitoring program for the unit. No further monitoring will be needed if the applicable post-closure care period for the unit is complete.

- **Regulated Unit Corrective Action Program**: Owners/operators required to implement a corrective action program in accordance with the provisions of 30 TAC 335.166 must remove the hazardous waste constituents found in the groundwater or treat the groundwater in-place to levels equal to or less than the GWPS down-gradient of the compliance point. The owner/operator must also establish and implement a groundwater monitoring program to demonstrate the effectiveness of the corrective action program. Corrective action measures may be terminated once the concentrations of hazardous constituents are reduced to levels equal to or below their respective concentration limits. After termination of the corrective action measures, the owner/operator must submit an application for modification of the compliance plan to re-establish a compliance monitoring program for the duration of the compliance period (see Figure 2).

Groundwater Corrective Action Requirements for Solid Waste Management Units (SWMUs)

- **HSWA Solid Waste Management Unit (SWMU) Corrective Action Program**: An owner/operator of a Permitted facility or an applicant applying for a hazardous waste permit is required to submit a Compliance Plan Application if hazardous constituents have been released from a SWMU and/or Area

of Concern (AOC) to the groundwater and exceeds background or Practical Quantitation Limit (PQL) values, if under Risk Reduction Rules 30 TAC 335 and/or appropriate Protective Concentration Limits (PCLs), if under Texas Risk Reduction Program Rules 30 TAC 350. The Permitted facility must implement a corrective action program for SWMUs and/or AOCs in accordance with provisions 30 TAC 335.167 (see Figure 3, page 122 of the instructions for example of process-alternate, but equivalent process may be authorized by the Executive Director).

Compliance Plan Application Form Structure:
The Compliance Plan Application consists of Sections XI.A. through E:

- Application Information Form:
  This section contains detailed information necessary for the application and regulatory requirements needed to put in the final compliance plan.

  The application form contains the following subsections:
  A. Site Specific Information
  B. Groundwater Protection Standard (GWPS)
  C. Compliance Monitoring Program
  D. Corrective Action Program
  E. Cost Estimates for Financial Assurance

  CP Attachments:
  A. Alternate Concentration Limits
  B. Well Design and Construction Specifications
  C. Sampling and Analysis Plan

- Compliance Plan Site Specific Tables:
  This section includes the following tables which are to be completed by the applicant, as applicable, and shall be incorporated as part of the final draft Compliance Plan. [Note: include a CD disk with the application providing an electronic copy of the files supporting the compliance plan tables, as applicable, in MS Word format]:
  - CP Table I – Waste Management Units and/or Areas Subject to Groundwater Corrective Action and Compliance Monitoring
  - CP Table II – Solid Waste Management Units and/or Areas of Concern for which Corrective Action applies pursuant to 30 TAC 335.167.
  - CP Table III – CORRECTIVE ACTION PROGRAM Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard
  - CP Table IIIA – CORRECTIVE ACTION PROGRAM Table of Indicator Parameters and the Groundwater Protection Standard
  - CP Table IV – COMPLIANCE MONITORING PROGRAM Table of Hazardous and Solid Waste Constituents and Practical Quantitation Limits or Method Quantitation Limits for Compliance Monitoring
  - CP Table IVA – COMPLIANCE MONITORING PROGRAM Table of Detected Hazardous Constituents and the Groundwater Protection Standard for Compliance Monitoring
  - CP Table V – Designation of Wells by Function
  - CP Table VI – Compliance Period for RCRA-Regulated Units

Note to the Permittee: All responses to each item in Section XI of the application form should be entered immediately below the original text associated with the form. Do not delete any areas of the application form that are not applicable, retain these areas with a response of either 'Reserved' or 'Not Applicable' below the original text of the form. In addition, if material supporting a response is located elsewhere in the application, the response should provide details as to the specific location within the referenced material.

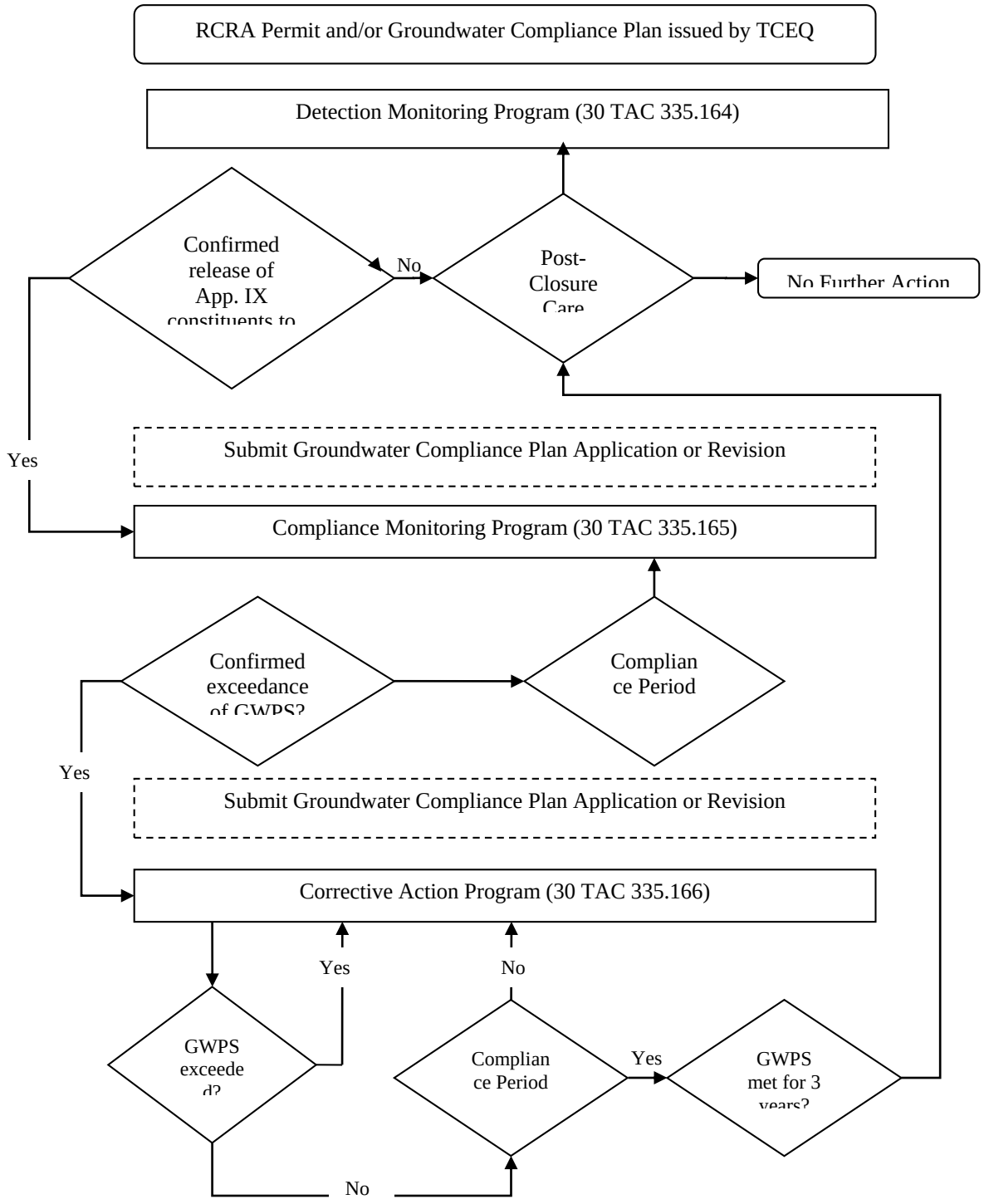
One of the primary goals of the performance based Compliance Plan is the wells listed in, CP Table V – Designation of Wells by Function (to be included in the final Compliance Plan) are the wells in which the GWPS must be met to verify compliance with Compliance Monitoring program or corrective action objectives, and to change the table would require a modification. On the other hand, the following types of wells Corrective Action Observation Wells, Corrective Action System well, etc., that are included in "Attachment A" maps of the final draft Compliance Plan, should be flexible. The purpose is to provide the permittee with the authority to alter the groundwater monitoring system and Corrective Action System designs, as necessary, to proactively address changing environmental conditions without modifying or amending the Compliance Plan. An application to modify/amend the compliance plan is only required if wells listed in CP Table V are changed; consequently, Corrective Action Observation and Corrective Action System Wells are not listed in CP Table V of the compliance plan so they may be added or removed without modifying/amending the compliance plan. Notification of proposed changes to the groundwater monitoring system and Corrective Action System designs can be included in the semiannual or annual report required by CP Table VIII – Compliance Schedule (to be included in the final Compliance Plan).

Figure 1
Overview of Required Submittals And Revisions Associated with TCEQ Groundwater Compliance Plan Application

Type of Compliance Plan Application or Revision	Minimum Required Submittals				Additional Application Submittals Or Revisions					
	Description of Modification	Public Notification Evidence	Fee Payment Evidence	Part B, Section I General Information	Section XI.A. Site-Specific Information	Section XI.B. Groundwater Protection Standard	Section XI.C. Compliance Monitoring Program	Section XI.D. Corrective Action Program	Section XI.E. Financial Assurance Cost Estimates	Attachment A Alternate Concentration Limits
RCRA Permitted Units										
Compliance Monitoring Program, commencement or modification per 30 TAC 335.165.	●	●	●	●	●	●	●	○	●	◒
Corrective Action Program, commencement or modification per 30 TAC 335.166.	●	●	●	●	●	●	○	●	●	◒
Compliance Period, termination or extension per 30 TAC 335.162.	●	●	●	●	◒	○	●	○	◒	○
Solid Waste Management Units										
Corrective Measure Implementation (CMI), per 30 TAC 335.167.	●	●	●	●	●	●	◒	●	●	○
Corrective Action Program termination.	●	●	●	●	◒	○	●	○	○	○

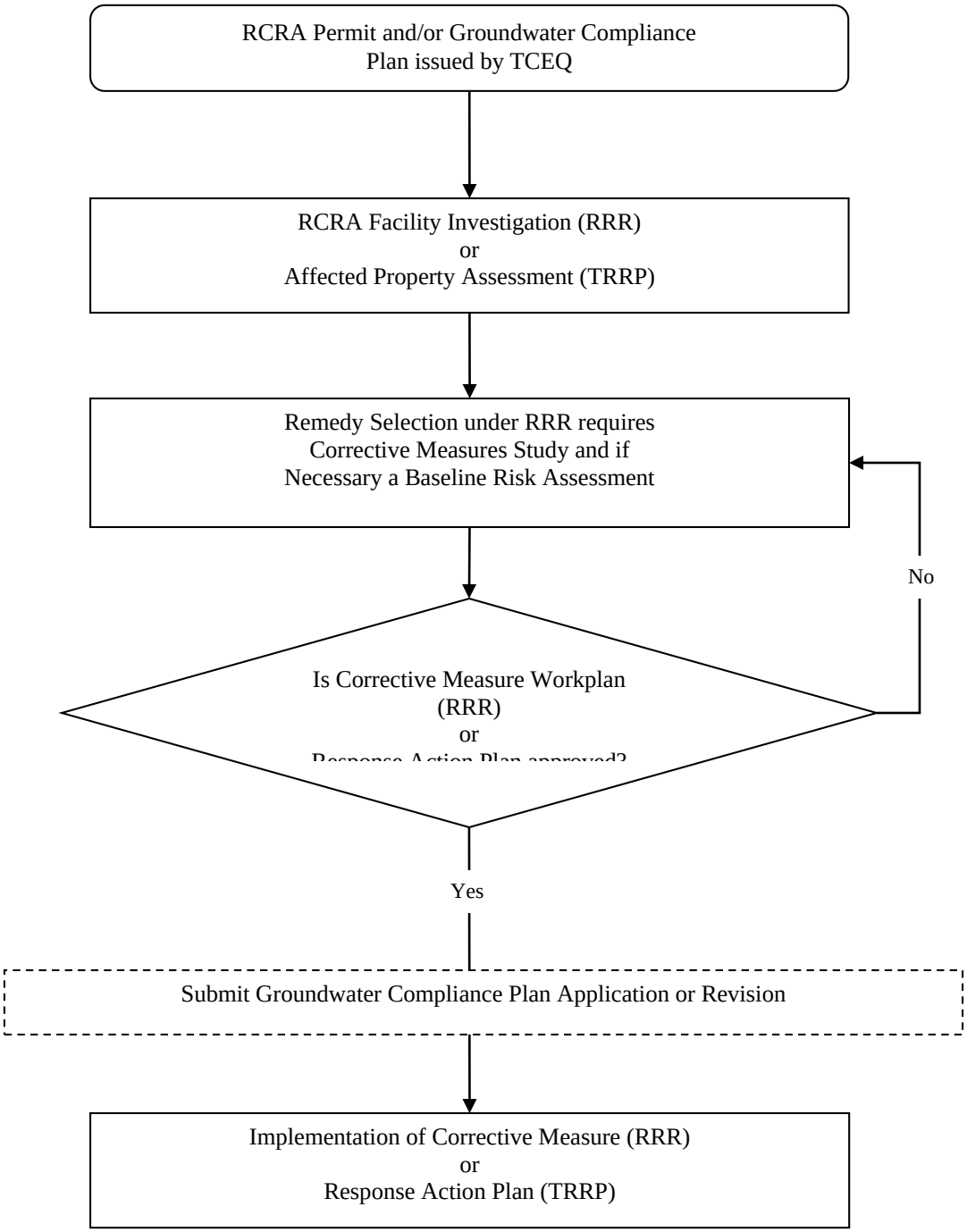
Note:
● =Submittal of additional or revised information required.
○ =No submittal of additional or revised information required.
◒ =Possible submittal of additional or revised information required.

Figure 2
Summary of Groundwater Monitoring and Compliance Plan
Application Requirements for Regulated Waste Management Units (30 TAC 335 Subchapter F)



Note:
- GWPS = Groundwater Protection Standard (See Section XI.B. of this document, and 30 TAC 335.158 – 160)
- App. IX = Groundwater Monitoring List, 40 CFR 264 Appendix IX.

Figure 3
Summary of Compliance Plan Application Requirements
for Solid Waste Management Units (SWMUS) (30 TAC 335.167)



Note:

(RRR) – Risk Reduction Rules, 30 TAC 335

A. SITE SPECIFIC INFORMATION

1. General Site Information (provide the following information):

   a. An overall plan view map of the entire facility delineating the facility's property boundary, Facility Operations Area (FOA) boundaries, as applicable, and the plume management zone (PMZ) boundaries as applicable;

   See CP Attachment A, Sheet 2 of 7 – Solid Waste Management Units (SWMUs)/Area of Concern (AOCs) Location Map

   b. A 7.5 minute U.S.G.S. quadrangle topographic map showing the entire facility;

   See CP Attachment A, Sheet 1 of 7 – Facility Site Map

   c. All oversized (larger than 8.5" by 11") drawings submitted in accordance with a and b, above, should be accompanied with legible photocopies of the reduced drawing on 8.5" by 11" sheet(s) of paper which shall be used as "CP Attachment A" maps in the final draft Permit/Compliance Plan. The applicant should title the map(s) accordingly as "CP Attachment A, Sheet 1 of xx – Facility Site Map"; "CP Attachment A, Sheet xx of xx, FOA Lateral Boundary Map"; "CP Attachment A, Sheet xx of xx, PMZ Boundary Location Map"; and

   The following maps are provided with this revision:
   - ***CP Attachment A, Sheet 1 of 7 – Facility Site Map***
   - ***CP Attachment A, Sheet 2 of 7 – Solid Waste Management Units (SWMUs)/Area of Concern (AOCs) Location Map***
   - ***CP Attachment A, Sheet 3 of 7 – Compliance Monitoring Well Network***
   - ***CP Attachment A, Sheet 4A and 4B of 7 – PMZ Boundary Map, A-TZ***
   - ***CP Attachment A, Sheet 5A and 5B of 7 – PMZ Boundary Map, B-CZ/B-TZ***
   - ***CP Attachment A, Sheet 6A and 6B of 7 – PMZ Boundary Map C-TZ, and D-TZ Monitoring Wells***
   - ***CP Attachment A, Sheet 7 of 7 – Post Response Action Care - Capped Areas, NAPL Collection System, and Slurry Wall***

   d. Aerial photographs through time depicting changes in the land use, if available.

   See Compliance Plan Figure XI.A.1.d (three years presented)

2. Waste Management

   Provide a complete list and a plan view drawing(s) locating and identifying the following waste management units at the scale of 2.5 centimeters (1 inch) equal to not more than 61.0 meters (200 feet). All oversized (larger than 8.5" by 11") drawings should be accompanied with legible photocopies of the reduced drawing on 8.5" by 11" sheet(s) of paper. Please provide information for each waste management unit listed below on Table XI.A.1. – Facility History for Waste Management Units.

   a. All hazardous waste management units regulated under the Industrial Solid Waste and Municipal Hazardous Waste Rules (Chapter 335) required to be monitored in accordance with 30 TAC 335.164 (Detection Monitoring), 335.165 (Compliance Monitoring Program) and 335.166 (Corrective Action Program);

See Table XI.A.1 – RCRA- Regulated Waste Management Unit 001 (SWMU 1) – Closed Surface Impoundment – all waste was removed in 1984 and the TCEQ granted no further action for the Corrective Action Monitoring for the unit in August 2015 (See Section VII and Response Action Plan (CP Attachment XI.D)). The regulated unit will continue to be monitored under the Corrective Action Program (335.166). Location of SWMU 1 shown on Compliance Plan Figure CP Attachment A, Sheet 1 of 5 – Facility Map, Figure CP Attachment A, Sheet 3of 6 - Compliance Monitoring Well Network, and Figure XI.A.2.1.

b. All solid waste management units (SWMUs) and Areas of Concern (AOCs) regulated under 335.167 which are recommended for further investigation and/or corrective action in the RCRA Facility Assessment (RFA) shall include those identified in accordance with the permit requirements subsequent to the initial RFA.

See Table XI.A.1 for list, SWMUs and AOCs shown on Figures XI.A.2, XI.A.2.1, XI.A.2.2, XI.A.2.3, and XI.A.2.4.

c. All on-site wastewater treatment units.

Not Applicable

3. Facility History

Based on the information provided in Table XI.A.1., complete CP Table I – Waste Management Units and Areas Subject to Groundwater Corrective Action and Compliance Monitoring accordingly in the format provided.

See Compliance Plan Table I (Waste Management Units and Areas Subject to Groundwater Corrective Action and Compliance Monitoring).

For the SWMUs or AOCs listed in Table XI.A.1. regulated under 30 TAC 335.167 which are recommended for further investigation and/or corrective action in the RCRA Facility Assessment (RFA), including those identified in accordance with permit requirements subsequent to the initial RFA, complete CP Table II – Solid Waste Management Units and Areas of Concern for which Corrective Action applies pursuant to 30 TAC 335.167. CP Table II will become part of the Compliance Plan.

See Compliance Plan Table II (Solid Waste Management Units and Areas of Concern for which Corrective Action Applies Pursuant to 30 TAC 335.167).

4. Site Geology, Hydrogeologic Conditions, and Relationship to Surface Water

For New, modified/amended Compliance Plan, please provide a Geology Report as required by Section VI.B of this application containing updated site geologic information including the following descriptions, maps and tables with appropriate supporting documentation [All maps should be at the scale of 1 inch equal to not more than 200 feet and legible when reduced to 8.5" by 11" letter size paper]:

a. A description of the site geology for the facility. The geologic description should include a site geology map and sufficient cross sections (see Item h. below) to describe the uppermost aquifer and any confining stratigraphic unit(s) beneath the site.

See Permit Section VI. Geology Report and Revised Response Action Plan (RAP) in CP Attachment XI.D – Attachment 1A.

b. A description of the site soils and subsurface lithologies using the Unified Soil Classification System. For those soil units which do not extend beneath the entire site area, the soil description should include a plan view map designating the soil's areal extent;

See Permit Section VI. Geology Report

c. Where a soil remedy is required in a corrective action program of Section XI.D.1. of this application for a Regulated Unit, SWMU and/or AOC, the applicant shall submit a description of contamination in soils of the vadose zone (unsaturated zone above the uppermost aquifer). The soil description should include maps indicating lateral and vertical extent of contamination;

See CP Attachment XI.D – Response Action Plan – Attachment 1A

d. A description and designation of the uppermost saturated zone or uppermost aquifer including the name, the type of unit (e.g. perched, confined, etc.,), and groundwater characteristics (flow rates, directions, hydraulic conductivity, etc.). As defined in 40 CFR 260.10, an aquifer is a geologic formation, group of formation, or part of a formation, capable of yielding significant amount of groundwater to wells or springs. Persons using Texas Risk Reduction Program (TRRP) should also consider the definition of a groundwater bearing unit as a saturated geologic formation, group of formations, or part of a formation with a hydraulic conductivity of equal to or greater than 1 x 10 -5 centimeters/second (30 TAC 350.4(a)40).

See Permit Section VI. Geology Report and CP Attachment XI.D – Response Action Plan – Attachment 1A

e. Present the geologic, stratigraphic and hydrogeological information; and
f. ***See Permit Section VI. Geology Report and CP Attachment XI.D – Response Action Plan – Attachment 1A***Maps indicating the lateral and vertical extent of the contamination for each stratigraphic unit affected, with supporting documentation.

See CP Attachment XI.D - Response Action Plan - Attachment 1A

g. Current Contaminant Plume Map(s) - Locating and identifying the extent of contamination as determined from previous monitoring on a separate facility base map(s). Locate and identify all monitor wells and waste management units/areas.

See CP Attachment XI.D - Response Action Plan - Attachment 1A

h. Cross section - Cross section transect lines should be indicated on the Contaminant Plume Map. The applicant, at a minimum, must submit two (2) stratigraphic cross sections for each waste management unit/area. One cross section should be drawn through all the point of compliance wells and the second cross section should be drawn along the direction of the movement of the contaminant plume released from the unit/area. Cross sections should follow the requirements outlined in the Geologic and Hydrogeologic Report of Parts IV and V of this application. At a minimum, the cross sections should include the following information:

   i. the stratigraphic interpretation (e.g., surface grade, uppermost aquifer, aquiclude);
   ii. lithology/geologic description of the uppermost aquifer and aquiclude;
   iii. the potentiometric surface;
   iv. detected non-aqueous phase liquids (NAPLs) and hazardous constituents; and
   v. screen length and screen depth for each well in the cross section.

See CP Attachment XI.D – Response Action Plan – Attachment 1A

i. Well Construction diagram - The report should include a well construction diagram for all wells used in the cross section. The well construction diagram should include the information in "Attachment B" of this (Compliance Plan) application. The well construction diagram information may be included on the geologic cross-section(s).

See Permit Section VI, Appendix VI.B for Well Completion Records and CP Attachment XI.D – Response Action Plan – Appendix 2

j. Describe the potential for any surface water bodies to be hydraulically connected to groundwater containing hazardous constituents. Apply the guidance provided in Determining PCLs for Surface Water and Sediment, RG-366/TRRP-24 Revised, December 2002, in order to determine the water body type and applicable surface water criteria for human health, aquatic life and wildlife, as applicable.

See CP Attachment XI.D – Response Action Plan. The nearest surface water body is Buffalo Bayou, located approximately 1.6 miles southwest of the Site. The potential for lateral migration of groundwater from the Site to the southwest approximately 1.6 miles to Buffalo Bayou is not likely.

B. HAZARDOUS CONSTITUENTS IN GROUNDWATER AND GROUNDWATER PROTECTION STANDARDS (GWPSS)

Hazardous Constituents in Groundwater

For each contaminated hydrogeologic unit beneath a waste management unit/area (40 CFR 264.95), provide a list of all 40 CFR Part 264 Appendix IX hazardous constituents that have been detected in groundwater samples above background values, Practical Quantitation Limits (PQLs), or Method Quantitation Limits (MQLs). Please submit for each unit/area the most recent Appendix IX laboratory analysis results showing the constituents, constituent concentrations, methods used for analysis and associated laboratory QA/QC.

The groundwater samples (collected for the purpose of determining whether constituents listed in Appendix IX are present) shall be from each waste management unit/area monitoring well system as required by 30 Texas Administrative Code (TAC) 335.164 (detection monitoring program).

The only RCRA Permitted Unit is the Closed Surface Impoundment (Waste Unit 001 (SWMU 1)), which will be monitored under the Corrective Action Program detailed in Section XI.D. The remainder of the units will be addressed using a facility-wide corrective action approach with Corrective Action Monitoring as specified in Compliance Plan Tables III, IIIA, and V.

If the waste management unit/area is subject to Corrective Action Program required by 30 TAC 335.166 or 335.167 and/or Compliance Monitoring required by 30 TAC 335.165, then list the unit/area and include the list of hazardous constituents and their principal degradation constituents in:

- CP Table III – Corrective Action Program Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard; and

See Compliance Plan Table III (Corrective Action Program Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard) for the hazardous constituents subject to the Corrective Action Program.

- CP Table IV – Compliance Monitoring Program Table of Hazardous and Solid Waste Constituents and Practical Quantitation Limits or Method Quantitation Limits for Compliance Monitoring.

Reserved.

Groundwater Protection Standards (GWPSs)

The GWPS (30 TAC 335.158) is designed to ensure that hazardous constituents (30 TAC 335.159) identified in groundwater and their principal degradational constituents do not exceed concentrations that pose a present or potential hazard to human health and the environment. Compliance monitoring and corrective action programs for a Regulated Unit (30 TAC 335.165 and 335.166) and a corrective action program for a solid waste management unit (SWMU) (30 TAC 335.167) require human health and the environment to be protected from all releases of hazardous wastes and constituents. These corrective action and monitoring programs are evaluated using the GWPS. The GWPS is based on the following criteria.

a. Background Levels - Background levels authorized under 30 TAC 335.160(a)(1) are defined as constituent concentration values that are naturally occurring or are not influenced by contamination coming from the waste management unit. These values are established by statistical analysis of upgradient well sampling data. Analytical results from a sufficient number of independent samples are required to be utilized with an approved

and appropriate statistical method. For guidance on the statistical methods consult, Statistical Analysis of Groundwater Data at RCRA Facilities-Unified Guidance, U.S. EPA, March 2009, and any subsequent updates to this document.

Not applicable.

Practical Quantitation Limits (PQLs) or Method Quantitation Limits (MQLs) are utilized in lieu of background values unless a background demonstration establishes concentrations for naturally occurring constituents. The PQL or MQL is defined in the footnote of CP Tables III and IV.

No PQLs or MQLs are used on CP Table III except for constituents that have GWPSs below the typical laboratory MQL using the appropriate analytical method.

b. Primary and Secondary Maximum Contaminant Levels (MCLs) - Maximum permissible level of a contaminant in water which is delivered to any user of a public water system (40 CFR Part 141 and 143, Federal Safe Drinking Water Act).

See Compliance Plan Table III (Corrective Action Program Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard) and associated footnotes.

c. Alternate Concentration Limits (ACLs) determined in accordance with 30 TAC 335.160(b) and are defined in footnote of CP Tables III and IV.

As discussed in the RAP (Attachment XI.D), TCEQ Protective Concentration Levels (PCLs) are the regulatory standards that apply at groundwater alternate points of exposure (POEs) for a particular groundwater exposure pathway, as set in the Title 30 Texas Administrative Code Chapter 350 Texas Risk Reduction Program (TRRP). Therefore, for this compliance plan, the proposed ACLs shall be based on TRRP PCLs ($^{GW}GW_{Ing}$). The PCLs may change as updates to the TRRP Rule are promulgated.

See Compliance Plan Table III (Corrective Action Program Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard) for the list of constituents and groundwater ACLs, and associated footnotes.

1. Establishing the Groundwater Protection Standard (GWPS)
   a. If background, PQL or MQLs are proposed for the GWPS, the applicant must list all constituents (i.e., detected and degradational constituents) for which a GWPS is being applied for and the appropriate concentration limits. This information shall be submitted in the format of CP Tables III, and IV.

The GWPS are the regulatory groundwater standard(s) for a COC that establish compliance and apply at POE wells as part of the PMZ. In the cases of PMZs and POEs, PCLs will be used to verify compliance.

See Compliance Plan Table III (Corrective Action Program Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard) for the GWPS (PCLs).

   b. Alternate Concentration Limits (ACLs) - ACLs are established at the point of compliance (POC) for a regulated or solid waste management unit (SWMU). All concentration values or limits listed in Section XI.B.1.c. are considered ACLs. ACLs are evaluated in accordance with the provisions of 30 TAC 335.160(b) and other regulations acceptable to the executive director. If an ACL is requested on the basis of Section XI.B.1.c. (MCLs), then no ACL demonstration

is necessary. The ACL demonstration must establish constituent concentrations in groundwater in accordance with regulations acceptable to the executive director. This information shall be submitted in the format of CP Tables III and IV. Note that depending upon the rule employed [i.e., 30 TAC 335 Subchapter S – Risk Reduction Rules (RRR) or 30 TAC 350 – Texas Risk Reduction Program (TRRP)], the applicant should determine the GWPS for the point of compliance and point of exposure, as applicable, in accordance with the remedy standard being utilized.

If the contaminant plume discharges or has a potential to discharge into surface water, then the facility must also comply with 30 TAC Chapter 307 (Texas Surface Water Quality Standards) unless other regulatory requirements acceptable to the executive director are requested.

See Compliance Plan Table III (Corrective Action Program Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard) for list of ACLs.

"Attachment A" of this Compliance Plan Application provides a summary of regulatory requirements for an ACL demonstration in accordance with 30 TAC 335.160(b).

Proposed ACLs are based on the TRRP PCLs as described above in XI.B.1.c. Where the POE is at a distance from the POC (i.e., edge of the groundwater PCLE Zone), TRRP PCLs directly apply at the POE. See CP Attachment XI.A (Alternate Concentration Levels) for additional discussion (Revision 4 – July 2017).

C. COMPLIANCE MONITORING PROGRAM

As required by 30 TAC 335.165, an owner or operator must monitor the groundwater to determine whether Regulated Units are in compliance with the Groundwater Protection Standard (GWPS) under 30 TAC 335.158. The applicant must provide the following information when proposing a compliance monitoring program.

RESERVED - The one regulated unit, Closed Surface Impoundment (SWMU 1), received a "no further action" from the TCEQ Corrective Action Division in a letter dated August 5, 2015. However, concentrations in one of the point-of-compliance (POC) wells exceeded the GWPS for naphthalene in July 2019 but returned to below GWPSs in January 2020. SWMU 001 will remain in the Corrective Action Program until concentrations in POC wells are below the GWPS for three consecutive years. Following that period, the Compliance Monitoring Program will be established through a permit revision.

The other SWMUs and AOCs will be addressed through the facility-wide Corrective Action Monitoring Program (see Section XI.D).

a. Groundwater Monitoring Program Description

Describe the proposed groundwater monitoring system to be used to monitor compliance with the GWPS which includes the following information.

(1) Changes, if applicable, from the current detection monitoring system or compliance monitoring system groundwater monitoring program at the waste management unit that will be required to comply with the compliance monitoring program described in 30 TAC 335.165. This description should address changes concerning:

Not applicable

(a) Geological and/or hydrogeological information differences since the submittal of the previous application [must submit an updated Geologic and Hydrogeologic Report required by Section XI.A.4];

(b) Waste management areas/units;

(c) Construction details for monitor wells to evaluate compliance with "Attachment B" well specification requirements;

(d) The number and locations of additional monitor wells [also see Section XI.C.1.b.(2)];

(e) Sample handling, chain of custody, and analytical procedures (also see "Attachment C");

(f) Frequency of monitoring;

(g) Monitoring parameters;

(h) Evaluation of compliance with GWPS (Statistical Methods);

(i) Other Sampling and Analysis Plan information to be compliant with "Attachment C";

(j) Compliance period as defined in Section XI.E.1.c. of the application;

(k) Financial assurance (see Section XI.E.); and

(l) An ACL variance under 30 TAC 335.160(b), if applicable (also see "Attachment A").

(2) The number, depth and location of all monitor wells (Background Wells, Point of Compliance Wells, Observation Wells, Piezometers, etc.). Complete CP Table V – Designation of Wells by Function and make changes as applicable to plans referenced in Section XI.C.1.b.

Not applicable.

(3) The proposed hazardous constituent monitoring list which is based on constituents that were monitored during detection monitoring (if applicable), constituents detected in accordance with 30 TAC 335.164, and degradational constituents identified in Table CP IV accordingly to develop the constituent list for the Compliance Monitoring Program. Also, list the PQL, MQL, or background concentration for each constituent in CP Table IV. CP Table IV shall become part of the final Compliance Plan to be analyzed at least annually as required by 30 TAC 335.165(7).

Not applicable.

(4) The proposed indicator parameter monitoring list. From the list of constituents and GWPS identified in CP Table IV., complete CP Table IVA – Compliance Monitoring Program, Table of Detected Hazardous Constituents and the Groundwater Protection Standard for Compliance Monitoring, accordingly. CP Table IVA shall become part of the final Compliance Plan to be analyzed at least semiannually as required by 30 TAC 335.165(6).

Not applicable.

(5) Monitoring frequency.

Not applicable.

(6) Provisions for reporting of groundwater data at least on an annual basis.
Not applicable.

(7) Annual determination of contamination plume rate and direction of migration.
Not applicable.

(8) Compliance period. Calculate the compliance period as required by 30 TAC 335.162 and 335.165(1)(d). Include calculations and complete CP Table VI – Compliance Period for RCRA-Regulated Units which shall become part of the final Compliance Plan.

Not applicable.

b. Submit the following plans and reports.

(1) Current Sampling and Analysis Plan - The Sampling and Analysis Plan must include information required by 30 TAC 335.163(4) and 335.163(5) and 40 CFR Subpart 270.30(j). For guidance, please see "Attachment C" to the application.

Not applicable.

(2) Monitoring System Plan - If the applicant is proposing a monitoring well or a monitoring system in the application, the applicable well installation specifications outlined in "Attachment B" of this application should be followed. All new monitoring wells must be installed in accordance with the specifications outlined in "Attachment B", unless an alternative design is approved by the agency prior to installation. If the applicant proposes as part of the monitoring system, any well (existing or proposed) that does not meet or exceed the requirements outlined in "Attachment B", then the proposed alternative design must be described in detail in the Monitoring System Plan and must be submitted with this application. The Monitoring System Plan must include:

(a) Monitoring System Design and Specifications - Certified by a qualified engineer and/or geologist which provides detailed plans and specifications on the monitoring system design; and

(b) Well Drilling and Well Casing Specifications - Certified by a qualified engineer and/or geologist which provides details on well casing specification, drilling logs and reports.

Not applicable.

(3) Current Geologic and Hydrogeologic Report - Provide a report per Section X.I.A.4 of this application discussing the geologic and hydrogeologic conditions of the facility and the specific area affected by the waste management areas. This report should include the most up-to-date information from which the design of the groundwater monitoring system was

based.

Not applicable.

1. Waste Management Units Monitored
   a. Delineate and identify the following for each waste management unit in the proposed groundwater monitoring program.

      (1) Boundary of the waste management unit and, if applicable, the proposed waste management area which includes more than one waste management unit (identify all waste management units which are included in the waste management area). These waste management units subject to compliance monitoring should be listed in CP Table I – Waste Management Units and Areas Subject to Groundwater Corrective Action and Compliance Monitoring which shall become part of the final Compliance Plan.

      Not Applicable

      (2) The proposed point of compliance (30 TAC 335.161) and point of exposure wells.
      Not Applicable

      (3) Any other proposed monitor wells such as supplemental wells, observation wells, background wells, etc. If appropriate the groundwater monitoring system should have a sufficient number of wells be designated to monitor the downgradient extent of the plume.
      Not Applicable

      (4) Features which may serve as conduits for subsurface contamination.

      Not Applicable

   b. For each waste management unit/area in the proposed groundwater monitoring system, submit the locations of individual waste management unit/area monitor wells (existing or proposed) and any soil borings (plugged and unplugged) specifically drilled for assessment of contamination. These individual monitor wells shall be identified by respective well number on a plan view drawing and only the background, point of compliance and/or point of exposure wells should be indicated in CP Table V – Designation of Wells by Function. The plan view map depicting the location of individual monitoring wells for compliance monitoring should be labeled as "CP Attachment A, sheet xx of xx" in the text box. The title box should also include reference to the facility name, Permit/Compliance Plan Number, Solid Waste Registration Number, Unit Description or name with Notice of Registration (NOR) Unit No. 0000. The "CP Attachment A" map(s) and CP Table V shall also become part of the final Compliance Plan.

      Not Applicable.

2. Implementation Schedule

   Itemize and discuss, in detail, the estimated time schedule necessary for any testing and assessments, system design, construction and installation, and final implementation of the groundwater monitoring program for each Regulated Unit and solid waste management unit. If the

schedule of implementation for items are not completed at the time of the application, or are not completed at the time of issuance of the final draft Permit/Compliance Plan, then the items should be added to the CP Table VIII - Compliance Schedule of the application.

Not Applicable.

D. CORRECTIVE ACTION PROGRAM

As required by 30 TAC 335.166, the owner or operator must take corrective action to ensure that Regulated Units are in compliance with the Groundwater Protection Standards (GWPS) under 30 TAC 335.158. As required under 30 TAC 335.167, all releases of hazardous constituents from any solid waste management unit at the facility must also be addressed. For existing corrective action programs which have been approved by the TCEQ, the applicant shall provide a copy of the TCEQ corrective action system approval letter, design system specifications and any updates as requested in Section XI.D.3.a.(1) of this section. The applicant must provide the information requested below when proposing a corrective action program which has not been previously approved by the TCEQ including a detailed description of a corrective action or a combination of corrective actions that will remedy the groundwater contamination at the waste management unit and a proposed plan for a monitoring program that will demonstrate the effectiveness of the corrective action.

The owner or operator may also apply for a the Facility Operations Area (FOA) pursuant to the requirements of 30 TAC 350.131 - 350.135 of the Texas Risk Reduction Program (TRRP) rules, provided the applicant meets the FOA pre-approval process steps 1 through 3 approved by the Commission.

Also, the owner or operator may apply for alternative groundwater Corrective Action Program pursuant 30 TAC 335.151, 335.156 and 30 TAC 350, where there are commingled releases from RCRA-regulated unit from one or more SWMUs, PCO, and/or AOC.

RCRA Regulated Waste Management Unit 001: The existing corrective action program previously approved by the TCEQ applies to the RCRA-Regulated Waste Management Unit 001 (SWMU 1).

Other SWMUs and AOCs: As detailed in the RAP (CP Attachment XI.D) , to address the PCLE Zone in groundwater on-site and within a portion of the COH ROW will be through Remedy Standard B control using the following response actions:

- ***A modified groundwater response objective through a plume management zone (PMZ);***
- ***Installation of a physical control through a slurry wall.***

The proposed cumulative PMZ (for all three GWBUs) consists of the following:

1) On-Site PMZ – The On-Site PMZ will include the cumulative groundwater PCLE Zone within the UPRR-owned property consisting of the center to the east portion of the Site and western portion of the Site (includes the On-Site PMZ (West) area for the B-CZ/B-TZ GWBU). The proposed PMZ includes the groundwater PCLE Zones for the creosote-related COCs and arsenic.

2) Off-Site PMZ (COH ROW) - The off-site PMZ includes the cumulative groundwater PCLE Zone that extends off-site to the north, east, and west of the Site within the City of Houston ROW.

A physical control consisting of a slurry wall barrier is proposed to be installed at the Site. The slurry wall will be constructed to impede groundwater flow from portions of the Site and establish a subsurface barrier separating the on-site contamination from the off-site areas to the north and east. This will reduce the risk of potential future migration of groundwater COC concentrations above the critical PCLs from the Site, and similarly reduce the potential for migration of mobile NAPL at the Site. However, creosote NAPL is present

off-site beyond where the proposed slurry wall is to be constructed and this NAPL represents potential source mass for the off-site groundwater PCLE Zones.

For the off-site groundwater PCLE Zones that extend off-site outside of the proposed PMZs, the response action objective is groundwater decontamination as defined in TRRP to the applicable critical PCLs under Remedy Standard B (Remedy Standard A equivalent). Pursuant to TRRP-32 guidance for NAPL Management, the off-site groundwater PCLE Zone where NAPL is in contact with B-CZ/B-TZ groundwater the NAPL response endpoint is to recover soluble NAPL fraction sufficient to eliminate source contributions to the groundwater PCLE zone. Two major aspects, which are functions of the generally low mobility physical properties of creosote and its components, and the significant and unfavorable hydrogeologic complexity of the Site, greatly hinder recoverability of the soluble DNAPL fraction from the subsurface. Therefore, the response actions related to this objective will be conducted in a phased approach as described below.

First, the construction of the slurry wall on-site will impede groundwater flow from areas where NAPL has been observed in monitoring wells on Site, thereby separating the on-site contamination from the off-site areas. Next, the mobile NAPL within the saturated soil matrix in certain areas of off-site hydrostratigraphic units will be addressed. The proposed remedial action objectives (functional objectives) for this NAPL as part of the effort to meet the absolute objective of decontamination for the off-site groundwater PCLE Zone will be to:

- ***Reduce the apparent thickness of in-well DNAPL in existing and proposed recovery wells over a reasonable time frame; and***
- ***Reduce the occurrence of DNAPL (i.e. the number of wells exhibiting measurable DNAPL) in those wells over a reasonable time frame.***

UPRR proposes to implement multi-phase extraction (MPE) events to recover DNAPL from existing and proposed wells as the response action to address the functional objectives listed above. Additional Corrective Action System Wells in the A-TZ, B-CZ/B-TZ, and C-TZ will be installed off-site to increase the potential for DNAPL recovery with the absolute objective of recovering the soluble NAPL fraction sufficient to eliminate source contributions to groundwater PCLE zone.

Given the inherent complex and unfavorable site geologic conditions and generally limited mobility characteristics of creosote DNAPL, it is anticipated that achieving the response objective of reducing COCs in groundwater to the applicable critical PCLs off-site within a reasonable timeframe will be challenging based on the physical characteristics and complex geology at the Site. In fact, it has been shown at numerous creosote DNAPL sites that complete removal of creosote DNAPL is not technically practicable. However, regular physical NAPL removal through MPE events will aid in advancing toward the response objective. Once the MPE achieves the functional objectives, passive remedial options such as monitored natural attenuation (MNA) will be evaluated for addressing the residual off-site groundwater PCLE Zones.

In terms of unprotective conditions for receptors during the remedial period, there are no potential or unprotected exposures to impacted groundwater for the off-site residents since none of the properties in the area use groundwater for drinking or any other purposes; and the properties are provided drinking water by the City of Houston. No groundwater drinking wells have been identified in the area and anticipated future use of the shallow groundwater as a resource is unlikely. In addition, soil gas assessments in conjunction with groundwater monitoring have indicated through multiple lines of evidence that the vapor intrusion pathway is not complete for the off-site properties.

1. Type of Corrective Action Proposed

   From the list below, indicate the type of groundwater corrective action proposed for each hazardous waste unit/area. Discuss in detail if more than one corrective action is to be used in a waste management area. Submit the discussion and descriptions as an attachment to the application.

a. Groundwater well recovery with surface treatment
b. Groundwater well recovery/surface treatment/re-injection
c. Groundwater well recovery and disposal
d. Vapor extraction system
e. Interceptor trench recovery and disposal
f. Interceptor trench recovery and surface treatment
g. In-situ treatment – bioreclamation
h. In-situ treatment – chemical reaction
i. Barrier walls/encapsulation
j. Permeable treatment beds
k. Other, please describe

See CP Attachment XI.D (RAP) for the discussion and description of proposed types of corrective actions. As detailed in the RAP, the type of corrective action proposed includes:

- ***(i.) Barrier walls/encapsulation – Slurry wall; and***
- ***(k.) Other - NAPL recovery activities.***

2. Program Description

Attach a technical report providing a detailed description of a complete corrective action system including above and below ground equipment/facilities. Include discussions on the following concerns for each type of corrective action as applicable.

See RAP (CP Attachment XI.D).

a. Recovery Wells
See RAP (CP Attachment XI.D) and CP Attachment A Sheet 4Aof 7, Sheet 4B of 7, Sheet 5A of 7, Sheet 5B of 7, Sheet 6A of 7, and Sheet 6B of 7.

(1) Indicate on a plan view of the waste management area the anticipated location of Recovery Well(s) which would optimize the extraction of the groundwater contaminants.
(2) Indicate on a plan view the estimated radius of influence of each Recovery Well.
(3) Indicate the optimum pumping rate of each Recovery Well determined from the aquifer pump test.
(4) Describe the design of the Recovery Wells and pump system including diameter, construction material, gravel packing, screen slot sizes and patterns, type of pumps and maintenance requirements.
(5) Describe the collection and storage of the contaminated groundwater which is classified hazardous waste (on-site storage of hazardous waste shall require compliance with the applicable regulations):
    (a) Less than 90-day tanks (see 40 CFR 262.34/40 CFR 265 Subpart J);
    (b) Permitted Tanks (see 40 CFR 264 Subpart J);
    (c) Less than 90-day Container Storage Area (see 40 CFR 262.34/40 CFR 265 Subpart I);
    (d) Permitted Container Storage Area (see 40 CFR 264 Subpart I); and
    (e) Temporary Units (see CFR 264.553).
(6) Describe the treatment and/or final disposition of the hazardous and nonhazardous contaminated groundwater.

b. Vapor Extraction System

Not Applicable

(1) Indicate on a plan view of the waste management area the anticipated location of the vapor extraction system which would optimize the extraction of hazardous constituents from the vadose zone.
(2) Describe the construction design of the vapor extraction system in detail, including all diagrams and drawings.
(3) Describe the emission control equipment used to comply with air quality regulations.
(4) Provide the anticipated volatile contaminants to be remediated along with information on the expected effectiveness of the vapor extraction system at the waste management unit.
(5) Provide established treatability data for the proposed design.
(6) Specify the hazardous constituents affected by this type of treatment.

c. Interceptor Trenches

Not Applicable

(1) Indicate on a plan view of the waste management area the anticipated location of the interceptor trench.
(2) Provide the construction design.
(3) Describe the procedure for construction.
(4) Describe the liquid removal and collection system.
(5) Describe the surface storage and/or treatment of the contaminated groundwater.
(6) Describe the final disposition of the contaminated groundwater.

d. In-situ Treatment – Chemical Reaction

Not Applicable

(1) Characterize the chemical agents to treat the contaminated groundwater and/or soils in the vadose zone.

(2) Provide laboratory treatability data.
(3) Specify the hazardous constituents affected by this type of treatment.
(4) Specify the reaction by-products produced during the chemical reactions.
(5) Indicate degradation time for each treated hazardous constituent and any resulting chemical reaction by-products.
(6) Describe the potential health risks caused by human exposure to the reaction by-products.
(7) Describe potential damage to wildlife, crops, vegetation and physical structures caused by exposure to reaction by-products.
(8) Describe the persistence and permanence of the potential effects of the reaction by-products.
(9) Describe the method of chemical reactant injection and other important aspects of the system design.

e. In-situ Treatment – Bioreclamation

Not Applicable

(1) Describe the type of bacteria most appropriate for the degradation of the hazardous constituents present in the groundwater and/or soil in the vadose zone.
(2) Describe the nutrients necessary and application frequency to encourage effective bioreclamation.
(3) Provide laboratory data from treatability studies utilizing the contaminated groundwater and describe any potential hazardous by-products.
(4) Indicate the degradation time for each hazardous constituent affected by this treatment.
(5) Describe the method of injecting the bacteria and nutrients and describe the delivery system design.

f. Barrier Walls

See RAP (CP Attachment XI.D), Worksheet 2.0.

(1) Provide laboratory permeability data using the actual contaminated groundwater.

(2) Describe the barrier wall materials.
(3) Summarize construction design and installation procedures.

g. Permeable Treatment Beds

Not Applicable

(1) Provide laboratory data of treatability simulations using actual contaminated groundwater in combination with the material proposed to be used in treatment beds.

(2) Discuss the properties of the treatment material which would make it effective for use at this site.
(3) Indicate which hazardous constituents will be affected by this treatment. Indicate the reactions which will take place and the resulting reactant by-products. Discuss the anticipated lifetime of the permeable treatment beds.
(4) Provide the construction design and installation procedures.

h. Other

Discuss in detail, any other corrective action (soils and groundwater) not included above which is proposed for use at the affected waste management area(s).

See RAP (CP Attachment XI.D), Worksheet 2.0.

<u>Soils</u>

The surface/subsurface soil PCLE Zones at the Site have been addressed as follows:

1) <u>Former HWPW Area</u>: Remedy Standard B closure through consolidating impacted soils within the Area of Contamination (AOC) and implementing Physical Control through an engineered soil cap and asphalt roadway. This response was completed in 2016 as detailed in the Response Action Completion Report (RACR) dated July 2016 (PBW, 2016) and Revised RACR dated June 2017 (PBW, 2017). Pursuant to the post-closure care detailed in the RAP, quarterly inspections and maintenance of the cap and roadway have been implemented;

2) <u>Englewood Intermodal Yard</u>: Remedy Standard B closure by implementing Physical Control using the existing concrete pavement as a cap as detailed in the RACR dated July 2016 (PBW, 2016) and Revised RACR dated June 2017 (PBW, 2017). In 2019, a NAPL Collection System was constructed as part of an interim response action consisting of two shallow collection trenches to address tar-like NAPL seeps identified in the Englewood Intermodal Yard. Details of the construction activities were provided in the Interim RACR dated March 29, 2019 (Golder, 2019b). The NAPL Collection System is being evaluated and additional response action activities will be proposed following additional assessment activities (i.e., test pits conducted in July 2020, potentially impacted underground utilities). As summarized in the Interim NAPL and TPH-NAPL Assessment Report (Appendix 3; Golder, 2020d), there is no Total TPH PCLE zone for soils at the Site, but the NAPL response action objectives are applicable for the NAPL found in the vadose zone at the Englewood Intermodal Yard. Pursuant to the post-closure care detailed in the RAP, quarterly inspections and maintenance of the cap have been implemented;

3) <u>Railroad mainlines and siding tracks</u>: The response action for the operational area between the Former HWPW area and the Englewood Intermodal Yard has followed a Remedy Standard B closure using the existing railroad ballast as a protective barrier as detailed in the RACR dated July 2016 (PBW, 2016) and Revised RACR dated June 2017 (PBW, 2017). Quarterly inspections and maintenance of the ballast area have been implemented;

4) <u>City of Houston ROW along Liberty Road</u>: Remedy Standard B closure through limited excavation of surface soils, consolidating impacted soils within the AOC, and implementing Physical Control through an engineered concrete sidewalk as detailed in the RACR dated July 2016 (PBW, 2016) and Revised RACR dated June 2017 (PBW, 2017). Quarterly inspections and maintenance of the cap and roadway have been implemented.

As detailed in the RACRs (PBW, 2016; PBW, 2017; Golder, 2019b), the surface and subsurface PCLE Zones have been addressed through the various caps constructed or implemented at the Site and are inspected as part of the post-response action completion requirements.

<u>Groundwater</u>
The response action objectives for groundwater are detailed in the RAP (CP Attachment XI.D).

3. <u>Groundwater Monitoring and Corrective Action Program Description</u>

   a. Describe the proposed groundwater monitoring system to be used to monitor corrective action and compliance with the GWPS which includes the following information.

   (1) Changes, if applicable, from the current groundwater monitoring program at the waste management unit that will be required to comply with the corrective action monitoring program described in 30 TAC 335.166. This description should address changes concerning:

      (a) Geological and/or hydrogeological information differences since the submittal of the previous application [must submit a Geologic and Hydrogeologic Report in accordance with Section XI.A.4;

   See Permit Section VI. Geology Report and CP Attachment XI.D – Response Action Plan – Attachment 1A for additional geologic and hydrogeologic information since previous permit application.

      (b) Waste management areas/units;

   The regulated unit SWMU 1 (Waste Management Unit 001) will continue to be

monitored under the Corrective Action Program. For the other SWMUs and AOCs, groundwater monitoring and corrective action program was designed for the facility-wide corrective action as detailed in the RAP (CP Attachment XI.D).

(c) Construction details for monitor wells to evaluate compliance with "Attachment B" well specification requirements;

See RAP, Worksheet 3.1, Attachment 3A – Table 1 (CP Attachment XI.D) for list of alternate point of exposure (APOE) wells, corrective action observation (CAO)wells, and corrective action system (CAS) wells to be incorporated into the Corrective Action Monitoring through the Plume Management Zone (PMZ). Some of the wells listed in the RAP, Worksheet 3.1, Attachment 3A – Table 1 (CP Attachment XI.D) pre-date the well specification requirements or were RFI investigation wells and may not be in compliance with Attachment B of Section XI. Well completion logs for the POE, CAO, and CAS wells are provided in Section VI, Appendix VI.B and CP Attachment XI.D Appendix 2. Any wells constructed after issuance of the Compliance Plan will meet the requirements of the CP Attachment B, unless an alternate well design is approved by the Executive Director.

(d) The number and locations of additional monitor wells [must submit the Monitoring System Plan/Report required by Section XI.D.3.c.(2);

See RAP, Worksheet 3.1, Attachment 3A (CP Attachment XI.D) for the list of monitoring wells

(e) Sample handling, chain of custody, and analytical procedures (also see "Attachment C");

See CP Attachment XI.C (Sampling and Analysis Plan).

(f) Frequency of monitoring;

The APOE, CAO and CAS wells will be monitored semiannually. UPRR will evaluate the sampling frequency annually as part of the Annual Groundwater Monitoring Reporting and recommended changes if needed.

(g) Monitoring parameters;

The parameters listed in Compliance Plan Tables IIIA (Table of Indicator Parameters and the Groundwater Protection Standard) will be monitored. As indicated on CP Table III, selected monitoring wells will also be evaluated for vinyl chloride based on sampling results from the Affected Property Assessment Report (APAR). The source of the vinyl chloride is not from a degradation of a parent chlorinated hydrocarbon, but rather it is likely from a contaminant in a creosote extender used in the late 1970s based on historical records for the Site.

(h) Evaluation of compliance with GWPS (statistical methods);

Evaluation of compliance with GWPS or other ACLs will include assessing the groundwater monitoring data from Alternate Point of Exposure (APOE) wells and Corrective Action Observation (CAO) wells as detailed in the Revised RAP.

Groundwater data will be either directly compared to the GWPS listed on CP Table IIIA or using statistical procedures, as discussed below:

- ***Directly compare the value of each constituent to the respective concentration limit of CP Table IIIA and determine if it is less than, equal to, or greater than the listed value . If the values for all the constituents are less than or equal to the respective concentration limits of CP Table IIIA (or CP Attachment D, RAP, Attachment 2E), then the well shall be considered compliant with the GWPS for the sampling event. If one or more constituent values (after verification resampling) are greater than the respective concentration limit, then the well will be considered non-compliant with the GWPS for the sampling event. However, it is important to note that this method is susceptible to a high rate of false positives.***

- ***Statistical approach using the Confidence Interval Procedure for the mean concentration based on a normal, log-normal, or non-parametric distribution. The 95 percent confidence coefficient of the t-distribution will be used in constructing the confidence interval (Chapter 21 of Statistical Analysis of Groundwater Data at RCRA Facilities-Unified Guidance, U.S. EPA, March 2009), and subsequent updates acceptable to the Executive Director. The confidence interval upper limit (UCL) for each constituent will be compared with the corresponding concentration limit in CP Table IIIA. To be considered in compliance, the confidence interval upper limit for a well in question must not exceed the table concentration limit depending on the objective of the well. A verified (after resampling) confidence interval upper limit above the table concentration limit shall be considered as evidence of statistically significant contamination and the well will be considered non-compliant with the GWPS for the sampling event.***

- ***As part of the evaluation of compliance with the GWPS, a verification resampling procedure will also be employed at the facility whenever an unverified, initial exceedance is detected either through direct comparison or through statistics. The verification resampling will follow a "pass 1 of 2" resamples to verify an initial exceedance of the GWPS.***

- ***Groundwater data will also be evaluated using trend analysis. See RAP, Appendix 7 Statistical Methodology regarding trend analysis (CP Attachment XI.D).***

(i) Other Sampling and Analysis Plan information to be in compliant with "Attachment C";

See CP Attachment XI.C (Sampling and Analysis Plan).

(j) Compliance period as defined in Section XI.E.1.c. of the application;

See Section XI.E.1.c.

(k) Financial assurance; and

See Section XI.E (Cost Estimates for Financial Assurance).

(l) An ACL variance under 30 TAC 335.160(b), if applicable (also see "Attachment A").

See Section XI Attachment A (Alternate Concentration Levels).

(2) The number, depth and location of all monitor wells (Background Wells, Point of Compliance Wells, Corrective Action Observation Wells, Supplemental Wells, piezometers, etc.) and all Recovery Wells and complete CP Table V – Designation of Wells by Function. Also, make revisions as applicable to plans referenced in Section XI.D.3.c.

See the following tables for monitoring wells at the facility to be incorporated into the Corrective Action Monitoring Program:

- ***RAP, Worksheet 3.1, Attachment 3A – Table 1 (CP Attachment XI.D) for the list of PMZ Monitoring Well Network (i.e., APOE, CAO and CAS Wells).***

See Compliance Plan Table V (Designation of Wells by Function) and associated sheets.

(3) The proposed hazardous constituent monitoring list which is based on constituents that were monitored during detection monitoring (if applicable), constituents detected in accordance with 30 TAC 335.164, and degradational constituents identified in CP Table III accordingly to develop the constituent list for the Corrective Action Monitoring Program. CP Table III shall become part of the final Compliance Plan.

See Compliance Plan Table III (Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard).

(4) The proposed indicator parameter monitoring list. From the list of constituents and GWPS identified in CP Table III complete CP Table IIIA – Corrective Action Program Table of Indicator Parameters and the Groundwater Protection Standard, accordingly. CP Table IIIA shall become part of the Compliance Plan to be analyzed at least semiannually as required by 30 TAC 335.166(7).

See Compliance Plan Table IIIA (Table of Indicator Parameters and the Groundwater Protection Standard).

(5) Monitoring frequency.

The parameters listed in Compliance Plan Table IIIA (Table of Indicator Parameters and the Groundwater Protection Standard) will be monitored semiannually.

(6) Provisions for semiannual reporting of groundwater data.

As detailed in the RAP (CP Attachment XI.D), the parameters listed in Compliance Plan Tables III (Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard) or Table IIIA (Table of Indicator Parameters and the Groundwater Protection Standard) will be reported annually in the Annual Groundwater Corrective Action Monitoring Report (details provided in the RAP, Worksheet 6.0 of the CP Attachment XI.D.)

(7) Annual determination of contamination plume rate and direction of migration.

As will be presented in the Annual Groundwater Corrective Action Monitoring Report, contaminant plume rate and direction of migration will be evaluated at a minimum annually and will be discussed in the annual reports for groundwater data.

(8) Compliance period. Calculate the compliance period as required by 30 TAC 335.162 and 335.165(1)(d). Include calculations and complete CP Table VI – Compliance Period for RCRA-Regulated Units which shall become part of the final Compliance Plan.

The only Regulated Unit, Waste Management Unit 001 (SWMU 1), was certified closed by a Registered Texas Professional Engineer in the closure letter dated April 1984. Groundwater monitoring of the SWMU 1 was initiated in August 1984 (quarterly), and entered Corrective Action Monitoring when the initial RCRA Permit was issued in 1994 and renewed in 2005. The SWMU 1 groundwater (in the A-TZ and B-TZ) had achieved Remedy Standard A RAOs and the TCEQ issued a No Further Action letter for corrective action in August 2015. However, the naphthalene concentration in a point-of-compliance (POC) well, MW-11B, was greater than the GWPS in July 2019, but concentrations reduced to below GWPS in January 2020. SWMU 1 will continue to be monitored under the Corrective Action Monitoring Program until compliance monitoring objectives are met.

b. Proposed methods of evaluating the effectiveness of the corrective action in the saturated and vadose zone.

The effectiveness of the corrective action in the saturated zone will ultimately be evaluated by compliance with the TRRP-based GWPS at the alternate POE wells as part of the PMZ. The GWPS and PCLs are listed in Compliance Plan Tables III (Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard) or Table IIIA (Table of Indicator Parameters and the Groundwater Protection Standard).

c. Submit the following plans and reports.

(1) Current Sampling and Analysis Plan - The Sampling and Analysis Plan must include information required by 30 TAC 335.163(4) and 335.163(5) and 40 CFR Subpart 270.30(j). For guidance, please see "Attachment C" to the application.

See CP Attachment XI.C (Sampling and Analysis Plan).

(2) Groundwater Recovery and Monitoring System Plan - At a minimum, the plan must include:

(a) Recovery System Plan - The applicant should propose a recovery system design that will achieve the performance requirement to protect human health and the environment. The plan should provide detailed plans, information and specifications on the recovery system's design and well installation specifications. All new recovery wells must be installed in accordance with applicable specifications outlined in "Attachment B", unless an alternative well design is approved by the agency prior to installation of the well. The Recovery System Plan must include Recovery System Design and Specifications - Certified by a Texas Registered Professional Engineer. The certification must be sealed by a licensed Professional Engineer, with current license, along with the Registered Engineering Firm's name and Registration Number as required by the Texas Engineering Practice Act.;

See CP Attachment XI.D – Response Action Plan (Worksheet 2.0 and Attachment 2B).

(b) Monitoring System Plan - If the applicant is proposing a monitoring well or a monitoring system in the application, the applicable well installation specifications outlined in "Attachment B" of this application should be followed. All new monitoring wells must be installed in accordance with the specifications outlined in "Attachment B", unless an alternative design is approved by the agency prior to installation. If the applicant proposes as part of the monitoring system, any well (existing or proposed) that does not meet or exceed the requirements outlined in "Attachment B", then the proposed alternative design must be described in detail in the Monitoring System Plan and must be submitted with this application. The Monitoring System Plan must include:

i. Monitoring System Design and Specifications - Certified by a qualified engineer and/or geologist which provides detailed plans and specifications on the monitoring system design; and

ii. Well Drilling and Well Casing Specifications - Certified by a qualified engineer and/or geologist which provides details on well casing specification, drilling logs and reports.

See CP Attachment XI.B (Well Design and Construction Specifications). No alternative designs are proposed as part of this application.

(3) Current Geologic and Hydrogeologic Report - Provide a report per Section XI.A.4 of this application discussing the geologic and hydrogeologic conditions of the facility and the specific area affected by the waste management areas. This report should include the most up-to-date information from which the design of the groundwater monitoring system was based.

See CP Attachment XI.D – Response Action Plan – Attachment 1A for up-to-date geologic and hydrogeologic information.

4. Waste Management Units/Areas Monitored Under Corrective Action Programs

a. Delineate and identify the following for each waste management unit/area in the proposed groundwater monitoring and corrective action programs.

(1) Boundary of the waste management unit and, if applicable, the proposed waste management area which includes more than one waste management unit (identify all waste management units which are included in the waste management area). These waste management units/areas subject to corrective action pursuant to 30 TAC 335.166 and 335.167 should be listed in CP Table I – Waste Management Units and Areas Subject to Groundwater Corrective Action and Compliance Monitoring. CP Table I shall become part of the final Compliance Plan.

The corrective action program covers a facility-wide approach with the soil Affected Property or the PCLE zone defining the Area of Contamination and the PCLE Zones defining the areas subject to corrective actions. See CP Attachment A, Sheet 1 of 5, Figures XI.A.2.1, XI.A.2.2, XI.A.2.3, and XI.A.2.4 for maps showing the SWMUs and AOCs under the Corrective Action Program.

(2) The proposed point of compliance (30 TAC 335.161), point of exposure wells, or alternate point of exposure wells.

As part of the facility-wide corrective action program that incorporates the Plume Management Zone (PMZ) for the GWBUs, see Section XI.D.6 and Compliance Plan Table V (Designation of Wells by Function) and associated sheets for the list of APOE wells.

(3) Any proposed monitor wells such as supplemental wells, observation wells, background wells, etc. If appropriate the groundwater monitoring system should have a sufficient number of wells to monitor the downgradient extent of the plume.

See the following tables for monitoring wells at the facility to be incorporated into the Corrective Action Monitoring Program as part of the PMZ (see Section XI.D.6): RAP, Worksheet 3.1, Attachment 3A – Table 1 (CP Attachment XI.D)

(4) Features which may serve as conduits for subsurface contamination.

As discussed in the RAP, Worksheet 2.1 (A-TZ) (see CP Attachment XI.D), an on-site field survey and water-well data search was conducted, indicating no potential water wells were located that could act as a conduit for migration of shallow groundwater into the underlying groundwater formation. However, as discussed in the APAR Addendum (PBW, 2009), two sets of fiber optic lines, Level 3 Communications and Qwest, run along the north side of the rail main lines across the entire length of the Site. Based on conversations with both Level 3 Communications and Qwest representatives, the fiber lines run underneath SWMUs 2, 5, 4, 8, and 10/11. The fiber lines run directly underneath the drainage ditch southwest of the Site and under the southern drainage ditch (SDD) about 3 to 5 feet bgs. The Level 3 Communications line reportedly was directionally bored to a depth of 40 to 45 feet bgs underneath the Original and Recent Process Areas (SWMU Nos. 5 and 4, respectively) and under the aboveground storage tank (AST) Area (SWMU No. 8). The Qwest fiber line reportedly runs 10 to 15 feet northwest and parallel of the main rail line, and is about 5 to 10 feet bgs through the Site. Just east of SWMU No. 8, both fiber lines return to approximately 4 to 6 feet below grade an continue running northeast parallel to the rail main line. The Level 3 Communications line may act as an artificial penetration since the reported depths of the line go through both the A-TZ and into the B-CZ immediately below the primary source areas. Given the depth of the fiber optic line is below the A-TZ and likely below the B-TZ (or carbonate seams within the B-CZ), monitoring well MW-19C will continue to be monitored as a Corrective Action Observation Well to evaluate if the directional bored fiber optic lines are creating a preferential pathway for COCs to migrate to the C-TZ GWBU.

In addition to the fiber lines, three City of Houston utilities were identified in the previous APAR (PBW, 2009) that cut across the Site oriented north-south just west of the Lockwood Street Bridge: 1) 60-in wastewater line, 2) 84-in water line, and 3) a 42-in storm sewer line (PBW, 2009). Through a review of the utility drawing files obtained from the City of Houston Public Works Survey Department, two of the underground utility lines (the 60-in sanitary sewer line and the 84-in water line) appear to be at depths that potentially intersect the uppermost GWBU A-TZ. The estimated depths of the utilities based on the city drawings are shown on the Geologic Cross Sections A-A', B-B', and C-C' (CP Attachment XI.D, RAP, Attachment 1A, Figure 4C-1 and 4C-2). The estimated base depth of the 60-in wastewater line and the 84-in water line where Cross Section B-B' crosses the utility lines is approximately 23 feet bgs (approximate elevation of 26 feet HVD). It is highly unlikely that A-TZ groundwater is seeping into the 84-in water line, given the line is under pressure (flow is south to north), constructed with welded steel pipe, and is relatively new (constructed in 2000). Sampling of the 60-in sanitary sewer line was conducted in 2010. Of the three samples collected in 2010, the only sample with concentrations greater than PCLs was the

upgradient sample SSW1 that had a detection of bis(2-ethylhexl)phthalate (0.0092 mg/L) above the $^{GW}GW_{ing}$ PCL of 0.006 mg/L; however, bis(2-ethylhexyl)phthalate is a common laboratory contaminant (as cited in 30 TAC§350.71(k)(2)(B)). The sanitary sewer sample analytical results suggest that there is not a significant mass loading of COCs from groundwater into the sanitary sewer.

(5) Corrective action system.

See RAP, Worksheet 2.0 (CP Attachment XI.D). UPRR will install additional recovery wells and continue DNAPL recovery activities from the wells where DNAPL has been detected and recovered (see RAP, Worksheet 3.1, Attachment 3A – Table 1 (CP Attachment XI.D) for the list of existing and proposed DNAPL recovery wells (i.e., Corrective Action System Wells)).

b. For each waste management unit/area in the proposed groundwater monitoring system, submit the locations of individual waste management unit/area monitor wells (existing or proposed) and any soil borings (plugged and unplugged) specifically drilled for assessment of contamination. These individual monitor wells shall be identified by respective well number on a plan view drawing and only the background, point of compliance, point of exposure wells and/or alternate point of exposure wells should be indicated in CP Table V – Designation of Wells by Function. The plan view map depicting the location of individual monitoring wells for corrective action monitoring should be labeled as "CP Attachment A, sheet xx of xx" in the text box. The title box should also include reference to the facility name, Permit/Compliance Plan Number, Solid Waste Registration Number, Unit Description or name with Notice of Registration (NoR) Unit No. 0000. The "CP Attachment A" map(s) and CP Table V shall also become part of the final Permit/Compliance Plan.

The following maps show the monitoring wells proposed as part of the Corrective Action Monitoring Program for the facility-wide approach using PMZs:

- ***CP Attachment A, Sheet 4A and 4B of 7 – PMZ Boundary Map, A-TZ***
- ***CP Attachment A, Sheet 5A and 5B of 7 – PMZ Boundary Map, B-CZ/B-TZ***
- ***CP Attachment A, Sheet 6A and 6B of 7 – PMZ Boundary Map, C-TZ, and D-TZ Monitoring Wells***

See Compliance Plan Table V (Designation of Wells by Function) and associated sheets.

5. Waste Management Units/Areas Addressed Under Other Corrective Action Programs -Facility Operations Area (FOA), specific to the requirements of 30 TAC 350.131 - 350.135. The Permittee should also complete Sections XI.D.4. for other units not addressed by the FOA that may require corrective action outside the FOA boundary. For other units not addressed by the FOA, either within the FOA or outside the FOA which may require compliance monitoring, the Permittee should complete Section XI.C. of this application accordingly.

Not Applicable

a. Provide an approved version of the FOA Qualifying Criteria Checklist and evidence that Steps 1 through 3 of the FOA pre-approval process has been approved by the Commission.
b. Provide a discussion on exceptions to the TRRP rule requested.
c. Provide a summary of the SWMUs/AOCs that will be addressed within the FOA boundary and a discussion of the multiple sources of COCs present and how FOA will better address these sources.
d. Provide maps of appropriate scale depicting the following (maps may be combined where

appropriate):

(1) The number, location and type of monitoring points in each stratigraphic unit to be monitored individual monitoring wells should be identified by respective well number on a plan view drawing, to include the background, Point of Compliance (POC), Point of Exposure (POE), FOA Boundary of Compliance wells, FOA piezometers or supplemental wells, Corrective Action Observation ((CAO), Corrective Action System (CAS) wells that are applicable for FOA monitoring program should be labeled as "CP Attachment A, sheet no xx of xx" in the title box. The title box should also include reference to the facility name, Permit/Compliance Plan Number (00000), TCEQ Solid Waste Registration Number and Unit Description or Name. The "CP Attachment A" map(s) shall become part of the final Permit/Compliance Plan.

(2) HWMUs/SWMUs/AOCs addressed
(3) Surrounding land use
(4) FOA lateral boundaries
(5) Potential source areas
(6) Potentiometric surface of all relevant transmissive units
(7) Surrounding water wells
(8) Extent of known contamination in each transmissive unit
(9) Areas of potential ecological impact
(10) Known occurrences of NAPL or DNAPL in each transmissive units
(11) FOA access control components

e. Provide cross-sections in accordance with Section XI.A.4. depicting the following (maps may be combined where appropriate);

(1) The vertical boundaries of the FOA;
(2) The vertical extent of contamination;
(3) Groundwater level elevations for each transmissive unit.

f. Provide tabulated information for;

(1) Results of Appendix IX GW sampling.
(2) Proposed PCLs for each hazardous constituent and principal degradational constituent for each monitoring point with supporting documentation (including a discussion of exposure pathways) should be listed in CP Table III – CORRECTIVE ACTION PROGRAM Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard. CP Table III shall become part of the final Compliance Plan.
(3) The proposed indicator parameter monitoring list. From the list of constituents and GWPS identified in CP Table IIIA. CP Table IIIA shall become part of the Compliance Plan to be analyzed at least semiannually as required by 30 TAC 335.166(7).
(4) Only the background, POC, POE, FOA Boundary of Compliance wells should be listed in CP Table V which shall become part of the final Permit/Compliance Plan.

g. Provide a discussion of the types of corrective action that will be employed to address contaminated media.

h. Provide detailed descriptions of GW recovery and other remedial technologies such as vapor extraction, interceptor trenches, hydraulic containment, barrier walls, etc., including radius of influence, estimated optimum recovery rates, location of collection, storage or disposal facilities.

i. Provide a detailed description of the ground water monitoring system including placement of monitoring wells, hydrogeologic characteristics of monitored units and well completion details.

j. Provide a Sampling and Analysis plan for the proposed FOA that includes development of

COCs to be monitored, sampling methodology, sample handling procedures, sampling frequency and statistical procedures for evaluating analytical results (Appendix C).

k. Propose a methodology for evaluating the effectiveness of remedial measures and potential remedial system enhancements.

l. Propose a reporting schedule to provide updated information on the installation and operation of remedial and monitoring systems.

m. Provide Financial Assurance in accordance with Section XI.E.

n. Provide draft language intended to comply with the deed notification requirements of 30 TAC 350.111 and 350.135(a)(11).

o. Provide a summary of the approved workers protection plan.

p. Provide a discussion of areas of ecological impact, if any, and development of associated Protective Concentration Limits (PCLs).

q. Provide a discussion of how NAPL occurrences, if any, will be addressed inside and outside the FOA.

r. Provide a schedule of implementation for items not completed at the time of application See also Section XI.D.8.

6. Waste Management Units/Areas Monitored Under Corrective Action Programs - Plume Management Zone (PMZ)

a. Please provide a summary of the HWMUs and SWMUs/AOCs that will be addressed within the PMZ boundary.

See RAP in CP Attachment XI.D, and see response to XI.6.b below.

b. Please provide a discussion of the multiple sources of COCs present and how PMZ will better address these sources.

See RAP in CP Attachment XI.D. The former HWPW facility was used for creosoting operations from 1899 to 1984 with numerous operations at the Site over that time period. Historical material and waste handling practices have resulted in releases to soil and groundwater. These releases have resulted in commingled creosote-derived COC PCLE zones and creosote non-aqueous phase liquid (NAPL) that are not attributable to specific waste management units or areas of concern. Former fueling aboveground storage tanks (ASTs) and wastewater lagoons previously occupied the present-day Englewood Intermodal Yard (south of the rail) portion of the Site (see Figure XI.A-2.4).

In order to effectively manage the corrective action process at the Site, a comprehensive site-wide approach to corrective action is proposed. The cumulative PMZ will include all or portions of the SWMUs and AOCs, except for AOC 4 and 6. Portions of AOC 4 and 6 were closed as detailed in the Response Action Completion Report (PBW, 2017)). No groundwater impacts were noted for the shallow groundwater near AOC 6.

c. Please provide maps of appropriate scale depicting the following (maps may be combined where appropriate);
(1) HWMUs/SWMUs/AOCs addressed

See Figures XI.A.2, XI.A.2.1, XI.A.2.2, XI.A.2.3, and XI.A.2.4 – Locations of Former Waste Management Units and SWMUs/AOCs Under Corrective Action..

(2) surrounding land use

See CP Attachment A, Sheet 1 of 7 - Facility Site Map.

(3) PMZ lateral boundaries

See the following maps for PMZ lateral boundaries proposed as part of the Corrective Action Monitoring Program for the facility-wide approach:

- ***CP Attachment A, Sheet 4A and 4B of 7 – PMZ Boundary Map, A-TZ***
- ***CP Attachment A, Sheet 5A and 5B of 7 – PMZ Boundary Map, B-CZ/B-TZ***
- ***CP Attachment A, Sheet 6A and 6B of 7 – PMZ Boundary Map, C-TZ, and DTZ Monitoring Wells***

UPRR proposes to monitor groundwater in wells within and around the Off-Site PMZ (City of Houston ROW) as part of the corrective action groundwater monitoring program. Data collected from the monitoring wells off-Site will be used to evaluate response actions to address the groundwater PCLE Zone.

(4) potential source areas

See RAP in CP Attachment XI.D, Attachment 1A (Figure 1A) and Figure XI.A.2.

(5) Potentiometric surface of all relevant transmissive units

See RAP in CP Attachment XI.D, Appendix 3C (Interim Groundwater Monitoring Report (2019-2020)).

(6) Surrounding water wells

See Permit Section VI. Geology Report – Figure VI.H

(7) extent of known contamination in each transmissive unit

See RAP in CP Attachment XI.D, Appendix 3C (Interim Groundwater Monitoring Report (2019-2020))

(8) number, location and type of monitoring points in each stratigraphic unit to be monitored

See RAP in CP Attachment XI.D, Worksheet 3.0 and Attachment 3A, Tables 1.

(9) Areas of potential ecological impact

None, no potential ecological impacts as discussed in the APAR (PBW, 2009).

(10) known occurrences of LNAPL or DNAPL in each transmissive unit

See RAP in CP Attachment XI.D, Appendix 3 (Interim NAPL and TPH-NAPL Report and DNAPL Recovery Activities Quarterly Report – 2nd Quarter 2020)

d. Please provide sufficient cross-sections depicting the following (maps may be combined where appropriate);
   (1) The vertical boundaries of the PMZ;
   (2) The vertical extent of contamination;
   (3) potentiometric surfaces for each transmissive unit.

See RAP in CP Attachment XI.D, Attachment 1A (Figures 4C-1 through 4C-6)), and Permit Section VI. Geology Report – Figures VI.E.1 through VI.E.5.

e. Please provide tabulated information for;
(1) history of all relevant units or AOCs;

See CP Table XI.A.1. – Facility History for Waste Management Units.

(2) summary of hydrogeologic data for each affected transmissive unit;

See RAP in CP Attachment XI.D, Attachment 1A and Permit Section VI. Geology Report

(3) results of Appendix IX GW sampling;

Appendix IX Groundwater sampling results are not available. The list of potential contaminants of concern was established in the RCRA Facility Investigation (RFI) Work Plan dated October 1994. The list of chemicals of concern (COCs) for the Site were developed by reviewing current and historical process operations, a list of standard chemicals associated with creosote operations, and groundwater monitoring results.

(4) proposed PCLs for each constituent for each monitoring point (Point of Exposure wells, alternate point of exposure wells, etc) with supporting documentation (including a discussion of exposure pathways). This should also include the designation/establishment of sufficient number of Attenuation Monitoring Points (AMPs) beginning at an appropriate hydraulically upgradient location within the groundwater protective concentration level exceedence (PLCE) zone and continuing down the approximate central flow path of the constituent of concern (COC) in the downgradient extent of the Plume Management Zone(s) in accordance with 30 TAC 350.33(f)(4)(D).

See Compliance Plan Table III (Table of Detection Hazardous and Solid Waste Constituents and the Groundwater Protection Standard) for list of PCLs for the alternate POE wells. See Compliance Plan Table IIIA (Corrective Action Program Table of Indicator Parameters and Groundwater Protection Standard) and associated footnotes. Attenuation Monitoring Points (AMPs) will be established after readily recoverable DNAPL removal is completed (as requested in the 4th Technical Notice of Deficiency Letter (TNOD) from TCEQ dated April 11, 2019).

(5) Establish/Calculate Attenuation Action Levels (AALs) (critical PCLs) for each attenuation monitoring point in accordance with 30 TAC 350.33(f)(4)(D)(ii). The established AALs (critical PCLs) for each AMP well should be graphically presented in table format on the plan view map depicting the location of individual monitoring wells (including AMP wells) for corrective action monitoring labeled "CP Attachment A, Sheet xx of xx", referenced in XI.D.4.b.

Attenuation Monitoring Points (AMPs) will be established after readily recoverable DNAPL removal is completed (as requested in the 4th TNOD from TCEQ).

f. Please provide a discussion of the types of corrective action that will be employed to address contaminated media.

See RAP in CP Attachment XI.D, Executive Summary:

The objective of this RAP is to develop response objectives and actions in accordance with TRRP to address the PCLE Zones at the Site. The primary response objective is to address potential exposure pathways to the PCLE Zones in surface soil, subsurface soil, and groundwater. Complete exposure pathways of onsite soil have been addressed through previous remedial actions. No complete exposure pathways for the off-site receptors exist (off-site residents) for groundwater and soil (except for the City of Houston ROW that was addressed with the concrete cap discussed below), and therefore there are no unacceptable risks to the off-site properties.

Below are the following response actions that are either proposed or have been completed at the Site to achieve the response objective:

- ***Surface/subsurface soil – The surface/subsurface soil PCLE Zones at the Site have been addressed as follows:***
    - ***<u>Former HWPW Area</u>: Remedy Standard B closure through consolidating impacted soils within the Area of Contamination (AOC) and implementing Physical Control through an engineered soil cap and asphalt roadway. This response was completed in 2016 as detailed in the Response Action Completion Report (RACR) dated July 2016 (PBW, 2016) and Revised RACR dated June 2017 (PBW, 2017). Pursuant to the post-closure care detailed in the RAP, quarterly inspections and maintenance of the cap and roadway have been implemented;***
    - ***<u>Englewood Intermodal Yard</u>: Remedy Standard B closure by implementing Physical Control using the existing concrete pavement as a cap as detailed in the RACR dated July 2016 (PBW, 2016) and Revised RACR dated June 2017 (PBW, 2017). In 2019, a NAPL Collection System was constructed as part of an interim response action consisting of two shallow collection trenches to address tar-like NAPL seeps identified in the Englewood Intermodal Yard. Details of the construction activities were provided in the Interim RACR dated March 29, 2019 (Golder, 2019b). The NAPL Collection System is being evaluated and additional response action activities will be proposed following additional assessment activities (i.e., test pits conducted in July 2020, potentially impacted underground utilities). As summarized in the Interim NAPL and TPH-NAPL Assessment Report (Appendix 3; Golder, 2020d), there is no Total TPH PCLE zone for soils at the Site, but the NAPL response action objectives are applicable for the NAPL found in the vadose zone at the Englewood Intermodal Yard. Pursuant to the post-closure care detailed in the RAP, quarterly inspections and maintenance of the cap have been implemented;***
    - ***<u>Railroad mainlines and siding tracks</u>: The response action for the operational area between the Former HWPW area and the Englewood Intermodal Yard has followed a Remedy Standard B closure using the existing railroad ballast as a protective barrier as detailed in the RACR dated July 2016 (PBW, 2016) and Revised RACR dated June 2017 (PBW, 2017). Quarterly inspections and maintenance of the ballast area have been implemented;***
    - ***<u>City of Houston ROW along Liberty Road</u>: Remedy Standard B closure through limited excavation of surface soils, consolidating impacted soils within the AOC, and implementing Physical Control through an engineered concrete sidewalk as detailed in the RACR dated July 2016 (PBW, 2016) and Revised RACR dated June 2017 (PBW, 2017). Quarterly inspections and maintenance of the cap and roadway have been implemented.***

As detailed in the RACRs (PBW, 2016; PBW, 2017; Golder, 2019b), the surface and subsurface PCLE Zones have been addressed through the various caps constructed or implemented at the Site and are inspected as part of the post-response action completion requirements.

- ***Groundwater – The response objectives for the on-site groundwater PCLE Zone and portion of the off-site groundwater PCLE Zone within the City of Houston right-of-way (COH ROW) will be addressed under Remedy Standard B (physical control) and modified Remedy Standard B PMZ through control measures and institutional controls.***

  To address the PCLE Zone in groundwater on-site and within a portion of the COH ROW will be through Remedy Standard B control using the following response actions:

  - ***A modified groundwater response objective through a plume management zone (PMZ);***
  - ***Installation of a physical control through a slurry wall.***

  The proposed cumulative PMZ (for all three GWBUs) consists of the following:

  1) ***On-Site PMZ – The On-Site PMZ will include the cumulative groundwater PCLE Zone within the UPRR-owned property consisting of the center to the east portion of the Site and western portion of the Site (includes the On-Site PMZ (West) area for the B-CZ/B-TZ GWBU). The proposed PMZ includes the groundwater PCLE Zones for the creosote-related COCs and arsenic.***
  2) ***Off-Site PMZ (COH ROW) - The off-site PMZ includes the cumulative groundwater PCLE Zone that extends off-site to the north, east, and west of the Site within the City of Houston ROW.***

  A physical control consisting of a slurry wall barrier is proposed to be installed at the Site. The slurry wall will be constructed to impede groundwater flow from portions of the Site and establish a subsurface barrier separating the on-site contamination from the off-site areas to the north and east. This will reduce the risk of potential future migration of groundwater COC concentrations above the critical PCLs from the Site, and similarly reduce the potential for migration of mobile NAPL at the Site. However, creosote NAPL is present off-site beyond where the proposed slurry wall is to be constructed and this NAPL represents potential source mass for the off-site groundwater PCLE Zones.

  For the off-site groundwater PCLE Zones that extend off-site outside of the proposed PMZs, the response action objective is groundwater decontamination as defined in TRRP to the applicable critical PCLs under Remedy Standard B (Remedy Standard A equivalent). Pursuant to TRRP-32 guidance for NAPL Management, the off-site groundwater PCLE Zone where NAPL is in contact with B-CZ/B-TZ groundwater the NAPL response endpoint is to recover soluble NAPL fraction sufficient to eliminate source contributions to the groundwater PCLE zone. Two major aspects, which are functions of the generally low mobility physical properties of creosote and its components, and the significant and unfavorable hydrogeologic complexity of the Site, greatly hinder recoverability of the soluble DNAPL fraction from the subsurface. Therefore, the response actions related to this objective will be conducted in a phased approach as described below.

  First, the construction of the slurry wall on-site will impede groundwater flow from areas where NAPL has been observed in monitoring wells on Site, thereby separating the on-site contamination from the off-site areas. Next, the mobile NAPL within the saturated soil matrix

in certain areas of off-site hydrostratigraphic units will be addressed. The proposed remedial action objectives (functional objectives) for this NAPL as part of the effort to meet the absolute objective of decontamination for the off-site groundwater PCLE Zone will be to:

- ***Reduce the apparent thickness of in-well DNAPL in existing and proposed recovery wells over a reasonable time frame; and***
- ***Reduce the occurrence of DNAPL (i.e. the number of wells exhibiting measurable DNAPL) in those wells over a reasonable time frame.***

UPRR proposes to implement multi-phase extraction (MPE) events to recover DNAPL from existing and proposed wells as the response action to address the functional objectives listed above. Additional Corrective Action System Wells in the A-TZ, B-CZ/B-TZ, and C-TZ will be installed off-site to increase the potential for DNAPL recovery with the absolute objective of recovering the soluble NAPL fraction sufficient to eliminate source contributions to groundwater PCLE zone.

Given the inherent complex and unfavorable site geologic conditions and generally limited mobility characteristics of creosote DNAPL, it is anticipated that achieving the response objective of reducing COCs in groundwater to the applicable critical PCLs off-site within a reasonable timeframe will be challenging based on the physical characteristics and complex geology at the Site. In fact, it has been shown at numerous creosote DNAPL sites that complete removal of creosote DNAPL is not technically practicable. However, regular physical NAPL removal through MPE events will aid in advancing toward the response objective. Once the MPE achieves the functional objectives, passive remedial options such as monitored natural attenuation (MNA) will be evaluated for addressing the residual off-site groundwater PCLE Zones.

In terms of unprotective conditions for receptors during the remedial period, there are no potential or unprotected exposures to impacted groundwater for the off-site residents since none of the properties in the area use groundwater for drinking or any other purposes; and the properties are provided drinking water by the City of Houston. No groundwater drinking wells have been identified in the area and anticipated future use of the shallow groundwater as a resource is unlikely. In addition, soil gas assessments in conjunction with groundwater monitoring have indicated through multiple lines of evidence that the vapor intrusion pathway is not complete for the off-site properties.

g. Please provide detailed descriptions of GW recovery and other remedial technologies such as vapor extraction, interceptor trenches, hydraulic containment, barrier walls, etc., including radius of influence, estimated optimum recovery rates, location of collection, storage or disposal facilities.

As discussed in the RAP, Worksheet 2.0 (CP Attachment XI.D), UPRR proposes the following:

To address the PCLE Zone in groundwater on-site and within a portion of the COH ROW will be through Remedy Standard B control using the following response actions:

- ***A modified groundwater response objective through a plume management zone (PMZ);***
- ***Installation of a physical control through a slurry wall.***

The proposed cumulative PMZ (for all three GWBUs) consists of the following:

1) On-Site PMZ – The On-Site PMZ will include the cumulative groundwater PCLE Zone within the UPRR-owned property consisting of the center to the east portion of the Site and western portion of the Site (includes the On-Site PMZ (West) area for the B-CZ/B-TZ GWBU). The proposed PMZ includes the groundwater PCLE Zones for the creosote-related COCs and arsenic.

2) Off-Site PMZ (COH ROW) - The off-site PMZ includes the cumulative groundwater PCLE Zone that extends off-site to the north, east, and west of the Site within the City of Houston ROW.

A physical control consisting of a slurry wall barrier is proposed to be installed at the Site. The slurry wall will be constructed to impede groundwater flow from portions of the Site and establish a subsurface barrier separating the on-site contamination from the off-site areas to the north and east. This will reduce the risk of potential future migration of groundwater COC concentrations above the critical PCLs from the Site, and similarly reduce the potential for migration of mobile NAPL at the Site. However, creosote NAPL is present off-site beyond where the proposed slurry wall is to be constructed and this NAPL represents potential source mass for the off-site groundwater PCLE Zones.

For the off-site groundwater PCLE Zones that extend off-site outside of the proposed PMZs, the response action objective is groundwater decontamination as defined in TRRP to the applicable critical PCLs under Remedy Standard B (Remedy Standard A equivalent). Pursuant to TRRP-32 guidance for NAPL Management, the off-site groundwater PCLE Zone where NAPL is in contact with B-CZ/B-TZ groundwater the NAPL response endpoint is to recover soluble NAPL fraction sufficient to eliminate source contributions to the groundwater PCLE zone. Two major aspects, which are functions of the generally low mobility physical properties of creosote and its components, and the significant and unfavorable hydrogeologic complexity of the Site, greatly hinder recoverability of the soluble DNAPL fraction from the subsurface. Therefore, the response actions related to this objective will be conducted in a phased approach as described below.

First, the construction of the slurry wall on-site will impede groundwater flow from areas where NAPL has been observed in monitoring wells on Site, thereby separating the on-site contamination from the off-site areas. Next, the mobile NAPL within the saturated soil matrix in certain areas of off-site hydrostratigraphic units will be addressed. The proposed remedial action objectives (functional objectives) for this NAPL as part of the effort to meet the absolute objective of decontamination for the off-site groundwater PCLE Zone will be to:

- ***Reduce the apparent thickness of in-well DNAPL in existing and proposed recovery wells over a reasonable time frame; and***
- ***Reduce the occurrence of DNAPL (i.e. the number of wells exhibiting measurable DNAPL) in those wells over a reasonable time frame.***

UPRR proposes to implement multi-phase extraction (MPE) events to recover DNAPL from existing and proposed wells as the response action to address the functional objectives listed above. Additional Corrective Action System Wells in the A-TZ, B-CZ/B-TZ, and C-TZ will be installed off-site to increase the potential for DNAPL recovery with the absolute objective of recovering the soluble NAPL fraction sufficient to eliminate source contributions to groundwater PCLE zone.

Given the inherent complex and unfavorable site geologic conditions and generally limited mobility characteristics of creosote DNAPL, it is anticipated that achieving the response objective of reducing COCs in groundwater to the applicable critical PCLs off-site within a

reasonable timeframe will be challenging based on the physical characteristics and complex geology at the Site. In fact, it has been shown at numerous creosote DNAPL sites that complete removal of creosote DNAPL is not technically practicable. However, regular physical NAPL removal through MPE events will aid in advancing toward the response objective. Once the MPE achieves the functional objectives, passive remedial options such as monitored natural attenuation (MNA) will be evaluated for addressing the residual off-site groundwater PCLE Zones.

In terms of unprotective conditions for receptors during the remedial period, there are no potential or unprotected exposures to impacted groundwater for the off-site residents since none of the properties in the area use groundwater for drinking or any other purposes; and the properties are provided drinking water by the City of Houston. No groundwater drinking wells have been identified in the area and anticipated future use of the shallow groundwater as a resource is unlikely. In addition, soil gas assessments in conjunction with groundwater monitoring have indicated through multiple lines of evidence that the vapor intrusion pathway is not complete for the off-site properties.

Details are provided in the RAP (CP Attachment XI.D).

h. Please provide a detailed description of the groundwater monitoring system including placement of monitoring wells, hydrogeologic characteristics of monitored units and well completion details.

See RAP in CP Attachment XI.D, Worksheet 2.1 and Attachment 3A – Table 1.

i. Please provide a Sampling and Analysis plan for the proposed PMZ that includes development of COCs to be monitored, sampling methodology, sample handling procedures, sampling frequency and statistical procedures for evaluating analytical results.

See the Sampling and Analysis Plan (SAP) in CP Attachment XI.C, RAP in CP Attachment XI.D, Worksheet 3.1 and Attachment 3A, and Appendix 7 (Statistical Methodology).

j. Please propose a methodology for evaluating the effectiveness of remedial measures and potential remedial system enhancements.

See RAP in CP Attachment XI.D, Worksheet 3.0 for additional details:

<u>Surface/Subsurface Soils</u>

See Response Action Completion Reports (RACR) (PBW, 2016; PBW, 2017; Golder, 2019).

<u>Cut-Off Slurry Wall</u>

Performance monitoring for the slurry wall will focus on evaluating if the containment system meets the design objective of reducing the risk of potential future migration of the on-site groundwater PCLE Zone and NAPL from the Site. The primary performance measure is to evaluate if the slurry wall has established cutoff of outflow from the source area. Therefore, the proposed performance monitoring will measure the following:

- ***Groundwater quality in the three transmissive zones to evaluate groundwater COC concentrations inside and outside of the slurry wall area, and***

- ***Hydraulic head in monitoring wells to evaluate water levels or piezometric readings inside and/or outside the barrier.***

It is anticipated that the groundwater COC concentrations in the wells downgradient of the slurry wall will eventually show decreasing concentrations over time. However, many of the areas, especially in the B-CZ/B-TZ and C-TZ GWMUs, creosote DNAPL is present in areas off-site outside of the proposed containment. Therefore, decreasing COC concentrations in those areas will be more contingent on NAPL removal in those areas (further detailed in the RAP (CP Attachment XI.D)). Groundwater monitoring results will be included in the RAER.

DNAPL

The performance measures for addressing the NAPL Triggers at the Site are dependent on the areas where the NAPL site conditions are present, as detailed in the Risk-Based NAPL Management Assessment (Appendix 3 of RAP in CP Attachment XI.D). The performance measures for each area are described below.

Englewood IM Yard

As discussed in Worksheet 2.0 of the RAP in CP Attachment XI.D, UPRR has implemented the following two responses in the Englewood IM Yard to address the migrating NAPL Trigger NAPL Response Endpoints (based on NAPL in vadose zone ≤ 15 ft below ground surface/ NAPL discharge to ground surface) from the tar-like NAPL that has been observed in the top 5 feet bgs with NAPL surface seeps noted in the Englewood IM Yard:

1. ***Installation of the NAPL Collection System as an interim response (detailed in the RACR dated March 2019 (Golder, 2019b)); and***
2. ***Conducting weekly site inspections of the tar-like NAPL seep areas and recovering any NAPL that has seeped to the ground surface.***

The primary performance measure for the NAPL Collection System in the Englewood IM Yard is the reduction of NAPL surface seeps within the area of the collection trench. To date, the system is operating as intended, however, a limited amount of NAPL is flowing into the collection trench. For the areas where NAPL seeps have been observed outside of the NAPL Collection System addressed through the weekly inspections, UPRR recently (July 2020) conducted test pits to conduct limited NAPL removal activities to eliminate NAPL discharge per achieve the NAPL response endpoint (TRRP-32 Guidance). During test pit construction, NAPL mass was removed from the area of where the NAPL seeps have been observed, and the test pits were backfilled, and the concrete pavement replaced. The plan is to monitor the test pit areas to assess if the NAPL seep areas return. Details of the additional investigation activities will be presented in the Englewood IM Yard Test Pit Evaluation Report.

HWPW/Englewood IM Yard Area

For the on-site areas where NAPL has been documented within the UPRR property boundary or within the City of Houston ROW, the resulting impacted GWBUs will be included within the proposed cumulative On-Site PMZ and off-site COH ROW PMZ as detailed in Worksheet 2.1 of the RAP (CP Attachment XI.D). Therefore, the TCEQ TRRP-32 Guidance provides two NAPL response endpoints under this site condition within the PMZ:

1. ***Recovery Endpoint – NAPL recovery sufficient to arrest NAPL migration; and***

2. ***Control Endpoint – NAPL zone migration arrested with physical control or natural methods.***

UPRR is proposing to address both NAPL Response Endpoints through DNAPL recovery from recovery wells on Site and installing a physical control (i.e. slurry wall) along the north and east sides of the Site as a Control Endpoint. The proposed response actions are aimed at establishing a subsurface barrier separating the on-site contamination from the off-site areas to the north and east and removing readily recoverable DNAPL on- and off-Site by MPE and total fluid pumps (On-Site PMZ (West)). Performance metrics to evaluate if reasonable progress is being made include the following:

- ***Reduction in the occurrence of DNAPL (i.e. the number of wells exhibiting measurable DNAPL) in existing wells as well as proposed recovery wells; and,***
- ***Reduction in the apparent thickness of in-well DNAPL within those wells.***
- ***Reduction in COC concentrations (source removal)***

Measurements of depth-to-water, depth-to-product, and total well depth over time will be conducted using an oil-water interface probe. The volume of recovered DNAPL will be recorded during each recovery event and is expected to become asymptotic over time as readily recoverable NAPL is depleted. Data including recovered volumes and associated graphs will be provided in quarterly reports as required by TCEQ.

Off-Site Groundwater PCLE Zone

With NAPL observed in contact with groundwater off-Site in the Class 3 B-CZ and Class 2 B-TZ GWBU outside the PMZs, the current NAPL response endpoint is Recovery Only – Recover soluble NAPL fraction sufficient to eliminate source contributions to groundwater PCLE zone. UPRR has developed a response action to more aggressively recover NAPL by installing additional recovery wells and using MPE in the off-site areas within the groundwater PCLE Zones, as detailed in Worksheet 2.0. Performance metrics to evaluate if reasonable progress is being made include the following:

- ***Reduction in the occurrence of DNAPL (i.e. the number of wells exhibiting measurable DNAPL) in existing wells as well as proposed recovery wells; and,***
- ***Reduction in the apparent thickness of in-well DNAPL within those wells.***

Measurements of depth-to-water, depth-to-product, and total well depth over time will be conducted using an oil-water interface probe. The volume of recovered DNAPL will be recorded during each recovery event and is expected to become asymptotic over time as readily recoverable NAPL is depleted. Data including recovered volumes and associated graphs will be provided in quarterly reports as required by TCEQ.

Groundwater

On-Site PMZ and Off-Site COH ROW PMZ

Groundwater monitoring will be performed in conjunction with the PMZ (Remedy Standard B) response action proposed for the groundwater PCLE zones on-site and off-site in the COH ROW. The groundwater data will be evaluated to assess if COC concentrations in the PCLE Zones show stable or decreasing concentrations at the downgradient boundaries of the On-Site and Off-Site COH ROW PMZs by comparing concentrations of these COCs to the cPCLs at each APOE well as specified in Worksheet 2.1 of the RAP (CP Attachment XI.D). However, as previously discussed, the

groundwater PCLE Zone currently extends beyond the proposed off-Site COH ROW PMZ boundaries and is anticipated to remain in this area until the DNAPL is fully recovered from the GWBUs outside the PMZs. It is anticipated that the groundwater COC concentrations in the wells downgradient of the slurry wall within the Off-Site COH ROW PMZ area will eventually show decreasing concentrations over time. However, in many of the areas, especially in the B-CZ/B-TZ and C-TZ GWMUs, creosote DNAPL is present in areas off-site outside of the proposed containment. Therefore, decreasing COC concentrations in those areas will be more contingent on NAPL removal in those areas. Groundwater monitoring results will be included in the RAER.

<u>Off-Site (not within a PMZ)</u>

The proposed slurry cutoff wall is designed to impede groundwater flow from portions of the Site and reduce the risk of potential future migration of groundwater COC concentrations above the critical PCLs from the Site, and similarly reduce the potential for migration of mobile NAPL from the Site. These response actions are expected to enhance natural attenuation of dissolved phase COCs off-site. However, as detailed in Worksheet 1.0, there are significant challenges to achieve the NAPL response objective of groundwater restoration with the presence of DNAPL within the GWBUs. As a result, unless both the mobile and residual DNAPL can be completely removed from the soil and GWBUs, groundwater response actions will not be able to attain the NAPL response objective of groundwater restoration within the PCLE Zones in a reasonable time frame. Therefore, the performance measures for the off-site groundwater PCLE Zones will be closely tied to the functional objective of recovering creosote DNAPL to reduce the extent of DNAPL and related groundwater PCLE Zone off-site.

For both on-site and off-site areas, routine groundwater monitoring, combined with graphical and statistical analysis, will be used to evaluate the effectiveness of the proposed response actions to address the COC concentrations in groundwater.

k. Please propose a reporting schedule to provide updated information on the installation and operation of remedial and monitoring systems.

See RAP in CP Attachment XI.D, Worksheet 6.0.

l. Please provide a thorough detailed description of an estimate of all costs that will be incurred by implementing, operating, and maintaining the corrective action and monitoring systems addressed by the compliance plan.

See Section XI.E (Cost Estimates for Financial Assurance).

m. Please provide draft language intended to comply with the deed notification requirements of 350.111, and schedule to verify compliance with institutional control requirements in accordance with 30 TAC 350.31(g) which provides notice of the existence and location of the PMZ and which prevents exposure to groundwater from this zone until such a time as constituents of concern may be reduced to below the GWPS.

See RAP in CP Attachment XI.D Appendix 4.

n. Schedule for notification requirements if an unexpected event occurs, or a condition is detected, during post-response action care period which indicates that additional response actions will be required at an affected property pursuant to 30 TAC 350.33(k).

See RAP in CP Attachment XI.D, Worksheet 6.0.

o. Please provide a summary of the approved soil response action plan.

Details of the soil response are provided in the RAP (CP Attachment XI.D) and Response Action Completion Reports (RACRs) (PBW, 2016; PBW, 2017; Golder, 2019b.

p. Please provide a discussion of areas of ecological impact, if any, and development of associated PCLs.

As discussed in the APAR Addendum (dated July 2009 (PBW, 2009)), no areas of ecological impact were identified, except at AOC 6.

q. Please provide a discussion of how NAPL occurrences, if any, will be addressed inside the PMZ.

See RAP in CP Attachment XI.D, Worksheet 2.1:

For the PMZ area, the NAPL response action objective will be to "ensure compliance of NAPL zone in the PMZ" to address the NAPL within the PMZs for each GWBU (see Risk-Based NAPL Assessment in Appendix 3 of CP Attachment XI.D). The TCEQ TRRP-32 Guidance provides only one NAPL response endpoint: Recovery Endpoint – Recover readily recoverable NAPL fraction.

The response objectives will include compliance with PMZ performance criteria at the NAPL zone and control through institutional controls on groundwater use to protect exposure to residual NAPL in the GWBUs. As part of the evaluation for compliance with PMZ performance criteria, the on-going DNAPL recovery activities in addition to the proposed mobile multi-phase extraction (MPE) recovery activities will be used to assess if the DNAPL in the GWBUs is considered readily recoverable and if other conventional or alternative NAPL recovery technologies should be considered. Methods to meet the response action objective for the creosote DNAPL will include recovery (recover readily recoverable creosote DNAPL from wells with DNAPL present) at the NAPL source zone so that the dissolved-phase groundwater PCLE zone is stable (or shrinking) and the PCLE performance objectives for the PMZ can be met, including the goal of no cPCL exceedances at the alternate POE wells.

r. Please provide a schedule of implementation for items not completed at the time of application {See also Section XI.D.8.}

See RAP in CP Attachment XI.D, Worksheet 6.0 and Section XI.D.8.

7. Waste Management Units/Areas Monitored Under Alternative Corrective Action Program for Co-

mingled plumes Alternative groundwater Corrective Action Program apply, pursuant 30 TAC 335.151, 335.156 and 350, for commingled release from RCRA-regulated unit and from one or more SWMUs and/or AOC.

Not Applicable

a. Complete Sections XI.D.1. through 4.;

b. In addition to the CP Attachment A maps in Section XI.D.4.b., CP Attachment A maps should clearly depict those waste management unit or areas of the facility which have commingled plumes and the alternative corrective action applies.

c. Please provide a schedule of implementation for items not completed at the time of application {See also Section XI.D.8.}

8. Implementation Schedule

Itemize and discuss, in detail, the estimated time schedule necessary for any testing and assessments, system design, construction and installation, and final implementation of the groundwater monitoring program for each Regulated Unit and solid waste management unit. If the schedule of implementation for items are not completed at the time of the application, or are not completed at the time of issuance of the final draft Compliance Plan, then the items should be added to the CP Table VIII - (Compliance Schedule) of the application.

See RAP in CP Attachment XI.D and Compliance Plan Table VIII (Compliance Schedule).

E. COST ESTIMATES FOR FINANCIAL ASSURANCE

As required by 30 TAC 335.156 and 335.167, the applicant must provide cost estimates for groundwater monitoring and corrective action to determine the amount of financial assurance. Please complete the applicable parts of this form. Cost estimates should be filled out for each proposed corrective action/monitoring system at the site; or any additional corrective action system not covered in this Part. Please note, the Executive Director may request from the applicant documentary evidence for cost estimates.

If an item is not applicable, please mark it NA.

General Information

1. For each Waste Management Area (WMA) list the following:

a. A description of the waste management unit(s) in the WMA (e.g., landfill, surface impoundment, land treatment);

See Compliance Plan Table I Waste Management Units Subject to Groundwater Corrective Action and Compliance Monitoring. However, the Corrective Action will be conducted on a facility-wide approach, not WMA by WMA.

b. The NoR unit number(s) in the WMA; and

See Compliance Plan Table I Waste Management Units Subject to Groundwater Corrective Action and Compliance Monitoring

c. The compliance period for the WMA listed above: Year(s) = 30

(The compliance period is the number of years equal to the active life of the waste management area as defined in 30 TAC 335.162).

d. In instances where the compliance period is equal to or exceeds 30 years, the maximum amount of financial assurance required will be based on 30 years because the required post-closure care period to perform corrective action and groundwater monitoring is 30 years. In instances where the compliance period is less than 30 years, the financial assurance for corrective action or compliance monitoring will be based on the longest time frame established by one of the following criteria:

(1) the duration of your compliance plan;

(2) the time frame for clean-up based on model projections and historical data as approved by the Executive Director; or

(3) the compliance period for the unit/area.

TOTAL YEARS USED TO CALCULATE THE FINANCIAL ASSURANCE FOR THE CORRECTIVE ACTION AND/OR COMPLIANCE MONITORING PROGRAM

YEAR(S) = 30

2. Please complete Table XI.E.1. – Corrective Action Program Cost Estimate.

3. Please complete Table XI.E.2. – Groundwater Monitoring Cost Estimate.

4. Please complete Table XI.E.3. – Financial Assurance Summary

XI. COMPLIANCE PLAN

COMPLIANCE PLAN
PART B PERMIT APPLICATION
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

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XI. COMPLIANCE PLAN

As required under 30 TAC 335.167, all releases of hazardous constituents from any solid waste management unit at the facility must be addressed. The Response Action Plan (RAP), included as Attachment D, was developed in accordance with 30 TAC §350.94 to protect current and future pathways from exposure to the PCLE Zones in surface soil, subsurface soil, and groundwater.

TABLES

Table XI.A.1. - Facility History for Waste Management Units

Name of Waste Management Unit[1]	Type of Waste Management Unit	Notice of Registration Unit Number	Date Waste Was *First* Placed in Unit	EPA Waste Code	Estimated Capacity of Unit	Quantity of Waste Left in Place	Date Waste Was *Last* Placed in Unit[2]	Date of Unit Closure Or Projected Closure	Date Unit Certified Closed[3]	Is There Evidence of a Release of Hazardous Constituent(s)[4] to Groundwater? (Yes, No, or Unknown)
1. Surface Impoundment*	Surface Impoundment	001	1979	U051 U188	5065 yd^3	0	8/31/1982	4/18/1984	4/18/1984	Yes
2. Tank Car	Storage Tank	002	Unknown	Unknown	12,500 gal	NA	Unknown	2004	Unknown	Unknown
3. Sub-surface tank	Storage Tank	003	Unknown	Unknown	12,500 gal	NA	Unknown	2004	Unknown	Unknown
4. Container Storage Area*	Container	004	8/8/1995	F034 K001	450 ft^2	NA	Current	Unknown	Unknown	Unknown
5. Waste Pile	Waste pile	005	8/8/1995	Unknown	Unknown	NA	Current	Unknown	Unknown	Unknown
6. Misc Storage Container	Container	006	8/8/1995	Unknown	Unknown	NA	Current	2004	Unknown	Unknown
7. Northern and Southern Drainage Ditches		NA	Unknown	Unknown	Unknown	NA	Unknown	2004	Unknown	Unknown
8. Recent Process Area		NA	Between 1955-1962	Unknown	Unknown	NA	Mid- 1980s	2004	Unknown	Unknown
9. Original Process Area		NA	1911	Unknown	Unknown	NA	Between 1955-1962	2004	Unknown	Unknown
10. Water Treatment and Boiler System		NA	Unknown	Unknown	Unknown	NA	Unknown	2004	Unknown	Unknown
11. Aboveground Storage Tank	Storage Tank	NA	Unknown	Unknown	Unknown	NA	Unknown	2004	Unknown	Unknown
12. Location of Former UST no 44-023-05	Storage Tank	NA	Unknown	Unknown	2000 gal	NA	Unknown	June 1990	Unknown	Unknown

Table XI.A.1. - Facility History for Waste Management Units

Name of Waste Management Unit[1]	Type of Waste Management Unit	Notice of Registration Unit Number	Date Waste Was *First* Placed in Unit	EPA Waste Code	Estimated Capacity of Unit	Quantity of Waste Left in Place	Date Waste Was *Last* Placed in Unit[2]	Date of Unit Closure Or Projected Closure	Date Unit Certified Closed[3]	Is There Evidence of a Release of Hazardous Constituent(s)[4] to Groundwater? (Yes, No, or Unknown)
13. Location of Former SAP Water Treatment Tank	Storage Tank	NA	Unknown	Unknown	Unknown	NA	Unknown	2004	Unknown	Unknown
14. Oil Water Separators		NA	Unknown	Unknown	Unknown	NA	Unknown	2004	Unknown	Unknown
15. Railroad Tie Storage Area		NA	1911	Unknown	Unknown	NA	Mid 1980s	2004	Unknown	Unknown
16. Diesel Storage Tank		NA	Unknown	Unknown	Unknown	NA	Unknown	Unknown	Unknown	Unknown
17. Contaminated Portion of City Water Line		NA	Mid 1980s	Unknown	Unknown	NA	Unknown	December 1980	Unknown	No
18. Location of Former Incinerator		NA	Unknown	Unknown	Unknown	NA	Dismantled Between 1955 and 1960	Between 1955 and 1960	Unknown	Unknown
19. City Storm Sewer		NA	1979	Unknown	Unknown	NA	1982	NA	Unknown	Unknown
20. Inactive Wastewater Lagoon		NA	Unknown	Unknown	Unknown	NA	Unknown	Unknown	Unknown	Unknown
21. Location of Former UST No. 44-023-21		NA	Unknown	Unknown	Unknown	NA	Unknown	1990	1990	No
22. Former Fueling ASTs and Wastewater Lagoons		NA	Unknown	Unknown	Unknown	NA	Unknown	Unknown	Unknown	Unknown

1. Indicate by asterisk (*) those waste management units that have received any hazardous waste constituent listed in Appendix VIII of 40 CFR Part 261.
2. For the purposes of this Compliance Plan Application, a waste management unit receiving hazardous waste after July 26, 1982 shall be considered a Regulated Unit. A waste management unit that ceased receiving hazardous waste on or before that date shall be considered a Solid Waste Management Unit (SWMU).
3. Date the applicant submitted certification of closure to the Commission.
4. Hazardous constituents are those hazardous constituents listed in Appendix IX of 40 CFR Part 264.

TABLE XI.E.1 - CORRECTIVE ACTION PROGRAM COST ESTIMATE
HWPW - DNAPL RECOVERY AND CAP INSPECTIONS

1.	**Pumping Capacity Per Year:**		
A.	Daily average system pumping rate		gal/day
B.	Annual groundwater volume recovered **(est. purge water plus recovered creosote DNAPL)**	4000	gal/yr
2.	**Off-Site Liquid Treatment / Disposal Cost:**		
A.	Volume of treated contaminated water to be disposed of off-site yearly	4000	gal/yr
B.	Transportation of liquid waste disposed of off-site yearly		
	(1) Transportation cost per gallon		$/gal
	(2) Gallons of contaminated water shipped per year		gal/yr
	(3) Annual cost of transportation (1 x 2)	$ 3,400.00	$/yr
C.	On-site yearly storage cost prior to off-site disposal		$/yr
D.	Off-site yearly treatment cost of liquid waste		
	(1) Treatment charge per gallon		$/gal
	(2) Total volume to be treated per year		gal/yr
	(3) Annual treatment cost (1 x 2)		$/yr
E.	Off-site disposal cost of liquid waste per year		
	(1) Disposal charge per gallon	$ 10.00	$/gal
	(2) Total volume to be disposed per year	3400	gal/yr
	(3) Annual disposal cost (1 x 2)	$ 34,000	$/yr
***Annual Off-Site Liquid Treatment / Disposal Cost (2B3 + 2C +2D3 + 2E3)**		$ 37,400	**$**

3. On-site Waste Water Treatment System Cost and On-site Treatment / Disposal Cost:

Submit a cost estimate for a treatment system specifically designed and used exclusively for the groundwater corrective action program and operational after some start up maintenance. Estimates to clean out the system should also be included in the following cost.

A.	Initial capital expenditure for treatment system including start up maintenance		$
***On-Site Waste Water Treatment System Capital Cost (3A)**		$ -	**$**
B.	Gallons of contaminated water to be treated on-site per year		gal/yr
C.	Cost of on-site treatment per gallon		$/gal
D.	Cost of sludge, or solids disposal per year		$/yr
E.	Cost per year of maintenance on treatment system and recovery system, along with any additional equipment and repairs needed for the systems		$/yr
F.	Cost of on-site disposal per year		$/yr
***Annual On-Site Treatment / Disposal Cost [(3B x 3C) + 3D + 3E + 3F]**		$ -	**$**

4. Inspections, Maintenance and Operation Cost for the Corrective Action Program: (Soil Cap, Asphalt Roadway, Concrete Sidewalk, Concrete Cap, and Railroad Ballast Inspections)

A.	Operator's time on-site for inspections and maintenance per year	40	hour/yr
B.	Charge of salary per hour	$ 100.00	$/hr
C.	Annual cost of labor (4A x 4B)	$ 4,000	$/yr
D.	Replacement of parts and equipment per year (includes mowing and fence repairs)	$ 43,000	$/yr
E.	Electricity cost per year		$/yr
***Annual Inspections / Maintenance / Operation Cost for the Corrective Action Program (4C + 4D + 4E)**		$ 47,000	**$**

TABLE XI.E.2. – GROUNDWATER MONITORING COST ESTIMATE

1. Annual Sampling and Analysis Cost			
A. Background Wells (SWMU 1 Wells only)			
(1) Number of wells	2		
(2) Sample analysis cost per well	$ 150.00		$/well
(3) Number of sampling events per year	2		/yr
(4) Sampling cost (1 x 2 x 3)	$ 600.00		$
B. Point of Compliance Wells (SWMU 1 Wells only)			
(1) Number of wells	8		
(2) Sample analysis cost per well	$ 150.00		$/well
(3) Number of sampling events per year	2		/yr
(4) Sampling cost (1 x 2 x 3)	$ 2,400.00		$
C. Recovery Wells			
(1) Number of wells			
(2) Sample analysis cost per well			$/well
(3) Number of sampling events per year			/yr
(4) Sampling cost (1 x 2 x 3)	$ -		$
D. Corrective Action Observation Wells			
(1) Number of wells	51		
(2) Sample analysis cost per well	$ 250.00		$/well
(3) Number of sampling events per year	2		/yr
(4) Sampling cost (1 x 2 x 3)	$ 25,500		$
E. Point of Exposure Wells			
(1) Number of wells	50		
(2) Sample analysis cost per well	$ 250.00		$/well
(3) Number of sampling events per year	2		/yr
(4) Sampling cost (1 x 2 x 3)	$ 25,000		$
F. Supplemental Wells (Site-Wide Background Wells)			
(1) Number of wells	3		
(2) Sample analysis cost per well	$ 250.00		$/well
(3) Number of sampling events per year	2		/yr
(4) Sampling cost (1 x 2 x 3)	$ 1,500		$

TABLE XI.E.2. – GROUNDWATER MONITORING COST ESTIMATE

G. Field Quality Control Sampling		
(1) Number of wells	6	
(2) Sample analysis cost per well	$ 250.00	$/well
(3) Number of sampling events per year	2	/yr
(4) Sampling cost (1 x 2 x 3)	$ 3,000.00	$
2. Sampling Labor Cost:		
A. Hours of sampling per well	2	hrs/well
B. Number of sampling technicians per well	1	
C. Charge per hour	$ 95.00	$/hr
D. Total number of wells to be sampled annually		Wells
E. Total number of wells sampled semi-annually	114	Wells
F. Total number of wells sampled quarterly		Wells
G. Total number of wells sampled monthly		Wells
H. Total number of wells sampled per year		total wells
(2D) + (2E x 2) + (2F x 4) + (2G x 12)	228	sampled/y
I. Sampling Labor Cost (2A x 2B x 2C x 2H)	$ 43,320	$
***Annual Groundwater Monitoring Cost**	$ 101,320	**$**
3. Well Installation (typical cost):		
A. Monitor well installation cost per well	$ 15,000	$/well
B. Number of monitor wells to be installed	7	Wells
C. Cost of monitor well system (A x B)	$ 105,000	$
D. Recovery well installation cost per well	$ 16,700	$/well
E. Number of Recovery Wells to be installed	16	Wells
F. Cost of Recovery well system (D x E)	$ 267,200	$
***Total Well Installation Cost (3C + 3F)**	$ 372,200	**$**
4. Administrative Cost:		
A. Annual cost for record-keeping and report preparation	$ 27,650	$
***Annual Administrative Cost (4A)**	$ 27,650	**$**
5. Inspection and Maintenance Cost for the Monitoring Program:		
A. Operator's time (hours) on-site for inspections and maintenance per year	20	hour/yr
B. Charge or salary per hour	$ 90.00	$/hr
C. Annual cost of labor (5A x 4B)	$ 1,800	$/yr
D. Replacement of parts and equipment per year	$ 7,700.00	$/yr
***Annual Inspections / Maintenance Cost for the Groundwater Monitoring Program (5C + 5D)**	$ 9,500	**$**

TABLE XI.E.3. – FINANCIAL ASSURANCE SUMMARY

Annual Off-Site Liquid Treatment / Disposal Cost	**$**	**37,400**	
Annual On-Site Treatment / Disposal Cost			
Annual Inspection / Maintenance / Operation Cost For The Corrective Action Program	**$**	**47,000**	
Annual Groundwater Monitoring Cost	**$**	**101,320**	
Annual Administrative Cost	**$**	**27,650**	
Annual Inspection And Maintenance Cost For The Groundwater Monitoring Program	**$**	**9,500**	
Annual DNAPL Recovery Costs (MPE)	**$**	**106,110**	
Annual Sub Total	**$**	**328,980**	
Total Years Used For Calculating Financial Assurance	**$**	**30**	Yrs
Remediation Cost (Annual Sub Total x Total Years Used)	**$**	**9,869,400**	
Physical Control - Slurry Wall Construction (HWPW			
1. Pre-Design Work	*$*	*294,500*	
2. Engineering Desigr	*$*	*125,900*	
3. Slurry Wall Install (Mobilization/Site Prep/Construction/QA	*$*	*7,007,000*	
SLURRY WALL CONSTRUCTION TOTAI	**$**	**7,427,400**	
NAPL Recovery- MPE Systen			
1. Pre-Design Work (Pilot Test)	*$*	*22,000*	
2. Engineering Desigr	*$*	*21,625*	
3. MPE System Constructior	*$*	*220,675*	
MPE SYSTEM TOTAL	**$**	**264,300**	
Total Well Costs (Recovery & Monitoring)	$	372,200	
10% Contingency	$	1,756,110	
Grand Total Cost (nearest $1000)	**$**	**19,689,000**	

CP Table I: Waste Management Units and Areas Subject to Groundwater Corrective Action and Compliance Monitoring

A. Corrective Action[1] (30 TAC §335.166)

Unit Type[5]	Unit Name	Notice of Registration (NOR) Number, if applicable	Date Program Requirement and Remedy Standard Completed[5]
RCRA-Regulated Waste Management Unit 001 (SWMU 1)	Closed Surface Impoundment	NOR 001	

B. Compliance Monitoring[1] (30 TAC §335.165)

RESERVED

Unit Type[5]	Unit Name	Notice of Registration (NOR) Number, if applicable	Date Program Requirement and Remedy Standard Completed[5]

C. Corrective Action[2] (30 TAC §335.167)

Unit Type[5]	Unit Name	Notice of Registration (NOR) Number, if applicable	Date Program Requirement and Remedy Standard Completed[5]
SWMU 7 (On-site PMZ)	Tank Car Storage Area	002	
(On-site PMZ)	Sub-surface Tank	003	
(On-site PMZ)	Container Storage Area	004	
(On-site PMZ)	Waste Pile	005	
(On-site PMZ)	Miscellaneous Storage Containers	006	
SWMU 2 (On-site PMZ)	Northern and Southern Drainage Ditches		
SWMU 3 (On-site PMZ)	Oil Drum Storage (ODS) Building		
SWMU 4 (On-site PMZ)	Recent Process Area		
SWMU 5 (On-site PMZ)	Original Process Area		
SWMU 6 (On-site PMZ)	Water Treatment and Boiler System		
SWMU 8 (On-site PMZ)	Aboveground Storage Tank Area		
SWMU 9 (On-site PMZ)	Location of Former UST No. 44-023-05		
SWMU 10 (On-site PMZ)	Location of Former Sap Water Treatment Tank		
SWMU 11 (On-site PMZ)	Oil Water Separators		
SWMU 12 (On-site PMZ)	Railroad Tie Storage Area		

Unit Type[5]	Unit Name	Notice of Registration (NOR) Number, if applicable	Date Program Requirement and Remedy Standard Completed[5]
AOC 1 (On-site PMZ)	Diesel Storage Tank		
AOC 2 (On-site PMZ)	Hose House		
AOC 3 (On-site PMZ)	Contaminated Portion of City Water Line		
AOC 4 (On-site PMZ)	Location of Former Incinerator		
AOC 5 (On-site PMZ)	City Storm Sewer		
AOC 6 (On-site PMZ)	Inactive Wastewater Lagoon		
AOC 7 (On-site PMZ)	Location of Former UST No. 44-023-21		
AOC 8 (On-site PMZ)	Former Fueling ASTs and Wastewater Lagoons		

D. Alternative Corrective Action[3] (30 TAC §335.151)

Unit Type[5]	Unit Name	Notice of Registration (NOR) Number, if applicable	Date Program Requirement and Remedy Standard Completed[5]
RESERVED			

E. Facility Operations Area (FOA)[4] (30 TAC §335.156 and Chapter 350)

Unit Type[5]	Unit Name	Notice of Registration (NOR) Number, if applicable	Date Program Requirement and Remedy Standard Completed[5]
RESERVED			

Note: "Reserved" if a specific program (referenced in CP Table I.A., I.B., I.C., I.D., and/or I.E.) is not applicable. More than one program may apply to a facility.

Foot Note:

1. Program applies to RCRA-regulated units only.
2. Program applies to releases from solid waste management units (SWMUs) and/or areas of concern (AOCs).
3. Program applies to commingled releases from RCRA-regulated unit and from one or more SWMUs and/or AOCs.
4. List SWMUs, additional units/areas of Investigation, AOCs, RCRA-regulated units within the FOA that are subject to corrective action. For RCRA units, SWMUs and/ or AOC outside the FOA boundary for which compliance monitoring and/ or corrective action applies should be listed separately in Items A, B or C as appropriate.
5. Specify the date of Commissions No Further Action approval letter for program requirement and remedy standard completed for all media of concern.

CP Table II: Solid Waste Management Units and/or Areas of Concern for which Corrective Action applies pursuant to 30 TAC 335.167

Unit Number [1]	Unit Name	Notice of Registration (NOR) Number, if applicable	SWMU or AOC	Media Affected[2]	Date Program Requirement and Remedy Standard Completed [3]
1.	Closed Surface Impoundment	001	SWMU 1 (RCRA-Regulated Waste Management Unit 001)	Groundwater	
2.	Tank Car Storage Area	002	SWMU 7	Soil, Groundwater	See footnote 4
3.	Sub-surface Tank	003		None	
4.	Container Storage Area	004		None	
5.	Waste Pile	005		None	
6.	Miscellaneous Storage Containers	006		None	
7.	Northern (NDD) and Southern Drainage Ditches (SDD)		SWMU 2	SDD-Soil, Groundwater	See footnote 4
8.	Oil Drum Storage (ODS) Building		SWMU 3	None	
9.	Recent Process Area		SWMU 4	Soil, Groundwater	See footnote 4
10.	Original Process Area		SWMU 5	Soil, Groundwater	See footnote 4
11.	Water Treatment and Boiler System		SWMU 6	Soil, Groundwater	See footnote 4
12.	Aboveground Storage Tank Area		SWMU 8	Soil, Groundwater	See footnote 4
13.	Location of Former UST No. 44-023-05		SWMU 9	Soil, Groundwater	See footnote 4
14.	Location of Former Sap Water Treatment Tank		SWMU 10	Soil, Groundwater	See footnote 4
15.	Oil Water Separators		SWMU 11	Soil, Groundwater	See footnote 4
16.	Railroad Tie Storage Area		SWMU 12	Groundwater	
17.	Diesel Storage Tank		AOC 1	Soil, Groundwater	See footnote 4
18.	Hose House		AOC 2	Soil, Groundwater	
19.	Contaminated Portion of City Water Line		AOC 3	None	
20.	Location of Former Incinerator		AOC 4	None	
21.	City Storm Sewer		AOC 5	None	
22.	Inactive Wastewater Lagoon		AOC 6	Soil, Groundwater	See footnote 4
23.	Location of Former UST No. 44-023-21		AOC 7	Soil, Groundwater	See footnote 4
24.	Former Fueling AST and Wastewater Lagoons		AOC 8	Soil, Groundwater	

Foot Note:
SWMU = Solid Waste Management Unit
AOC = Area of Concern

1. For sites with FOA Authorization, list SWMUs and/or AOCs that were not included in the FOA, and are subject to corrective action.
2. Specify affected media groundwater, soils, etc.
3. Specify the date of Commissions No Further Action approval letter for program requirement and remedy standard completed for all media of concern.
4. Completion of interim soil response action activities are documented in Interim RACR (2016, revised 2017).

CP Table III: Corrective Action Program Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard

Solid Waste Management Unit (SWMU) 1 – RCRA-Regulated Waste Management Unit 001

Unit Name	COLUMN A Hazardous Constituents	COLUMN B Groundwater Protection Standard ($^{GW}GW_{Ing}$) (mg/l)
RCRA-Regulated Waste Management Unit 001 A-TZ	Acenaphthene	1.5 PCL
	Acenaphthylene	1.5 PCL
	Anthracene	7.3 PCL
	bis(2-ethylhexyl)phthalate	0.006 MCL/PCL
	Dibenzofuran	0.098 PCL
	Di-n-butyl phthalate	2.4 PCL
	Fluoranthene	0.98 PCL
	Fluorene	0.98 PCL
	2-Methylnaphthalene	0.098 PCL
	Naphthalene	0.49 PCL
	Phenanthrene	0.73 PCL
	Phenol	7.3 PCL
	Pyrene	0.73 PCL
RCRA-Regulated Waste Management Unit 001 B-TZ	Acenaphthene	1.5 PCL
	Acenaphthylene	1.5 PCL
	Anthracene	7.3 PCL
	bis(2-ethylhexyl)phthalate	0.006 MCL/PCL
	Dibenzofuran	0.098 PCL
	Di-n-butyl phthalate	2.4 PCL
	Fluoranthene	0.98 PCL
	Fluorene	0.98 PCL
	2-Methylnaphthalene	0.098 PCL
	Naphthalene	0.49 PCL
	Phenanthrene	0.73 PCL
	Phenol	7.3 PCL
	Pyrene	0.73 PCL

Note: $^{GW}GW_{Ing}$ Protective Concentration Levels (PCLs), Commercial/Industrial land use assuming Class 2 Groundwater, November 8, 2019; Table 3.

CP Table III: Corrective Action Program Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard

On-Site PMZ

Unit Name	COLUMN A Hazardous Constituents	COLUMN B Groundwater Protection Standards (GWPS) at Alternate Point of Exposure (APOE) $^{GW}GW_{Ing}$ (mg/l) (C/I)	COLUMN C Groundwater Protection Standards (GWPS) at Alternate Point of Exposure (APOE) $^{GW}GW_{Ing}$ (mg/l) (Residential)
On Site – Site Wide PMZ	1,2-Dichloroethane	A-TZ/B-TZ/C-TZ/D-TZ[1] - 5.0E-03 MCL/PCL B-CZ- 5.0E-01 MCL/PCL	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 5.0E-03 MCL/PCL B-CZ- 5.0E-01 MCL/PCL
	Benzene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 5.0E-03 MCL/PCL B-CZ - 5.0E-01 MCL/PCL	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 5.0E-03 MCL/PCL B-CZ – 5.0E-01 MCL/PCL
	Chlorobenzene	A-TZ/B-TZ/C-TZ/ D-TZ[1]- 1.0E-01 MCL/PCL B-CZ - 1.0E+01 MCL/PCL	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 1.0E-01 MCL/PCL B-CZ – 1.0E+01 MCL/PCL
	Ethylbenzene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 7.0E-01 MCL/PCL B-CZ - 7.0E-01 MCL/PCL	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 7.0E-01 MCL/PCL B-CZ – 7.0E-01 MCL/PCL
	Methylene Chloride	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 5.0E-03 MCL/PCL B-CZ - 5.0E-01 MCL/PCL	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 5.0E-03 MCL/PCL B-CZ – 5.0E-01 MCL/PCL
	Toluene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 1.0E+00 MCL/PCL B-CZ - 1.0E+02 MCL/PCL	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 1.0E+00 MCL/PCL B-CZ – 1.0E+02 MCL/PCL
	Xylenes (total)	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 1.0E+01 MCL/PCL B-CZ - 1.0E+03 MCL/PCL	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 1.0E+01 MCL/PCL B-CZ – 1.0E+03 MCL/PCL
	Vinyl Chloride (selected well)*	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 2.0E-03 MCL/PCL B-CZ - 2.0E-01 MCL/PCL	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 2.0E-03 MCL/PCL B-CZ – 2.0E-01 MCL/PCL
	1,2-Diphenylhydrazine	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 2.6E-03 PCL B-CZ - 2.6E-01 PCL	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 1.1E-03 PCL B-CZ -
	2,4-Dimethylphenol	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 1.5E+00 PCL B-CZ - 1.5E+02 PCL	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 4.9E-01 PCL B-CZ -4.9E+01 PCL
	2,4-Dinitrotoluene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 3.0E-03 PCL B-CZ - 3.0E-01 PCL	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 1.3E-03 PCL B-CZ – 1.3E-01 PCL
	2,6-Dinitrotoluene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 3.0E-03 PCL B-CZ - 3.0E-01 PCL	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 1.3E-03 PCL B-CZ -1.3E-01 PCL
	2-Chloronaphthalene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 5.8E+00 PCL B-CZ - 5.8E+02 PCL	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 2.0E+00 PCL B-CZ -2.0E+02 PCL
	2-Methyl-4,6-dinitrophenol	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 7.3E-03 PCL B-CZ - 7.3E-01 PCL	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 2.4E-03 PCL B-CZ – 2.4E-01 PCL
	2-Methylnaphthalene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 2.9E-01 PCL B-CZ - 2.9E+01 PCL	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 9.8E-02 PCL B-CZ -9.8E+00 PCL
	4-Nitrophenol	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 1.5E-01 PCL B-CZ - 1.5E+01 PCL	A-TZ/B-TZ/C-TZ/ D-TZ[1]- 4.9E-02 PCL B-CZ -4.9E+00 PCL

CP Table III: Corrective Action Program Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard

On-Site PMZ (cont.)

Unit Name	COLUMN A Hazardous Constituents	COLUMN B Groundwater Protection Standards (GWPS) at Alternate Point of Exposure (APOE) $^{GW}GW_{Ing}$ (mg/l) (C/I)	COLUMN C Groundwater Protection Standards (GWPS) at Alternate Point of Exposure (APOE) $^{GW}GW_{Ing}$ (mg/l) (Residential)
	Acenaphthene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 4.4E+00 [PCL] B-CZ - 4.4E+02 [PCL]	A-TZ/B-TZ/C-TZ/D-TZ[1] - 1.5E+00 [PCL] B-CZ - 1.5E+02 [PCL]
	Acenaphthylene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 4.4E+00 [PCL] B-CZ - 4.4E+02 [PCL]	A-TZ/B-TZ/C-TZ/D-TZ[1] - 1.5E+00 [PCL] B-CZ -1.5E+02 [PCL]
	Anthracene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 2.2E+01 [PCL] B-CZ - 2.2E+03 [PCL]	A-TZ/B-TZ/C-TZ/D-TZ[1] - 7.3E+00 [PCL] B-CZ -7.3E+02 [PCL]
	Benzo(a)anthracene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 2.8E-03 [PCL] B-CZ - 2.8E-01 [PCL]	A-TZ/B-TZ/C-TZ/D-TZ[1] - 1.3E-03 [PCL] B-CZ -1.3E-01 [PCL]
	Benzo(a)pyrene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 2.0E-04 [MCL/PCL] B-CZ - 2.0E-02 [MCL/PCL]	A-TZ/B-TZ/C-TZ/D-TZ[1] - 2.0E-04 [MCL/PCL] B-CZ -2.0E-02 [MCL/PCL]
	bis(2-chloroethoxy)methane	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 1.9E-03 [PCL] B-CZ - 1.9E-01 [PCL]	A-TZ/B-TZ/C-TZ/D-TZ[1] - 8.3E-04 [PCL] B-CZ - 8.3E-02 [PCL]
	bis(2-ethylhexyl)phthalate	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 6.0E-03 [MCL/PCL] B-CZ - 6.0E-01 [MCL/PCL]	A-TZ/B-TZ/C-TZ/D-TZ[1] - 6.0E-03 [MCL/PCL] B-CZ - 6.0E-01 [MCL/PCL]
	Chrysene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 2.8E-01 [PCL] B-CZ - 2.8E+01 [PCL]	A-TZ/B-TZ/C-TZ/D-TZ[1] - 1.3E-01 [PCL] B-CZ - 1.3E+01 [PCL]
	Dibenzofuran	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 2.9E-01 [PCL] B-CZ - 2.9E+01 [PCL]	A-TZ/B-TZ/C-TZ/D-TZ[1] - 9.8E-02 [PCL] B-CZ - 9.8E-00 [PCL]
	Di-n-butyl Phthalate	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 7.3E+00 [PCL] B-CZ - 7.3E+02 [PCL]	A-TZ/B-TZ/C-TZ/D-TZ[1] - 2.4E+00 [PCL] B-CZ -2.4E+02 [PCL]
	Fluoranthene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 2.9E+00 [PCL] B-CZ - 2.9E+02 [PCL]	A-TZ/B-TZ/C-TZ/D-TZ[1] - 9.8E-01 [PCL] B-CZ -9.8E+01 [PCL]
	Fluorene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 2.9E+00 [PCL] B-CZ - 2.9E+02 [PCL]	A-TZ/B-TZ/C-TZ/D-TZ[1] - 9.8E-01 [PCL] B-CZ - 9.8E+01 [PCL]
	Naphthalene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 1.5E+00 [PCL] B-CZ - 1.5E+02 [PCL]	A-TZ/B-TZ/C-TZ/D-TZ[1] - 4.9E-01 [PCL] B-CZ - 4.9E+01 [PCL]
	Nitrobenzene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 1.5E-01 [PCL] B-CZ - 1.5E+01 [PCL]	A-TZ/B-TZ/C-TZ/D-TZ[1] - 4.9E-02 [PCL] B-CZ - 4.9E+00 [PCL]

CP Table III: Corrective Action Program Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard

On-Site PMZ (cont.)

Unit Name	COLUMN A Hazardous Constituents	COLUMN B Groundwater Protection Standards (GWPS) at Alternate Point of Exposure (APOE) $^{GW}GW_{Ing}$ (mg/l) (C/I)	COLUMN C Groundwater Protection Standards (GWPS) at Alternate Point of Exposure (APOE) $^{GW}GW_{Ing}$ (mg/l) (Residential)
	n-Nitrosodiphenylamine	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 4.2E-01 [PCL] B-CZ - 4.2E+01 [PCL]	A-TZ/B-TZ/C-TZ/D-TZ[1] - 1.9E-01 [PCL] B-CZ - 1.9E+01 [PCL]
	Pentachlorophenol	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 1.0E-03 [PCL] B-CZ - 1.0E-01 [PCL]	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 1.0E-03 [PCL] B-CZ -1.0E-01 [PCL]
	Phenanthrene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 2.2E+00 [PCL] B-CZ - 2.2E+02 [PCL]	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 7.3E-01 [PCL] B-CZ - 7.3E+01 [PCL]
	Phenol	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 2.2E+01 [PCL] B-CZ - 2.2E+03 [PCL]	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 7.3E+00 [PCL] B-CZ -7.3E+02 [PCL]
	Pyrene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 2.2E+00 [PCL] B-CZ - 2.2E+02 [PCL]	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 7.3E-01 [PCL] B-CZ - 7.3E+01 [PCL]
	Arsenic	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 0.01[PCL] B-CZ – 1[PCL]	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 0.01[PCL] B-CZ – 1[PCL]

Note:
$^{GW}GW_{Ing}$ Protective Concentration Levels (PCLs), Commercial/Industrial and Residential assuming Class 2 Groundwater for A-TZ, B-TZ, and C-TZ GWBU, Class 3 Groundwater for B-CZ GWBU, November 8, 2019; Table 3.
NE – Not established (see CP Attachment XI.D)
* Vinyl Chloride shall be sampled in accordance with the schedule specified in CP Table VIII.
[1]- D-TZ wells are corrective action observation wells. There is no PMZ in the D-TZ.

CP Table III: Corrective Action Program Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard

Off-Site PMZ (City of Houston-owned ROW)

Unit Name	COLUMN A Hazardous Constituents	COLUMN B Groundwater Protection Standards (GWPS) at Alternate Points of Exposure (APOE) $^{GW}GW_{Ing}$ (mg/l) (Res)
Off Site PMZ	1,2-Dichloroethane	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 5.0E-03 MCL/PCL B-CZ- 5.0E-01 MCL/PCL
	Benzene	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 5.0E-03 MCL/PCL B-CZ – 5.0E-01 MCL/PCL
	Chlorobenzene	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 1.0E-01 MCL/PCL B-CZ – 1.0E+01 MCL/PCL
	Ethylbenzene	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 7.0E-01 MCL/PCL B-CZ – 7.0E-01 MCL/PCL
	Methylene Chloride	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 5.0E-03 MCL/PCL B-CZ – 5.0E-01 MCL/PCL
	Toluene	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 1.0E+00 MCL/PCL B-CZ – 1.0E+02 MCL/PCL
	Xylenes (total)	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 1.0E+01 MCL/PCL B-CZ – 1.0E+03 MCL/PCL
	Vinyl Chloride (selected wells)*	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 2.0E-03 MCL/PCL B-CZ – 2.0E-01 MCL/PCL
	1,2-Diphenylhydrazine	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 1.1E-03 PCL B-CZ -
	2,4-Dimethylphenol	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 4.9E-01 PCL B-CZ -4.9E+01 PCL
	2,4-Dinitrotoluene	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 1.3E-03 PCL B-CZ – 1.3E-01 PCL
	2,6-Dinitrotoluene	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 1.3E-03 PCL B-CZ -1.3E-01 PCL
	2-Chloronaphthalene	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 2.0E+00 PCL B-CZ -2.0E+02 PCL
	2-Methyl-4,6-dinitrophenol	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 2.4E-03 PCL B-CZ – 2.4E-01 PCL
	2-Methylnaphthalene	A-TZ/B-TZ/C-TZ/ D-TZ[1] – 9.8E-02 PCL B-CZ -9.8E+00 PCL

CP Table III: Corrective Action Program Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard

Off-Site PMZ (City of Houston-owned ROW) (cont.)

Unit Name	COLUMN A Hazardous Constituents	COLUMN B Groundwater Protection Standards (GWPS) at Alternate Points of Exposure (APOE) $^{GW}GW_{Ing}$ (mg/l) (Res)
	4-Nitrophenol	A-TZ/B-TZ/C-TZ/ D-TZ[1]- 4.9E-02 [PCL] B-CZ -4.9E+00 [PCL]
	Acenaphthene	A-TZ/B-TZ/C-TZ/D-TZ[1] - 1.5E+00 [PCL] B-CZ - 1.5E+02 [PCL]
	Acenaphthylene	A-TZ/B-TZ/C-TZ/D-TZ[1] - 1.5E+00 [PCL] B-CZ -1.5E+02 [PCL]
	Anthracene	A-TZ/B-TZ/C-TZ/D-TZ[1] - 7.3E+00 [PCL] B-CZ -7.3E+02 [PCL]
	Benzo(a)anthracene	A-TZ/B-TZ/C-TZ/D-TZ[1] - 1.3E-03 [PCL] B-CZ -1.3E-01 [PCL]
	Benzo(a)pyrene	A-TZ/B-TZ/C-TZ/D-TZ[1] - 2.0E-04 [MCL/PCL] B-CZ -2.0E-02 [MCL/PCL]
	bis(2-chloroethoxy)methane	A-TZ/B-TZ/C-TZ/D-TZ[1] - 8.3E-04 [PCL] B-CZ - 8.3E-02 [PCL]
	bis(2-ethylhexyl)phthalate	A-TZ/B-TZ/C-TZ/D-TZ[1] - 6.0E-03 [MCL/PCL] B-CZ - 6.0E-01 [MCL/PCL]
	Chrysene	A-TZ/B-TZ/C-TZ/D-TZ[1] - 1.3E-01 [PCL] B-CZ - 1.3E+01 [PCL]
	Dibenzofuran	A-TZ/B-TZ/C-TZ/D-TZ[1] - 9.8E-02 [PCL] B-CZ - 9.8E-00 [PCL]
	Di-n-butyl Phthalate	A-TZ/B-TZ/C-TZ/D-TZ[1] - 2.4E+00 [PCL] B-CZ -2.4E+02 [PCL]
	Fluoranthene	A-TZ/B-TZ/C-TZ/D-TZ[1] - 9.8E-01 [PCL] B-CZ -9.8E+01 [PCL]
	Fluorene	A-TZ/B-TZ/C-TZ/D-TZ[1] - 9.8E-01 [PCL] B-CZ - 9.8E+01 [PCL]
	Naphthalene	A-TZ/B-TZ/C-TZ/D-TZ[1] - 4.9E-01 [PCL] B-CZ - 4.9E+01 [PCL]
	Nitrobenzene	A-TZ/B-TZ/C-TZ/D-TZ[1] - 4.9E-02 [PCL] B-CZ - 4.9E+00 [PCL]

CP Table III: Corrective Action Program Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard

Off-Site PMZ (City of Houston-owned ROW) (cont.)

Unit Name	COLUMN A Hazardous Constituents	COLUMN B Groundwater Protection Standards (GWPS) at Alternate Points of Exposure (APOE) $^{GW}GW_{Ing}$ (mg/l) (Res)
	n-Nitrosodiphenylamine	A-TZ/B-TZ/C-TZ/D-TZ[1] - 1.9E-01 [PCL] B-CZ - 1.9E+01 [PCL]
	Pentachlorophenol	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 1.0E-03 [PCL] B-CZ -1.0E-01 [PCL]
	Phenanthrene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 7.3E-01 [PCL] B-CZ - 7.3E+01 [PCL]
	Phenol	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 7.3E+00 [PCL] B-CZ -7.3E+02 [PCL]
	Pyrene	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 7.3E-01 [PCL] B-CZ - 7.3E+01 [PCL]
	Arsenic	A-TZ/B-TZ/C-TZ/ D-TZ[1] - 0.01[PCL] B-CZ – 1[PCL]

Note:
$^{GW}GW_{Ing}$ Protective Concentration Levels (PCLs), Residential assuming Class 2 Groundwater for A-TZ, B-TZ, and C-TZ GWBU, Class 3 Groundwater for B-CZ GWBU, November 8, 2019; Table 3.
* Vinyl Chloride shall be sampled in accordance with the schedule specified in CP Table VIII.
** - Class 3 Groundwater PCLs used for Groundwater Protection Standards at AMPs instead of calculating AALs. AAL was not calculated since no groundwater PCL exceedance (PCLE) zone was observed in the B-CZ for the given COC.
[1]- D-TZ wells are corrective action observation wells. There is no PMZ in the D-TZ.

CP Table IIIA: Corrective Action Program Table of Indicator Parameters and Groundwater Protection Standard

Solid Waste Management Unit (SWMU) 1 – RCRA-Regulated Waste Management Unit 001

Unit Name	COLUMN A Hazardous Constituents	COLUMN B Groundwater Protection Standard ($^{GW}GW_{Ing}$)(mg/l)
RCRA-Regulated Waste Management Unit 001 A-TZ	Acenaphthene	1.5 PCL
	Acenaphthylene	1.5 PCL
	Anthracene	7.3 PCL
	bis(2-ethylhexyl)phthalate	0.006 MCL/PCL
	Dibenzofuran	0.098 PCL
	Di-n-butyl phthalate	2.4 PCL
	Fluoranthene	0.98 PCL
	Fluorene	0.98 PCL
	2-Methylnaphthalene	0.098 PCL
	Naphthalene	0.49 PCL
	Phenanthrene	0.73 PCL
	Phenol	7.3 PCL
	Pyrene	0.73 PCL
RCRA-Regulated Waste Management Unit 001 B-TZ	Acenaphthene	1.5 PCL
	Acenaphthylene	1.5 PCL
	Anthracene	7.3 PCL
	bis(2-ethylhexyl)phthalate	0.006 MCL/PCL
	Dibenzofuran	0.098 PCL
	Di-n-butyl phthalate	2.4 PCL
	Fluoranthene	0.98 PCL
	Fluorene	0.98 PCL
	2-Methylnaphthalene	0.098 PCL
	Naphthalene	0.49 PCL
	Phenanthrene	0.73 PCL
	Phenol	7.3 PCL
	Pyrene	0.73 PCL

Note: $^{GW}GW_{Ing}$ Protective Concentration Levels (PCLs), Commercial/Industrial (C/I) land use assuming Class 2 Groundwater, November 8, 2019; Table 3.

CP Table IIIA: Corrective Action Program Table of Indicator Parameters and Groundwater Protection Standard

On-Site PMZ

Unit Name	COLUMN A Hazardous Constituents	COLUMN B Groundwater Protection Standards (GWPS) at Alternate Point of Exposure (APOE) $^{GW}GW_{Ing}$ (mg/l) (C/I)	COLUMN C Groundwater Protection Standards (GWPS) at Alternate Point of Exposure (APOE) $^{GW}GW_{Ing}$ (mg/l) (Res)
A-TZ	Benzene	0.005 MCL/PCL	0.005 MCL/PCL
	2,4-Dimethylphenol	1.5 PCL	0.49 PCL
	2 Methylnaphthalene	0.29 PCL	0.098 PCL
	Benzo(a)pyrene	0.0002PCL	0.0002PCL
	Dibenzofuran	0.29 PCL	0.098 PCL
	Fluorene	2.9PCL	0.98PCL
	Naphthalene	1.5 PCL	0.49 PCL
	Phenanthrene	2.2PCL	0.73PCL
	Pyrene	2.2PCL	0.73PCL
	Vinyl Chloride*	0.002 MCL/PCL	0.002 MCL/PCL
	Arsenic	0.01 MCL/PCL	0.01MCL/PCL
B-CZ**	Benzene	0.5 MCL/PCL	0.5 MCL/PCL
	2,4-Dimethylphenol	150 PCL	49PCL
	2 Methylnaphthalene	29 PCL	9.8PCL
	Benzo(a)pyrene	0.02PCL	0.02PCL
	Dibenzofuran	29 PCL	9.8PCL
	Fluorene	290PCL	98PCL
	Naphthalene	150 PCL	49PCL
	Phenanthrene	220PCL	73
	Pyrene	220PCL	73
	Vinyl Chloride*	0.2 MCL/PCL	
	Arsenic	1 MCL/PCL	1 MCL/PCL
B-TZ	Benzene	0.005 MCL/PCL	0.005 MCL/PCL
	2,4-Dimethylphenol	1.5 PCL	0.49 PCL
	2 Methylnaphthalene	0.29 PCL	0.098 PCL
	Benzo(a)pyrene	0.0002PCL	0.0002PCL
	Dibenzofuran	0.29 PCL	0.098 PCL
	Fluorene	2.9PCL	0.98PCL
	Naphthalene	1.5 PCL	0.49 PCL
	Phenanthrene	2.2PCL	0.73PCL
	Pyrene	2.2PCL	0.73PCL
	Vinyl Chloride*	0.002 MCL/PCL	0.002 MCL/PCL
	Arsenic	0.01 MCL/PCL	0.01MCL/PCL

Unit Name	COLUMN A Hazardous Constituents	COLUMN B Groundwater Protection Standards (GWPS) at Alternate Point of Exposure (APOE) $^{GW}GW_{Ing}$ (mg/l) (C/I)	COLUMN C Groundwater Protection Standards (GWPS) at Alternate Point of Exposure (APOE) $^{GW}GW_{Ing}$ (mg/l) (Res)
C-TZ	Benzene	0.005 MCL/PCL	0.005 MCL/PCL
	2,4-Dimethylphenol	1.5 PCL	0.49 PCL
	2 Methylnaphthalene	0.29 PCL	0.098 PCL
	Benzo(a)pyrene	0.0002PCL	0.0002PCL
	Dibenzofuran	0.29 PCL	0.098 PCL
	Fluorene	2.9PCL	0.98PCL
	Naphthalene	1.5 PCL	0.49 PCL
	Phenanthrene	2.2PCL	0.73PCL
	Pyrene	2.2PCL	0.73PCL
	Vinyl Chloride*	0.002 MCL/PCL	0.002 MCL/PCL
	Arsenic	0.01 MCL/PCL	0.01MCL/PCL
D-TZ[1]	Benzene	0.005 MCL/PCL	0.005 MCL/PCL
	2,4-Dimethylphenol	1.5 PCL	0.49 PCL
	2 Methylnaphthalene	0.29 PCL	0.098 PCL
	Benzo(a)pyrene	0.0002PCL	0.0002PCL
	Dibenzofuran	0.29 PCL	0.098 PCL
	Fluorene	2.9PCL	0.98PCL
	Naphthalene	1.5 PCL	0.49 PCL
	Phenanthrene	2.2PCL	0.73PCL
	Pyrene	2.2PCL	0.73PCL
	Vinyl Chloride*	0.002 MCL/PCL	0.002 MCL/PCL
	Arsenic	0.01 MCL/PCL	0.01MCL/PCL

Note:
$^{GW}GW_{Ing}$ Protective Concentration Levels (PCLs), Commercial/Industrial and Residential assuming Class 2 Groundwater for A-TZ, B-TZ, and C-TZ GWBU, **Class 3 Groundwater for B-CZ GWBU, November 8, 2019; Table 3.
* Vinyl Chloride shall be sampled in accordance with the schedule specified in CP Table VIII.
** - Class 3 Groundwater PCLs used to develop GWPS for B-CZ GWBU.
[1]- D-TZ wells are corrective action observation wells. There is no PMZ in the D-TZ.

CP Table IIIA: Corrective Action Program Table of Indicator Parameters and Groundwater Protection Standard

Off-Site PMZ (City of Houston ROW)

Unit Name	COLUMN A Hazardous Constituents	COLUMN B Groundwater Protection Standards (GWPS) at Point of Exposure (POE) $^{GW}GW_{Ing}$ (mg/l) (Res)
A-TZ	Benzene	0.005 MCL/PCL
	2,4-Dimethylphenol	0.49 PCL
	2 Methylnaphthalene	0.098 PCL
	Benzo(a)pyrene	0.0002 PCL
	Dibenzofuran	0.098 PCL
	Fluorene	0.98 PCL
	Naphthalene	0.49 PCL
	Phenanthrene	0.73 PCL
	Pyrene	0.73 PCL
	Vinyl Chloride*	0.002 MCL/PCL
	Arsenic	0.01 MCL/PCL
B-CZ**	Benzene	0.5 MCL/PCL
	2,4-Dimethylphenol	49 PCL
	2 Methylnaphthalene	9.8 PCL
	Benzo(a)pyrene	0.02 PCL
	Dibenzofuran	9.8 PCL
	Fluorene	9.8 PCL
	Naphthalene	49 PCL
	Phenanthrene	73 PCL
	Pyrene	73 PCL
	Vinyl Chloride*	0.2 MCL/PCL
	Arsenic	1 MCL/PCL
B-TZ	Benzene	0.005 MCL/PCL
	2,4-Dimethylphenol	0.49 PCL
	2 Methylnaphthalene	0.098 PCL
	Dibenzofuran	0.098 PCL
	Naphthalene	0.49 PCL
	Vinyl Chloride*	0.002 MCL/PCL
	Benzo(a)pyrene	0.0002 PCL
	Fluorene	0.98 PCL
	Phenanthrene	0.73 PCL
	Pyrene	0.73 PCL
	Arsenic	0.01 MCL/PCL
C-TZ	Benzene	0.005 MCL/PCL
	2,4-Dimethylphenol	0.49 PCL

Unit Name	COLUMN A Hazardous Constituents	COLUMN B Groundwater Protection Standards (GWPS) at Point of Exposure (POE) $^{GW}GW_{Ing}$ (mg/l) (Res)
C-TZ (continued)	2 Methylnaphthalene	0.098 PCL
	Dibenzofuran	0.098 PCL
	Naphthalene	0.49 PCL
	Vinyl Chloride*	0.002 MCL/PCL
	Benzo(a)pyrene	0.0002PCL
	Fluorene	0.98PCL
	Phenanthrene	0.73PCL
	Pyrene	0.73PCL
D-TZ[1]	Benzene	0.005 MCL/PCL
	2,4-Dimethylphenol	0.49 PCL
	2 Methylnaphthalene	0.098 PCL
	Dibenzofuran	0.098 PCL
	Naphthalene	0.49 PCL
	Vinyl Chloride*	0.002 MCL/PCL
	Benzo(a)pyrene	0.0002PCL
	Fluorene	0.98PCL
	Phenanthrene	0.73PCL
	Pyrene	0.73PCL

Note:
$^{GW}GW_{Ing}$ Protective Concentration Levels (PCLs), Residential assuming Class 2 Groundwater for A-TZ, B-TZ, and C-TZ GWBU, **Class 3 Groundwater for B-CZ GWBU, November 8, 2019; Table 3.
*Vinyl Chloride shall be sampled in accordance with the schedule specified in CP Table VIII.
** - Class 3 Groundwater PCLs used to develop GWPS for B-CZ GWBU.
[1]- D-TZ wells are corrective action observation wells. There is no PMZ in the D-TZ.

CP Table IV: Compliance Monitoring Program Table of Hazardous and Solid Waste Constituents and Quantitation Limits

Reserved

CP Table IVA: Compliance Monitoring Program Table of Detected Hazardous Constituents and the Groundwater Protection Standard

Reserved

CP Table V: Designation of Wells

Point of Compliance Wells: (RCRA- Regulated Waste Management Unit 001 (SWMU 1) Only)

- A-TZ POC wells: MW-01A, MW-02, MW-07, MW-10A, and MW-11A;
- B-TZ POC wells: MW-10B, MW-11B, and P-10.

Point of Exposure Wells:

NONE

Alternate Point of Exposure Wells (PMZ Wells) (for other SWMUs and AOCs):

1. A-TZ

   On-Site: MW-12A, MW-13, MW-15A, MW-50A, MW-69A, MW-88A, MW-97A, MW-98A

   Off-Site: **MW-101A, MW-32AR, MW-33A, **MW-71A, **MW-34A, MW-36A, MW-25A, MW-61A, MW-59A, MW-47A

2. B-TZ/B-CZ

   On-Site (Main): MW-14, MW-15B, MW-50B, MW-80B, MW-88B, MW-98B
   On-Site (West): MW-22BR, MW-38B, MW-39B, MW-42B, MW-62B, P-10, P-12

   Off-Site: **RW-1B, MW-32B, MW-36B, MW-54B, MW-59B, MW-60B, MW-61B, MW-70B, MW-71B

3. C-TZ

   On-Site: MW-15C, MW-47C, MW-19C, and MW-88C

   Off-Site: **MW-32C, **MW-71C, MW-34CR, MW-54C, MW-48C, MW-70C

Background Wells (RCRA- Regulated Waste Management Unit 001 (SWMU 1)):

1. A-TZ: MW-8
2. B-TZ: P-12

FOA Boundary of Compliance Wells Background Wells:

Exposure Pathway: (e.g. SWGW - Groundwater to surface water PCL for Brazos River or Barge Canal, etc)

NONE

Note: Wells that are not listed in this table are subject to change, upon approval by the Executive Director, without modification to the Compliance Plan.

* - Proposed APOE Wells for the Off-Site PMZ will be corrective action observation wells pending PMZ approval.

** - Proposed well, will be installed following approval of the Response Action Plan (see CP Attachment XI.D)

CP Table VI: Compliance Period for RCRA-Regulated Units

SWMU 1	Year or Number of Years
Year Waste Management Activities Initiated	1979
Year Closed (Certified Closed)	1984 (April 18)
Compliance Period	5 Years
Compliance Period Began	1994
Compliance Period Remaining	3 Years (2023)

CP Table VIII: Compliance Schedule

Item	**Compliance Schedule** (from the date of issuance of the Compliance Plan unless otherwise specified)	**Regulatory Citation**	**Requirement**
A.	60	Compliance Plan	Submit to the Executive Director a schedule summarizing all activities required by the Compliance Plan. The schedule shall list the starting dates of all routine activities. The Permittee shall include an updated schedule in the report required by Compliance Plan CP Table VII – Reporting Requirements. The schedule shall list the activity or report, the Compliance Plan Section which requires the activity or report and the calendar date the activity or report it to be completed or submitted (if this date can be determined).
B.	120 days from Compliance Plan Issuance	30 TAC §350.31(g)	Submit to the Executive Director proof of compliance with institutional control requirements in accordance with which provides notice of the existence and location of the Plume Management Zone (PMZ) and which prevents exposure to groundwater from this zone until such a time as constituents of concern may be reduced to below the Groundwater Protection Standards of CP Table III – Corrective Action Program Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard. • Filing of deed recordation for UPRR-owned properties requiring commercial/industrial land use and prohibiting groundwater use. Deed recordation will also restrict excavation activities over capped areas. • Filing of restrictive covenant prohibiting groundwater use for off-site PMZ.
C.	Notify within 30 days	30 TAC §350.33(k)	After an unexpected event occurs, or a condition is detected, during post-response action care period which indicates that additional response actions will be required at an affected property.
D.	Within 60 Days of Compliance Plan Issuance		DNAPL recovery will continue in the Corrective Action System Wells where DNAPL is recoverable. NAPL recovery through MPE events will be initiated following approval of the RAP and the proposed schedule detailed in the Revised RAP.
E.	During Second and Fourth Quarters of each year	30 TAC §350.33(4)(D)	Conduct groundwater monitoring events for those units listed in CP Table I that are subject to Compliance and Corrective action monitoring.
F.	Annually in accordance with CP Table VII		The Groundwater monitoring report required by CP Table VII shall include the results of all remediation and post-response action activities at the site, including Post Response Action Care Reports, and DNAPL recovery activities.
G.	During Second and Fourth Quarters of each year		Off-site MW-33BR and On-site wells MW-18A and MW-17C shall be sampled for vinyl chloride.

Item	**Compliance Schedule** (from the date of issuance of the Compliance Plan unless otherwise specified)	**Regulatory Citation**	**Requirement**
H.	Weekly until a revised frequency is approved upon submittal of the PRACR.		Inspections of NAPL Collection System in Englewood Intermodal Yard

FIGURES

EXPLANATION

UPRR Property Boundary

UPRR Facility Boundary

N

Approx. Scale in Feet

0 300 600

SOURCE:
Base map from Google Earth, photography dated 12/31/43.

UNION PACIFIC RAILROAD CO.

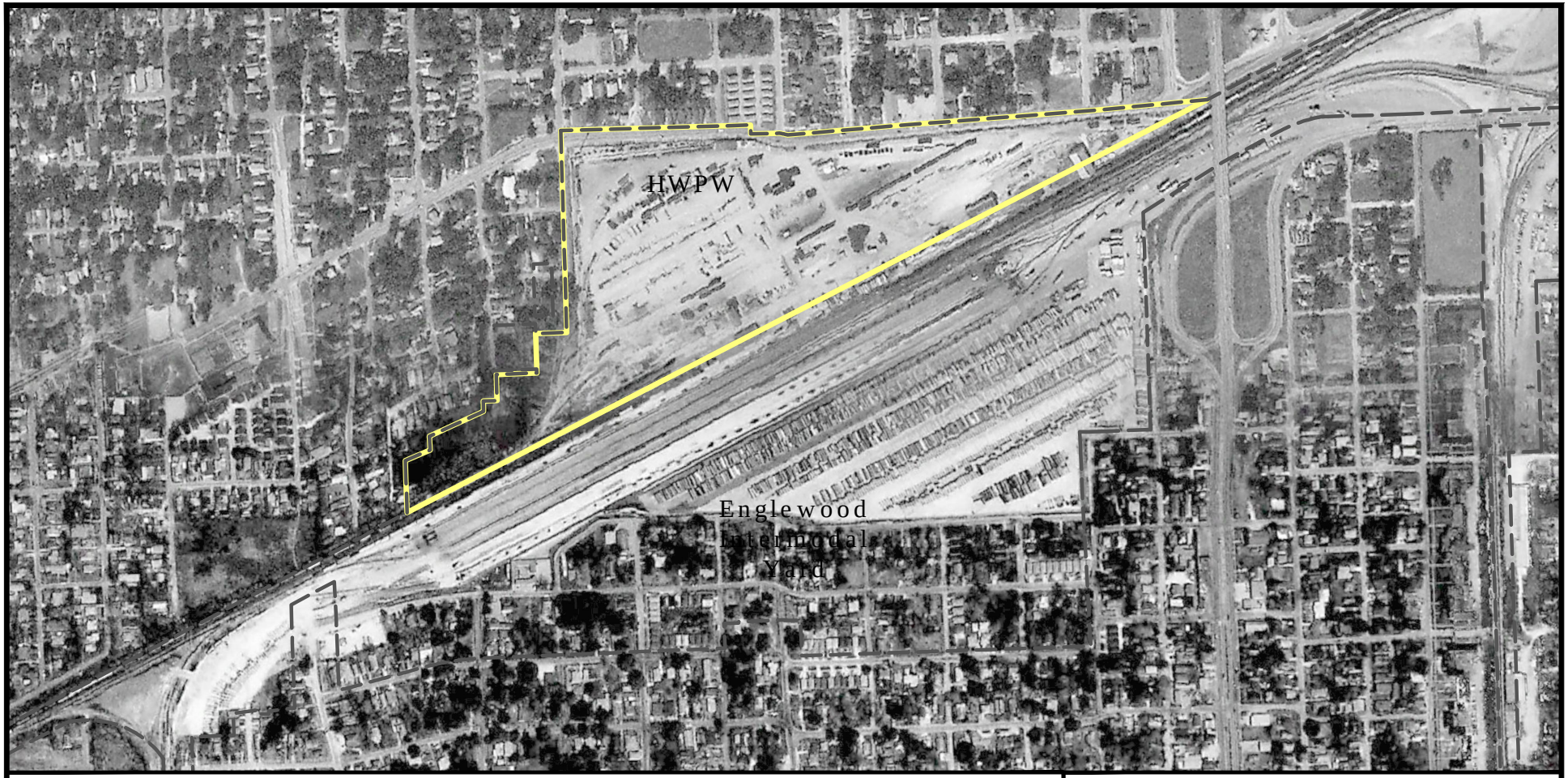
HOUSTON WOOD PRESERVING WORKS

Figure XI.A.1d

1943 AERIAL PHOTOGRAPH

PROJECT: 1358	BY: AJD	REVISIONS
DATE: NOV., 2014	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

UPRR Property Boundary

UPRR Facility Boundary

N

Approx. Scale in Feet

0 300 600

SOURCE:
Base map from Google Earth, photography dated 12/31/88.

UNION PACIFIC RAILROAD CO.

HOUSTON WOOD PRESERVING WORKS

Figure XI.A.1d

1988 AERIAL PHOTOGRAPH

PROJECT: 1358	BY: AJD	REVISIONS
DATE: NOV., 2014	CHECKED: ECM	

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CONSULTING ENGINEERS AND SCIENTISTS

EXPLANATION

UPRR Property Boundary

UPRR Facility Boundary

N

Approx. Scale in Feet

0 300 600

SOURCE:
Base map from Google Earth, photography dated 4/8/14.

UNION PACIFIC RAILROAD CO.

HOUSTON WOOD PRESERVING WORKS

Figure XI.A.1d

2014 AERIAL PHOTOGRAPH

PROJECT: 1358	BY: AJD	REVISIONS
DATE: NOV., 2014	CHECKED: ECM	

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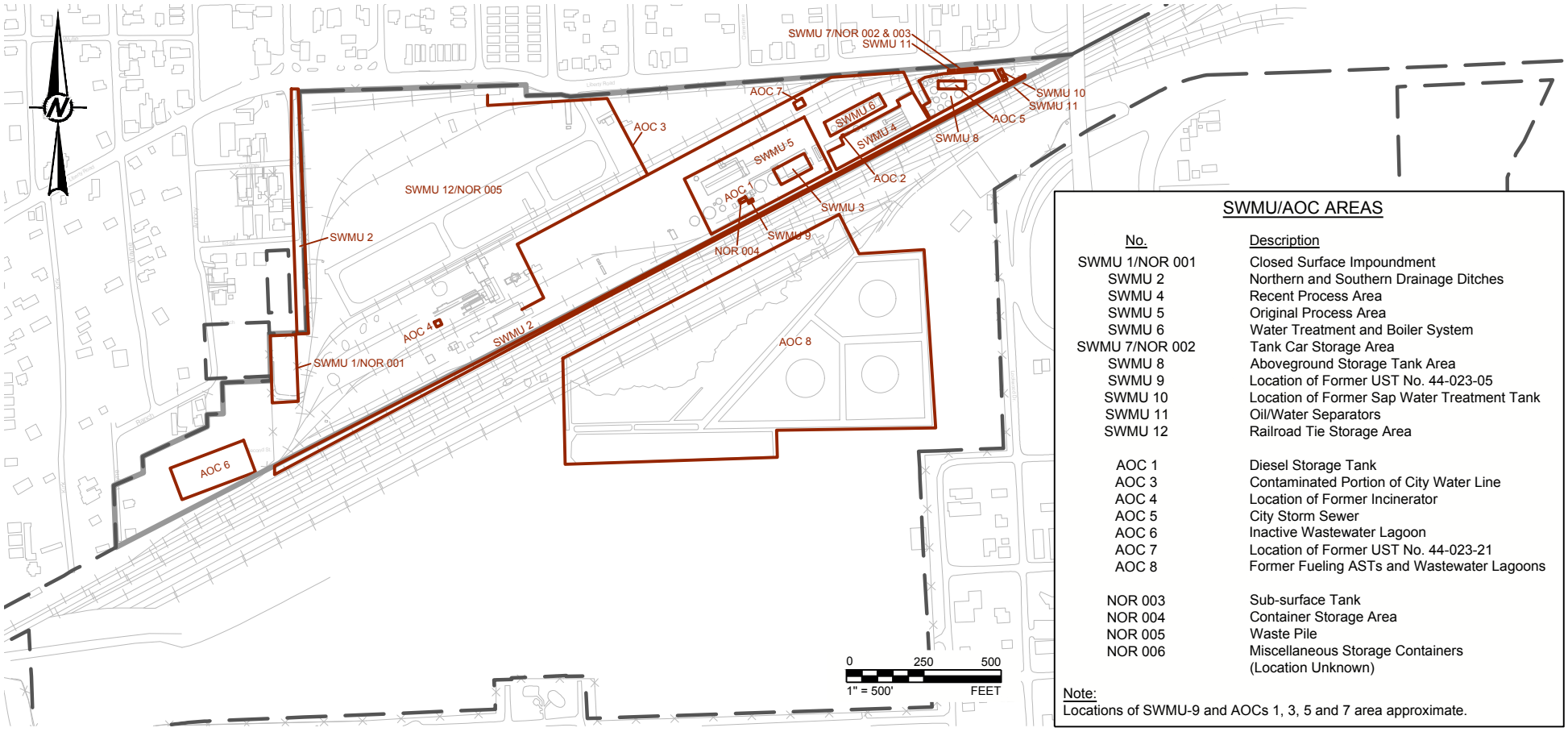
CONSULTING ENGINEERS AND SCIENTISTS

Last Edited By: rsalazar Date: 2020-08-26 Time:9:14:48 AM | Printed By: RSalazar Date: 2020-08-26 Time:10:27:51 AM |
Path: \\texarkana\data\Projects - Round Rock_2019\19119232 - HWPW\2020-8 RAP Revision\ | File Name: FIG XI-A-2 - Locations of Former WMUs.dwg



SWMU/AOC AREAS

No.	Description
SWMU 1/NOR 001	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 4	Recent Process Area
SWMU 5	Original Process Area
SWMU 6	Water Treatment and Boiler System
SWMU 7/NOR 002	Tank Car Storage Area
SWMU 8	Aboveground Storage Tank Area
SWMU 9	Location of Former UST No. 44-023-05
SWMU 10	Location of Former Sap Water Treatment Tank
SWMU 11	Oil/Water Separators
SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
AOC 3	Contaminated Portion of City Water Line
AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21
AOC 8	Former Fueling ASTs and Wastewater Lagoons
NOR 003	Sub-surface Tank
NOR 004	Container Storage Area
NOR 005	Waste Pile
NOR 006	Miscellaneous Storage Containers (Location Unknown)

Note:
Locations of SWMU-9 and AOCs 1, 3, 5 and 7 area approximate.

LEGEND

- UPRR PROPERTY BOUNDARY
- UPRR FACILITY BOUNDARY
- HISTORIC STRUCTURE AND FEATURE
- ROAD, PARKING LOT, SIDEWALK
- FENCE
- RAILROAD

REFERENCE(S)
BASE MAP TAKEN FROM ERM-SOUTHWEST, INC APAR ADDENDUM, FIG 3-1, DATED JUNE 2004.

CLIENT
UNION PACIFIC RAILROAD CO.

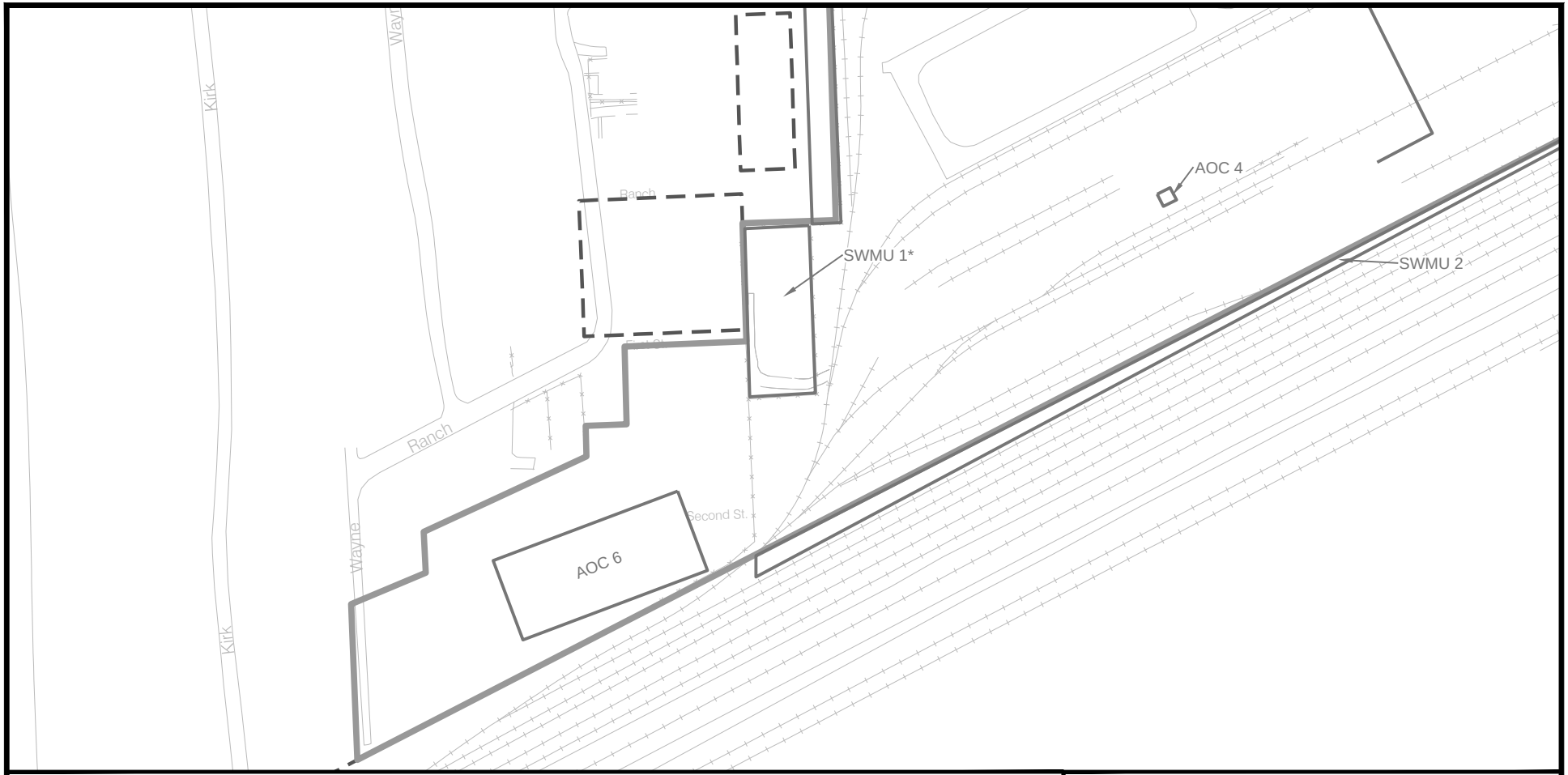
PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
LOCATIONS OF FORMER WASTE MANAGEMENT UNITS

CONSULTANT
GOLDER

YYYY-MM-DD	2020-08-26
DESIGNED	RS
PREPARED	RS
REVIEWED	MH
APPROVED	ECM

PROJECT NO. 19119232 | REV. 0 | FIGURE XI.A.2



EXPLANATION

- UPRR Property Boundary
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- UPRR Facility Boundary

Notes:

* SWMU1 Under Detection Monitoring Program.

N

Approx. Scale in Feet

0 100 200

SWMU/AOC AREAS

No.	Description
SWMU 1	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 4	Recent Process Area
SWMU 5	Original Process Area
SWMU 6	Water Treatment and Boiler System
SWMU 7	Tank Car Storage Area
SWMU 8	Aboveground Storage Tank Area
SWMU 9	Location of Former UST No. 44-023-05
SWMU 10	Location of Former Sap Water Treatment Tank
SWMU 11	Oil/Water Separators
SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
AOC 3	Contaminated Portion of City Water Line
AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21

Note:
Locations of SWMU-9 and AOCs 1, 3, 5 and 7 area approximate.

Source:
Base map from ERM-Southwest, Inc APAR Addendum, Fig 3-1, dated June 2004.

UNION PACIFIC RAILROAD CO.

HOUSTON WOOD PRESERVING WORKS

Figure XI.A.2.1

SWMUS/AOCS UNDER CORRECTIVE ACTION

PROJECT: 1358	BY: ADJ	REVISIONS
DATE: NOV., 2015	CHECKED: ECM	

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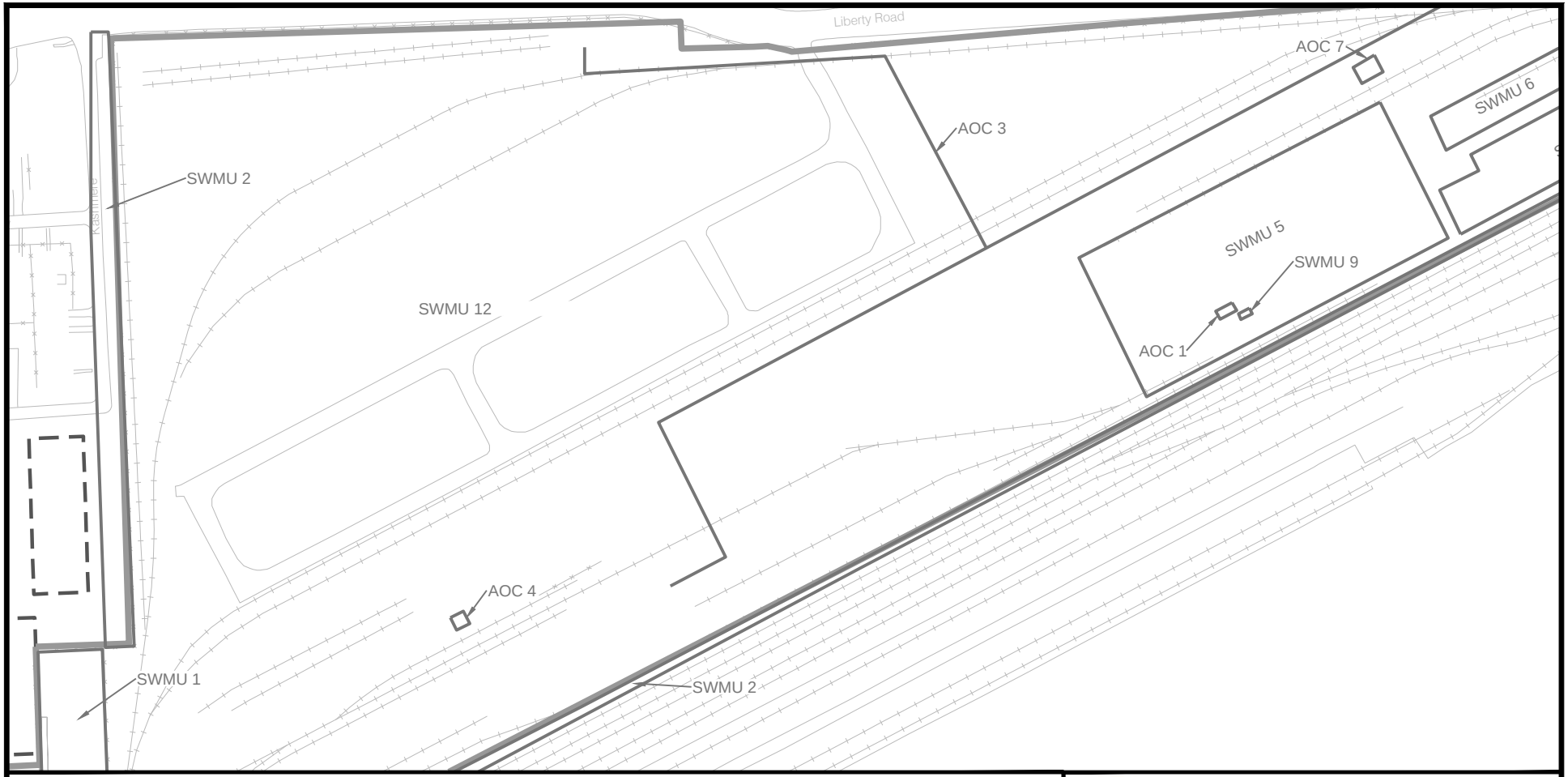


EXPLANATION

- UPRR Property Boundary
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- UPRR Facility Boundary

N

Approx. Scale in Feet

0 100 200

SWMU/AOC AREAS

No.	Description
SWMU 1	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 4	Recent Process Area
SWMU 5	Original Process Area
SWMU 6	Water Treatment and Boiler System
SWMU 7	Tank Car Storage Area
SWMU 8	Aboveground Storage Tank Area
SWMU 9	Location of Former UST No. 44-023-05
SWMU 10	Location of Former Sap Water Treatment Tank
SWMU 11	Oil/Water Separators
SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
AOC 3	Contaminated Portion of City Water Line
AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21

Note:
Locations of SWMU-9 and AOCs 1, 3, 5 and 7 area approximate.

Source:
Base map from ERM-Southwest, Inc APAR Addendum, Fig 3-1, dated June 2004.

UNION PACIFIC RAILROAD CO.

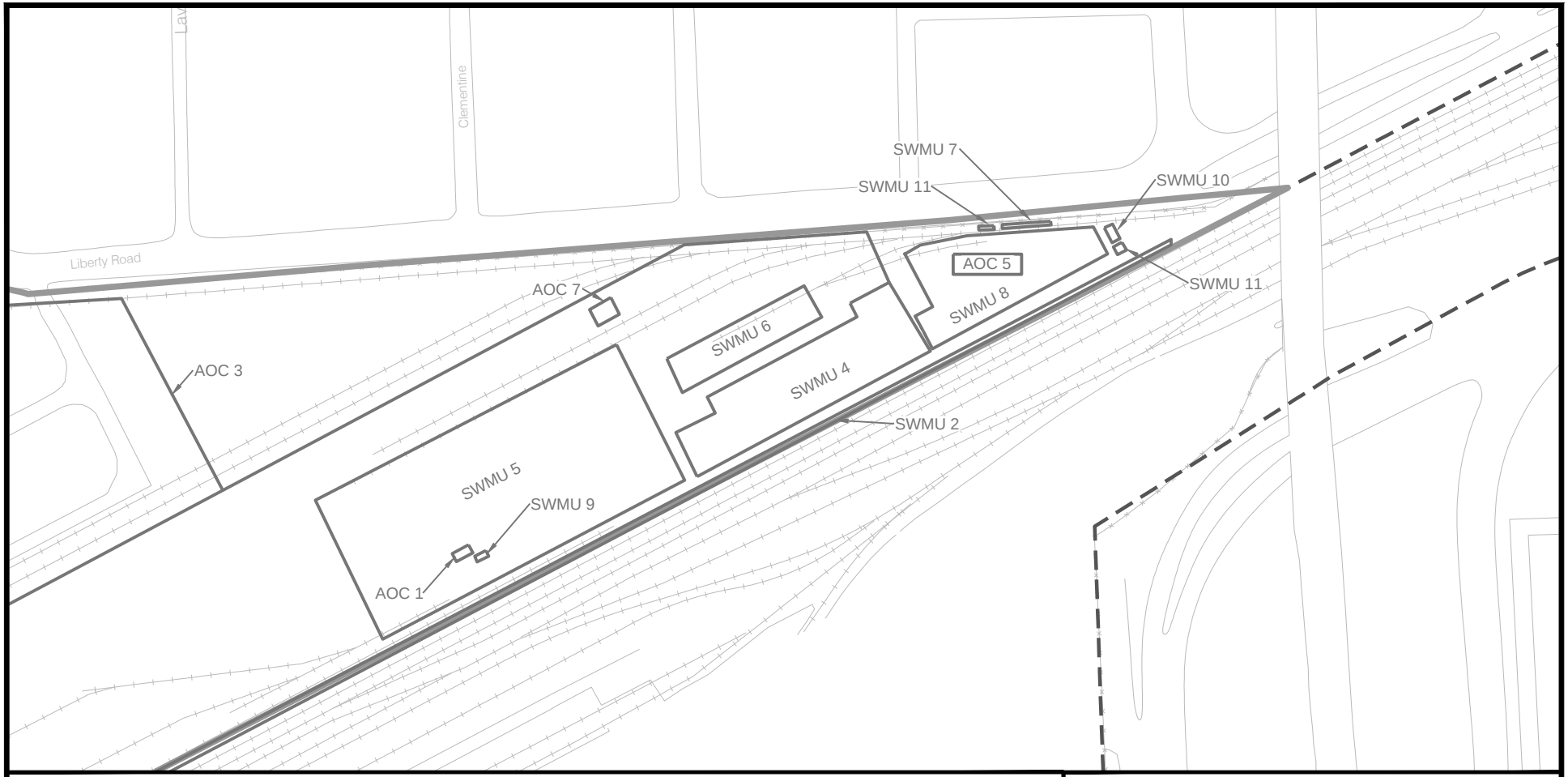
HOUSTON WOOD PRESERVING WORKS

Figure XI.A.2.2

SWMUS/AOCS UNDER CORRECTIVE ACTION

PROJECT: 1358	BY: ADJ	REVISIONS
DATE: NOV., 2015	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- UPRR Property Boundary
- Road, Parking Lot, Sidewalk
- Fence
- Railroad
- UPRR Facility Boundary

N

Approx. Scale in Feet

0 100 200

SWMU/AOC AREAS

No.	Description
SWMU 1	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 4	Recent Process Area
SWMU 5	Original Process Area
SWMU 6	Water Treatment and Boiler System
SWMU 7	Tank Car Storage Area
SWMU 8	Aboveground Storage Tank Area
SWMU 9	Location of Former UST No. 44-023-05
SWMU 10	Location of Former Sap Water Treatment Tank
SWMU 11	Oil/Water Separators
SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
AOC 3	Contaminated Portion of City Water Line
AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21

Note:
Locations of SWMU-9 and AOCs 1, 3, 5 and 7 area approximate.

Source:
Base map from ERM-Southwest, Inc APAR Addendum, Fig 3-1, dated June 2004.

UNION PACIFIC RAILROAD CO.

HOUSTON WOOD PRESERVING WORKS

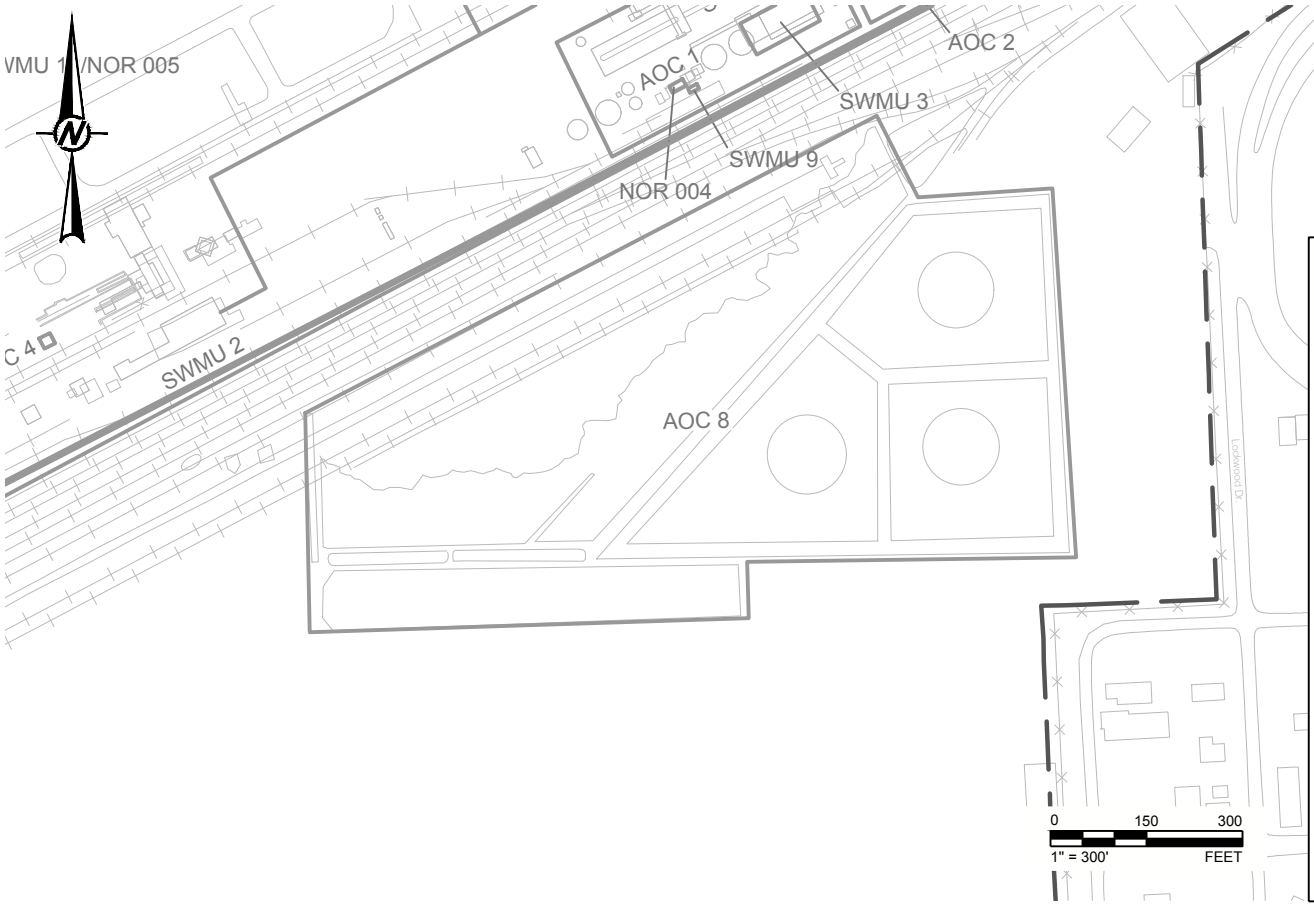
Figure XI.A.2.3

SWMUS/AOCS UNDER CORRECTIVE ACTION

PROJECT: 1358	BY: ADJ	REVISIONS
DATE: NOV., 2015	CHECKED: ECM	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Last Edited By: rsalazar Date: 2020-08-26 Time:9:13:45 AM | Printed By: RSalazar Date: 2020-08-26 Time:10:26:33 AM |
Path: \\texarkana\data\Projects - Round Rock_2019\19119232 - HWPW\2020-8 RAP Revision\ | File Name: FIG XI-A-2.4 - SWMUs-AOCs Under Corrective Action.dwg



SWMU/AOC AREAS

No.	Description
SWMU 1/NOR 001	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 4	Recent Process Area
SWMU 5	Original Process Area
SWMU 6	Water Treatment and Boiler System
SWMU 7/NOR 002	Tank Car Storage Area
SWMU 8	Aboveground Storage Tank Area
SWMU 9	Location of Former UST No. 44-023-05
SWMU 10	Location of Former Sap Water Treatment Tank
SWMU 11	Oil/Water Separators
SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
AOC 3	Contaminated Portion of City Water Line
AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21
AOC 8	Former Fueling ASTs and Wastewater Lagoons
NOR 003	Sub-surface Tank
NOR 004	Container Storage Area
NOR 005	Waste Pile
NOR 006	Miscellaneous Storage Containers (Location Unknown)

Note:
Locations of SWMU-9 and AOCs 1, 3, 5 and 7 area approximate.

LEGEND

- UPRR PROPERTY BOUNDARY
- UPRR FACILITY BOUNDARY
- HISTORIC STRUCTURE AND FEATURE
- ROAD, PARKING LOT, SIDEWALK
- FENCE
- RAILROAD

REFERENCE(S)

BASE MAP TAKEN FROM ERM-SOUTHWEST, INC APAR ADDENDUM, FIG 3-1, DATED JUNE 2004.

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
SWMUs-AOCs UNDER CORRECTIVE ACTION

CONSULTANT
GOLDER

YYYY-MM-DD	2020-08-26
DESIGNED	RS
PREPARED	RS
REVIEWED	MH
APPROVED	ECM

PROJECT NO. 19119232 | REV. 0 | FIGURE XI.A.2.4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
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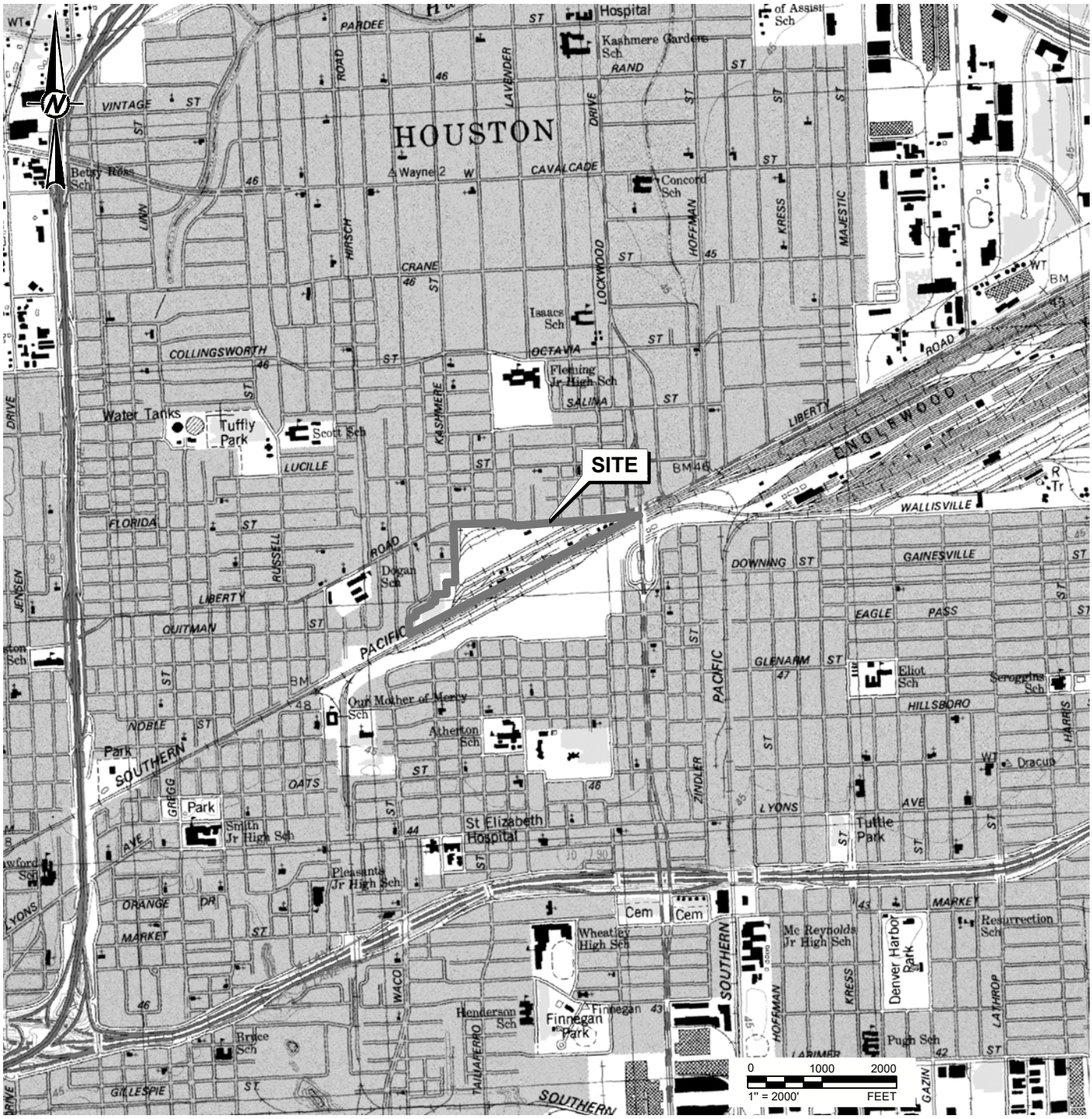
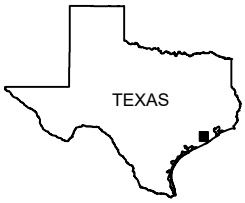


LEGEND

FACILITY BOUNDARY



QUADRANGLE LOCATIONS

REFERENCE(S)

BASE MAP FROM WWW.TNRIS.GOV, SETTEGAST, TX 7.5 MIN. USGS QUADRANGLE DATED 1982.

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
FACILITY SITE MAP

CONSULTANT
GOLDER
TEXAS GEOSCIENCE FIRM NO. 50369
TEXAS ENGINEERING FIRM NO. 2578

YYYY-MM-DD	2020-10-19
DESIGNED	AJD
PREPARED	AJD
REVIEWED	MH
APPROVED	ECM

PROJECT NO. 19119232 | REV. 0 | CP ATTACHMENT A SHEET 1 of 7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

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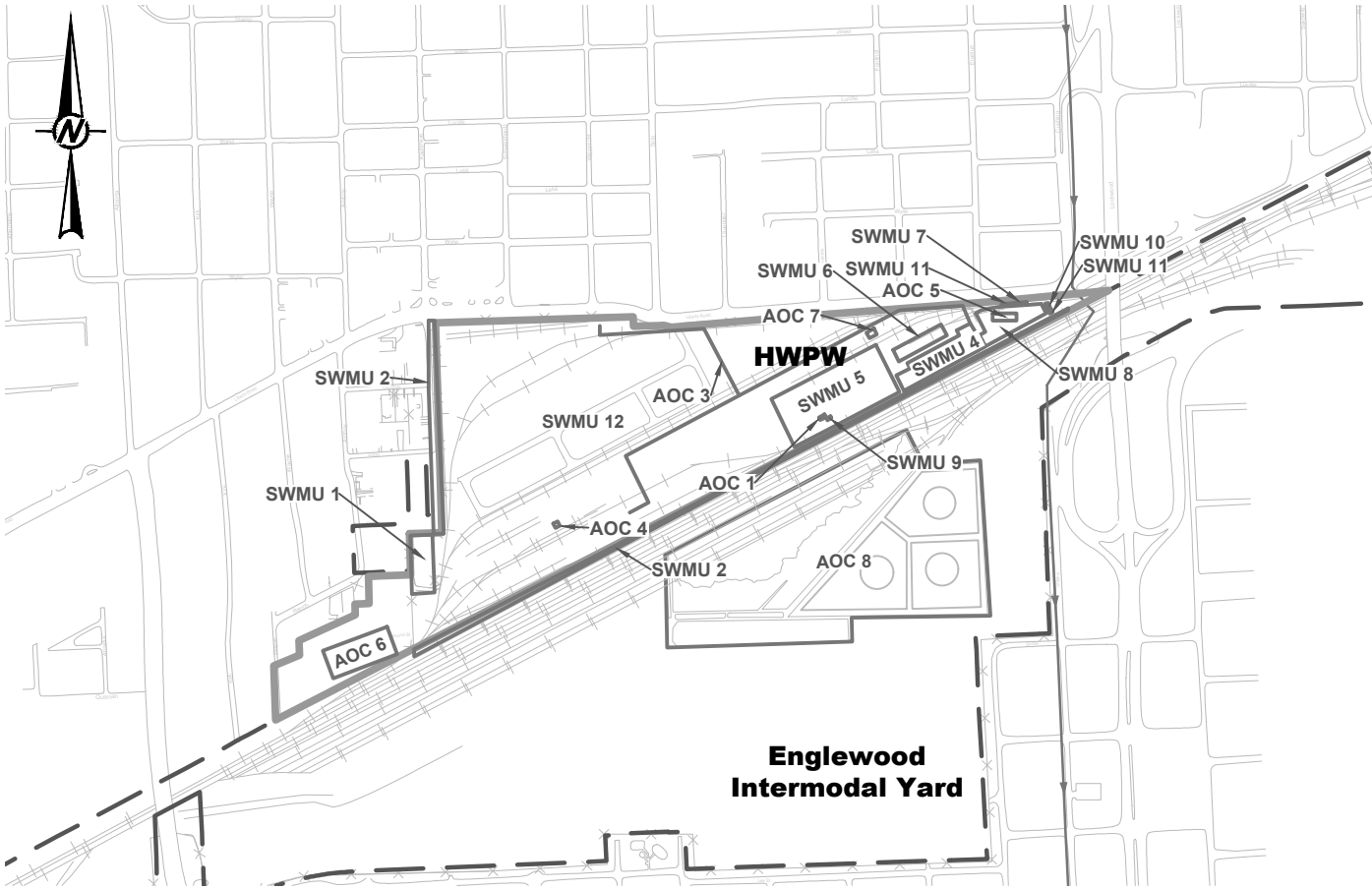

SWMU/AOC AREAS

No.	Description
SWMU 1	Closed Surface Impoundment
SWMU 2	Northern and Southern Drainage Ditches
SWMU 4	Recent Process Area
SWMU 5	Original Process Area
SWMU 6	Water Treatment and Boiler System
SWMU 7	Tank Car Storage Area
SWMU 8	Aboveground Storage Tank Area
SWMU 9	Location of Former UST No. 44-023-05
SWMU 10	Location of Former Sap Water Treatment Tank
SWMU 11	Oil/Water Separators
SWMU 12	Railroad Tie Storage Area
AOC 1	Diesel Storage Tank
AOC 3	Contaminated Portion of City Water Line
AOC 4	Location of Former Incinerator
AOC 5	City Storm Sewer
AOC 6	Inactive Wastewater Lagoon
AOC 7	Location of Former UST No. 44-023-21
AOC 8	Former Fueling ASTs and Wastewater Lagoons

Note:
Locations of SWMU-9 and AOCs 1, 3, 5 and 7 area approximate.

0 350 700
1" = 700' FEET

LEGEND

- UPRR PROPERTY BOUNDARY
- ROAD, PARKING LOT, SIDEWALK
- FENCE
- RAILROAD
- UPRR FACILITY BOUNDARY

REFERENCE(S)

BASE MAP FROM ERM-SOUTHWEST, INC APAR ADDENDUM, FIG 3-1, DATED JUNE 2004.

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
SOLID WASTE MANAGEMENT UNITS (SWMUs) / AREAS OF CONCERN (AOCs) LOCATION MAP

CONSULTANT
GOLDER
TEXAS GEOSCIENCE FIRM NO. 50369
TEXAS ENGINEERING FIRM NO. 2578

YYYY-MM-DD	2020-10-20
DESIGNED	AJD
PREPARED	AJD/RS
REVIEWED	MH
APPROVED	ECM

PROJECT NO. 19119232 | REV. 0 | CP ATTACHMENT A SHEET 2 of 7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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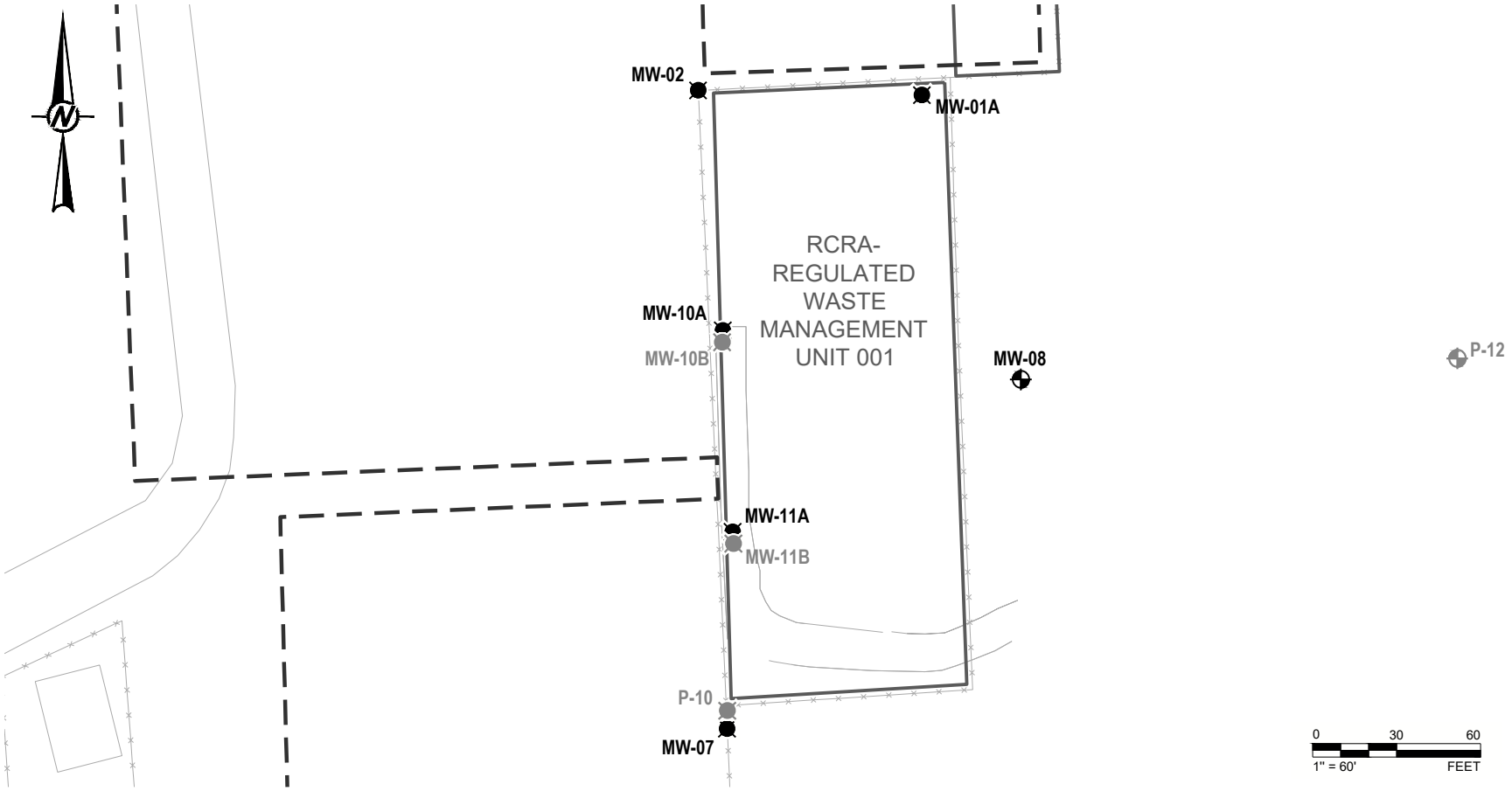

LEGEND

- UPRR PROPERTY BOUNDARY
- ROAD, PARKING LOT, SIDEWALK
- FENCE
- RAILROAD
- A-TZ BACKGROUND MONITORING WELL LOCATION
- B-TZ BACKGROUND MONITORING WELL LOCATION
- A-TZ POINT-OF-COMPLIANCE (POC) WELL LOCATION
- B-TZ POINT-OF-COMPLIANCE (POC) WELL LOCATION

REFERENCE(S)

BASE MAP FROM ERM-SOUTHWEST, INC APAR ADDENDUM, FIG 3-1, DATED JUNE 2004.

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
CORRECTIVE ACTION MONITORING WELL NETWORK - RCRA - REGULATED WASTE MANAGEMENT UNIT 001 - TCEQ PERMIT 50343; SWR NO. 31547

CONSULTANT
GOLDER
TEXAS GEOSCIENCE FIRM NO. 50369
TEXAS ENGINEERING FIRM NO. 2578

YYYY-MM-DD	2020-10-19
DESIGNED	AJD
PREPARED	AJD/RS
REVIEWED	MH
APPROVED	ECM

PROJECT NO. 19119232 | REV. 0 | CP ATTACHMENT A SHEET 3 of 7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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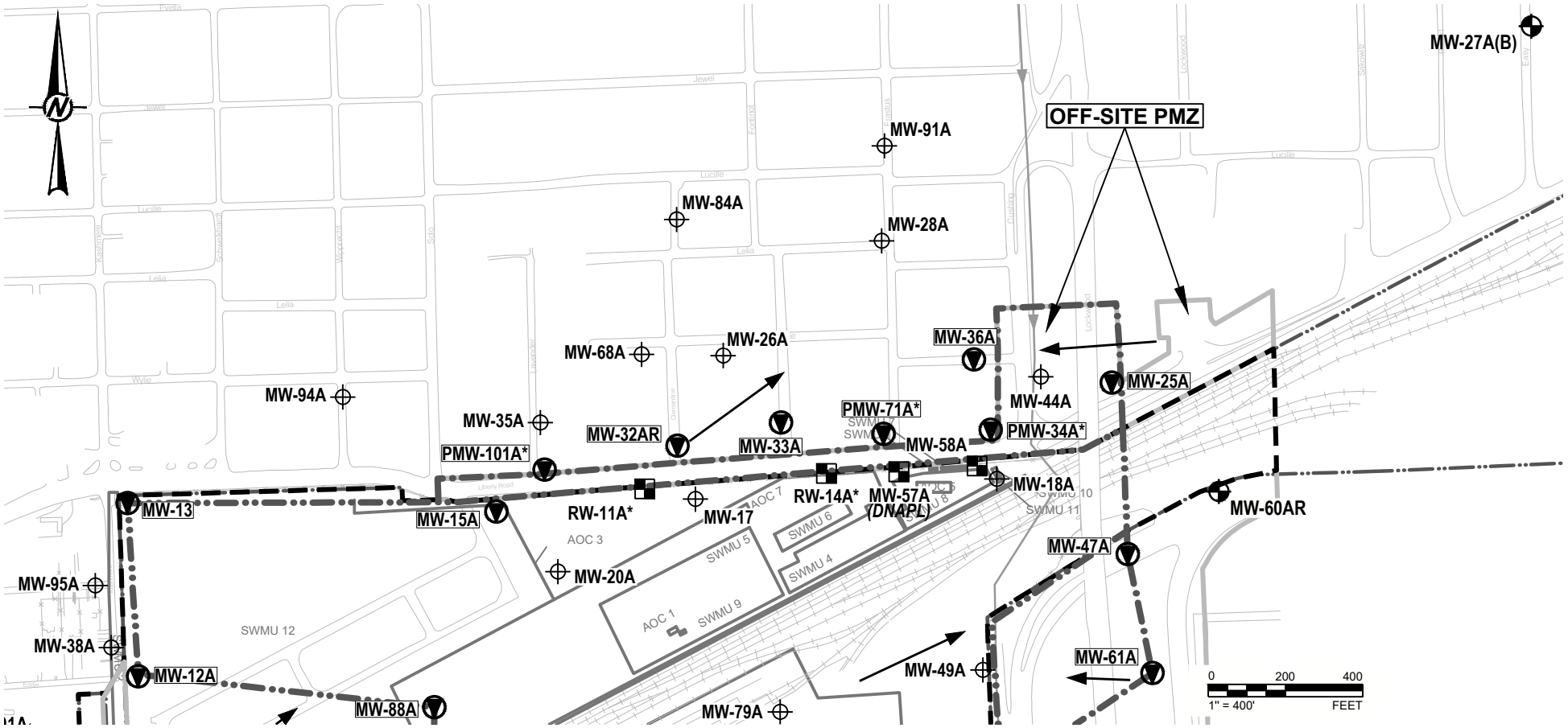

LEGEND

- UPRR PROPERTY BOUNDARY
- ROAD, PARKING LOT, SIDEWALK
- FENCE
- RAILROAD
- A-TZ MONITORING WELL LOCATION
- A-TZ CORRECTIVE ACTION SYSTEM WELLS (CAS) (DNAPL RECOVERY)
- A-TZ PMZ BOUNDARY (ON-SITE)
- A-TZ PMZ BOUNDARY (OFF-SITE)
- MW-15A — ALTERNATE POINT OF EXPOSURE (APOE)
- MW-79A — CORRECTIVE ACTION OBSERVATION WELLS (CAO)
- MW-01A — POINT OF COMPLIANCE WELLS (POC)
- INFERRED GROUNDWATER FLOW DIRECTION
- PROPOSED CUMULATIVE PMZ (A-TZ, B-CZ/B-TZ, AND C-TZ)
- ON-SITE PMZ
- OFF-SITE PMZ

REFERENCE(S)

BASE MAP FROM ERM-SOUTHWEST, INC APAR ADDENDUM, FIG 3-1, DATED JUNE 2004.

NOTE(S)

1. VERTICAL DATUM BASED ON CITY OF HOUSTON VERTICAL DATUM (HVD).
2. DNAPL = DENSE NON-AQUEOUS PHASE LIQUIDS DETECTED IN MONITORING WELL (JANUARY 2020).
3. (B) - BACKGROUND WELL.
4. * - PROPOSED WELL LOCATION.

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
PMZ BOUNDARY MAP - A-TZ (NORTH)

CONSULTANT
GOLDER
TEXAS GEOSCIENCE FIRM NO. 50369
TEXAS ENGINEERING FIRM NO. 2578

YYYY-MM-DD	2020-10-19
DESIGNED	AJD
PREPARED	AJD/RS
REVIEWED	MH
APPROVED	ECM

PROJECT NO. 19119232 | REV. 0 | CP ATTACHMENT A SHEET 4A of 7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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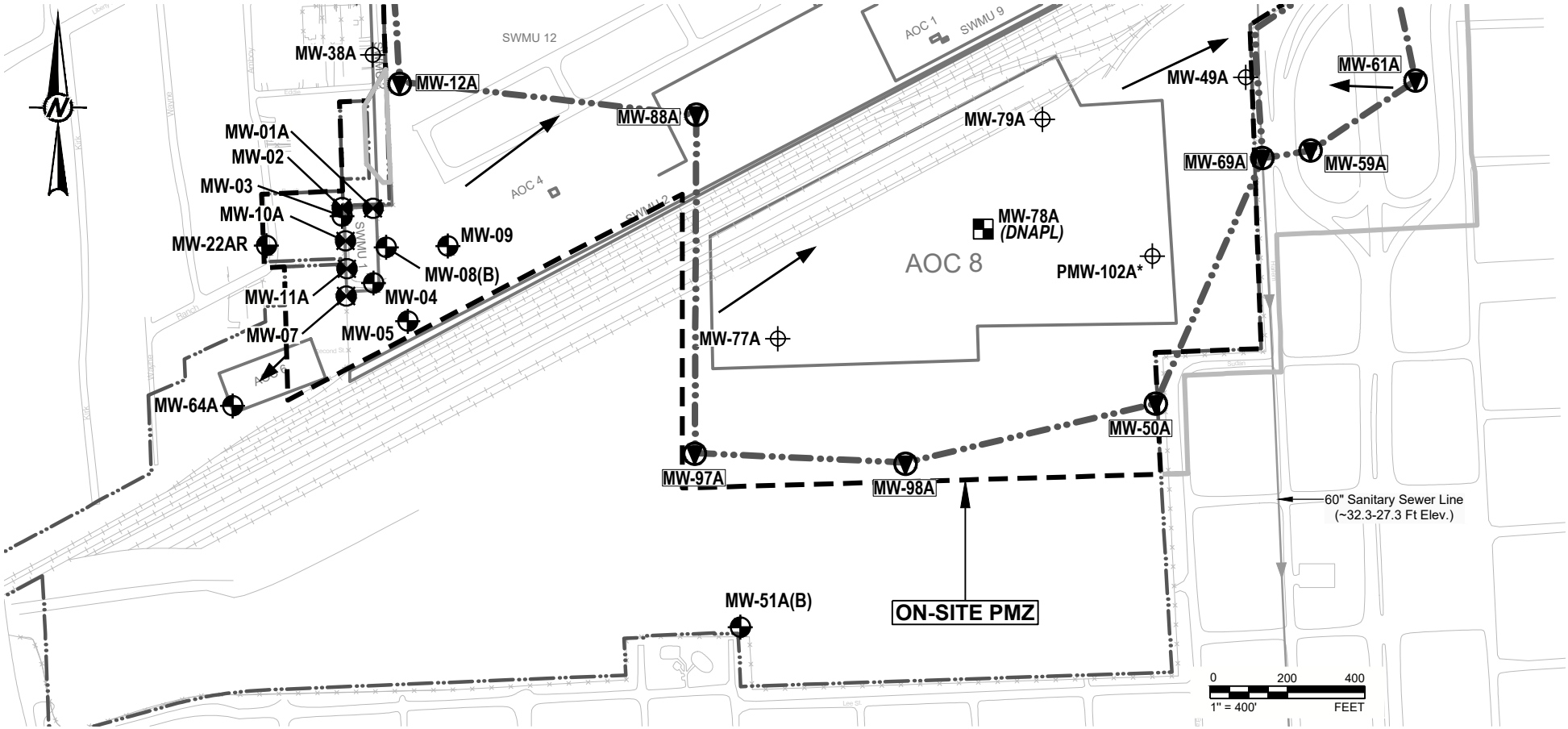

LEGEND

- UPRR PROPERTY BOUNDARY
- ROAD, PARKING LOT, SIDEWALK
- FENCE
- RAILROAD
- A-TZ MONITORING WELL LOCATION
- A-TZ CORRECTIVE ACTION SYSTEM WELLS (CAS) (DNAPL RECOVERY)
- A-TZ PMZ BOUNDARY (ON-SITE)
- A-TZ PMZ BOUNDARY (OFF-SITE)
- MW-15A — ALTERNATE POINT OF EXPOSURE (APOE)
- MW-79A — CORRECTIVE ACTION OBSERVATION WELLS (CAO)
- MW-01A — POINT OF COMPLIANCE WELLS (POC) - UNIT 001
- INFERRED GROUNDWATER FLOW DIRECTION
- PROPOSED CUMULATIVE PMZ (A-TZ, B-CZ/B-TZ, AND C-TZ)
- ON-SITE PMZ
- OFF-SITE PMZ

REFERENCE(S)

BASE MAP FROM ERM-SOUTHWEST, INC APAR ADDENDUM, FIG 3-1, DATED JUNE 2004.

NOTE(S)

1. VERTICAL DATUM BASED ON CITY OF HOUSTON VERTICAL DATUM (HVD).
2. DNAPL = DENSE NON-AQUEOUS PHASE LIQUIDS DETECTED IN MONITORING WELL (JANUARY 2020).
3. (B) - BACKGROUND WELL.
4. * - PROPOSED WELL LOCATION.

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
PMZ BOUNDARY MAP - A-TZ (SOUTH)

CONSULTANT
GOLDER
TEXAS GEOSCIENCE FIRM NO. 50369
TEXAS ENGINEERING FIRM NO. 2578

YYYY-MM-DD	2020-10-19
DESIGNED	AJD
PREPARED	AJD/RS
REVIEWED	MH
APPROVED	ECM

PROJECT NO. 19119232 | REV. 0 | CP ATTACHMENT A SHEET 4B of 7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
1 in
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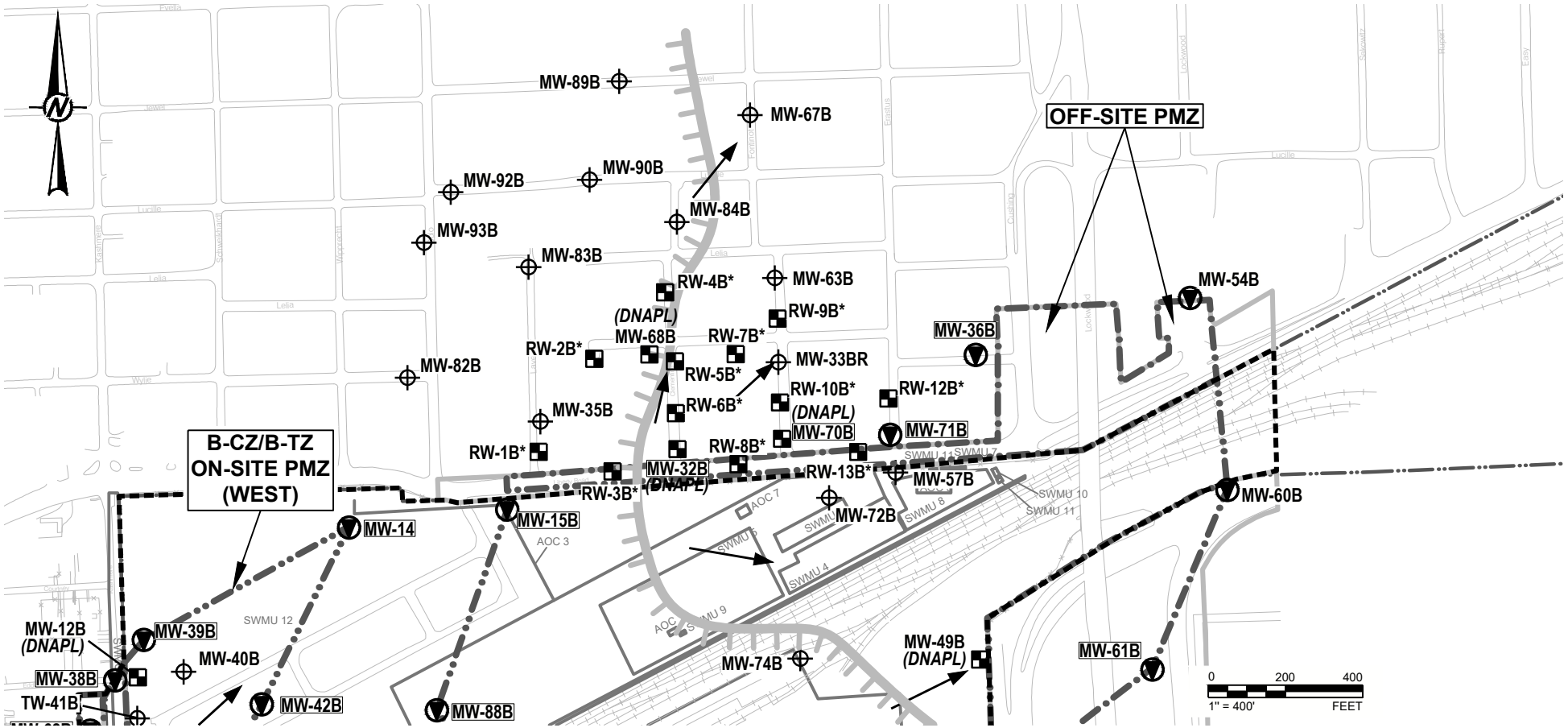

LEGEND

- UPRR PROPERTY BOUNDARY
- ROAD, PARKING LOT, SIDEWALK
- FENCE
- RAILROAD
- B UNIT MONITORING WELL LOCATION
- B UNIT CORRECTIVE ACTION SYSTEM WELLS (CAS) (DNAPL RECOVERY)
- B-TZ/B-CZ BOUNDARY
- B-CZ/B-TZ PMZ BOUNDARY (ON-SITE)
- B-CZ/B-TZ PMZ BOUNDARY (OFF-SITE)
- MW-15B — ALTERNATE POINT OF EXPOSURE (APOE)
- MW-76B — CORRECTIVE ACTION OBSERVATION WELLS (CAO)
- MW-11B — POINT OF COMPLIANCE WELLS (POC)
- INFERRED GROUNDWATER FLOW DIRECTION
- PROPOSED CUMULATIVE PMZ (A-TZ, B-CZ/B-TZ, AND C-TZ)
- ON-SITE PMZ
- OFF-SITE PMZ

REFERENCE(S)

BASE MAP FROM ERM-SOUTHWEST, INC APAR ADDENDUM, FIG 3-1, DATED JUNE 2004.

NOTE(S)

1. VERTICAL DATUM BASED ON CITY OF HOUSTON VERTICAL DATUM (HVD).
2. DNAPL = DENSE NON-AQUEOUS PHASE LIQUIDS DETECTED IN MONITORING WELL (JANUARY 2020).
3. (B) - BACKGROUND WELL.
4. * - PROPOSED WELL LOCATION.

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
PMZ BOUNDARY MAP - B-CZ/B-TZ (NORTH)

CONSULTANT
GOLDER
TEXAS GEOSCIENCE FIRM NO. 50369
TEXAS ENGINEERING FIRM NO. 2578

YYYY-MM-DD	2020-10-20
DESIGNED	AJD
PREPARED	AJD/RS
REVIEWED	MH
APPROVED	ECM

PROJECT NO. 19119232 | REV. 0 | CP ATTACHMENT A SHEET 5A of 7

Last Edited By: adiamond Date: 2020-10-22 Time:4:15:35 PM | Printed By: adiamond Date: 2020-10-22 Time:4:17:07 PM |
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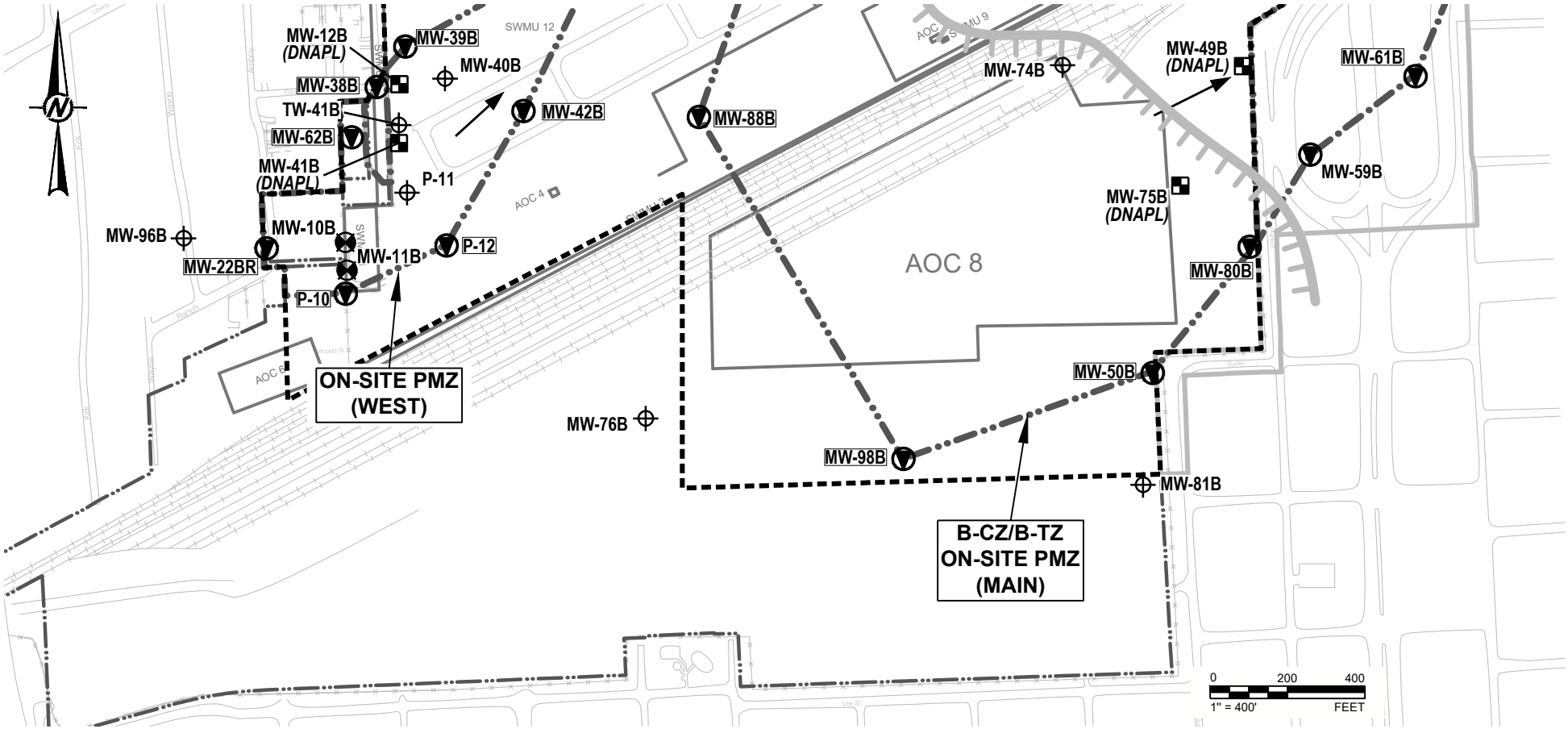

LEGEND

- UPRR PROPERTY BOUNDARY
- ROAD, PARKING LOT, SIDEWALK
- FENCE
- RAILROAD
- B UNIT MONITORING WELL LOCATION
- B UNIT CORRECTIVE ACTION SYSTEM WELLS (CAS) (DNAPL RECOVERY)
- B-TZ/B-CZ BOUNDARY
- B-CZ/B-TZ PMZ BOUNDARY (ON-SITE)
- B-CZ/B-TZ PMZ BOUNDARY (OFF-SITE)
- MW-15B — ALTERNATE POINT OF EXPOSURE (APOE)
- MW-76B — CORRECTIVE ACTION OBSERVATION WELLS (CAO)
- MW-11B — POINT OF COMPLIANCE WELLS (POC) - UNIT 001
- INFERRED GROUNDWATER FLOW DIRECTION
- PROPOSED CUMULATIVE PMZ (A-TZ, B-CZ/B-TZ, AND C-TZ)
- ON-SITE PMZ
- OFF-SITE PMZ

REFERENCE(S)

BASE MAP FROM ERM-SOUTHWEST, INC APAR ADDENDUM, FIG 3-1, DATED JUNE 2004.

NOTE(S)

1. VERTICAL DATUM BASED ON CITY OF HOUSTON VERTICAL DATUM (HVD).
2. DNAPL = DENSE NON-AQUEOUS PHASE LIQUIDS DETECTED IN MONITORING WELL (JANUARY 2020).
3. (B) - BACKGROUND WELL.
4. * - PROPOSED WELL LOCATION.

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
PMZ BOUNDARY MAP - B-CZ/B-TZ (SOUTH)

CONSULTANT
GOLDER
TEXAS GEOSCIENCE FIRM NO. 50369
TEXAS ENGINEERING FIRM NO. 2578

YYYY-MM-DD	2020-10-20
DESIGNED	AJD
PREPARED	AJD/RS
REVIEWED	MH
APPROVED	ECM

PROJECT NO. 19119232 | REV. 0 | CP ATTACHMENT A SHEET 5B of 7

Last Edited By: adiamond Date: 2020-10-19 Time:10:21:59 AM | Printed By: adiamond Date: 2020-10-19 Time:10:22:19 AM |
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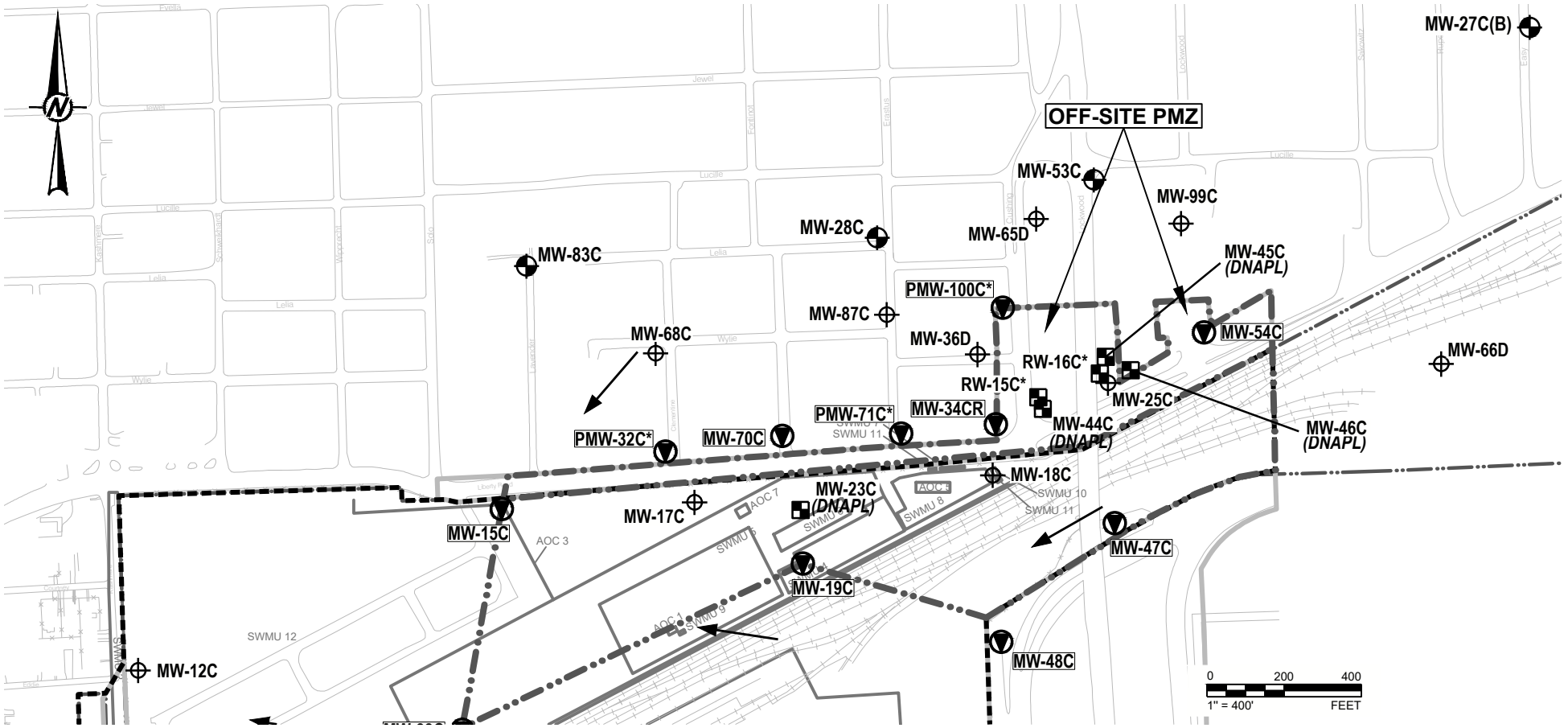

LEGEND

- UPRR PROPERTY BOUNDARY
- ROAD, PARKING LOT, SIDEWALK
- FENCE
- RAILROAD
- C-TZ MONITORING WELL LOCATION
- C-TZ CORRECTIVE ACTION SYSTEM WELLS (CAS) (DNAPL RECOVERY)
- C-TZ PMZ BOUNDARY (ON-SITE)
- C-TZ PMZ BOUNDARY (OFF-SITE)
- MW-15C — ALTERNATE POINT OF EXPOSURE (APOE)
- MW-86C — CORRECTIVE ACTION OBSERVATION WELLS (CAO)
- MW-01A — POINT OF COMPLIANCE WELLS (POC)
- INFERRED GROUNDWATER FLOW DIRECTION
- PROPOSED CUMULATIVE PMZ (A-TZ, B-CZ/B-TZ, AND C-TZ)
- ON-SITE PMZ
- OFF-SITE PMZ

REFERENCE(S)

BASE MAP FROM ERM-SOUTHWEST, INC APAR ADDENDUM, FIG 3-1, DATED JUNE 2004.

NOTE(S)

1. VERTICAL DATUM BASED ON CITY OF HOUSTON VERTICAL DATUM (HVD).
2. DNAPL = DENSE NON-AQUEOUS PHASE LIQUIDS DETECTED IN MONITORING WELL (JANUARY 2020).
3. (B) - BACKGROUND WELL.
4. * - PROPOSED WELL LOCATION.

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
PMZ BOUNDARY MAP - C-TZ AND D-TZ MONITORING WELLS (NORTH)

CONSULTANT
GOLDER
TEXAS GEOSCIENCE FIRM NO. 50369
TEXAS ENGINEERING FIRM NO. 2578

YYYY-MM-DD	2020-10-19
DESIGNED	AJD
PREPARED	AJD/RS
REVIEWED	MH
APPROVED	ECM

PROJECT NO. 19119232 | REV. 0 | CP ATTACHMENT A SHEET 6A of 7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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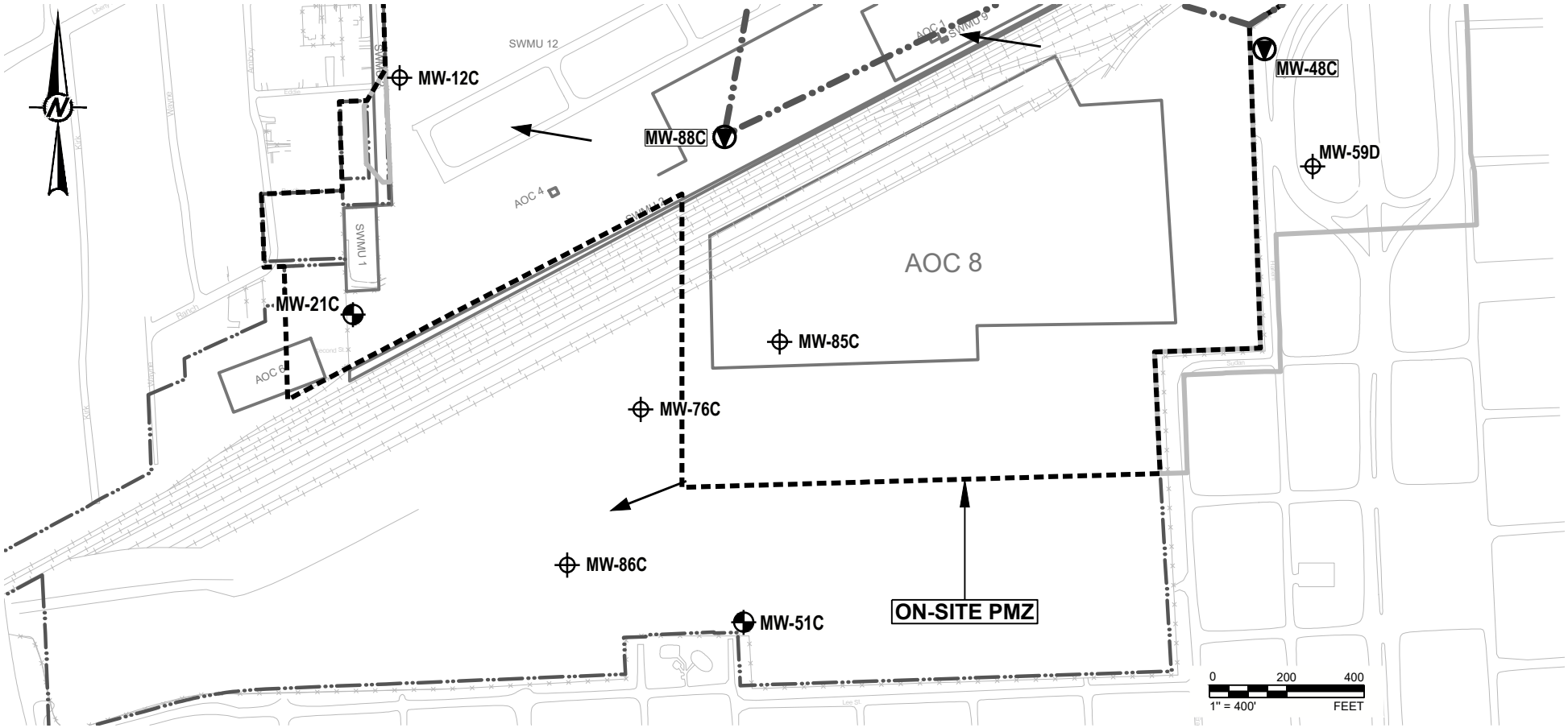

LEGEND

- UPRR PROPERTY BOUNDARY
- ROAD, PARKING LOT, SIDEWALK
- FENCE
- RAILROAD
- C-TZ MONITORING WELL LOCATION
- C-TZ CORRECTIVE ACTION SYSTEM WELLS (CAS) (DNAPL RECOVERY)
- C-TZ PMZ BOUNDARY (ON-SITE)
- C-TZ PMZ BOUNDARY (OFF-SITE)
- MW-15C — ALTERNATE POINT OF EXPOSURE (APOE)
- MW-86C — CORRECTIVE ACTION OBSERVATION WELLS (CAO)
- MW-01A — POINT OF COMPLIANCE WELLS (POC) - UNIT 001
- INFERRED GROUNDWATER FLOW DIRECTION
- PROPOSED CUMULATIVE PMZ (A-TZ, B-CZ/B-TZ, AND C-TZ)
- ON-SITE PMZ
- OFF-SITE PMZ

REFERENCE(S)

BASE MAP FROM ERM-SOUTHWEST, INC APAR ADDENDUM, FIG 3-1, DATED JUNE 2004.

NOTE(S)

1. VERTICAL DATUM BASED ON CITY OF HOUSTON VERTICAL DATUM (HVD).
2. DNAPL = DENSE NON-AQUEOUS PHASE LIQUIDS DETECTED IN MONITORING WELL (JANUARY 2020).
3. (B) - BACKGROUND WELL.
4. * - PROPOSED WELL LOCATION.

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
PMZ BOUNDARY MAP - C-TZ AND D-TZ MONITORING WELLS (SOUTH)

CONSULTANT
GOLDER
TEXAS GEOSCIENCE FIRM NO. 50369
TEXAS ENGINEERING FIRM NO. 2578

YYYY-MM-DD	2020-10-19
DESIGNED	AJD
PREPARED	AJD/RS
REVIEWED	MH
APPROVED	ECM

PROJECT NO. 19119232 | REV. 0 | CP ATTACHMENT A SHEET 6B of 7

Last Edited By: adiamond Date: 2020-10-15 Time:2:19:35 PM | Printed By: adiamond Date: 2020-10-19 Time:10:55:58 AM |
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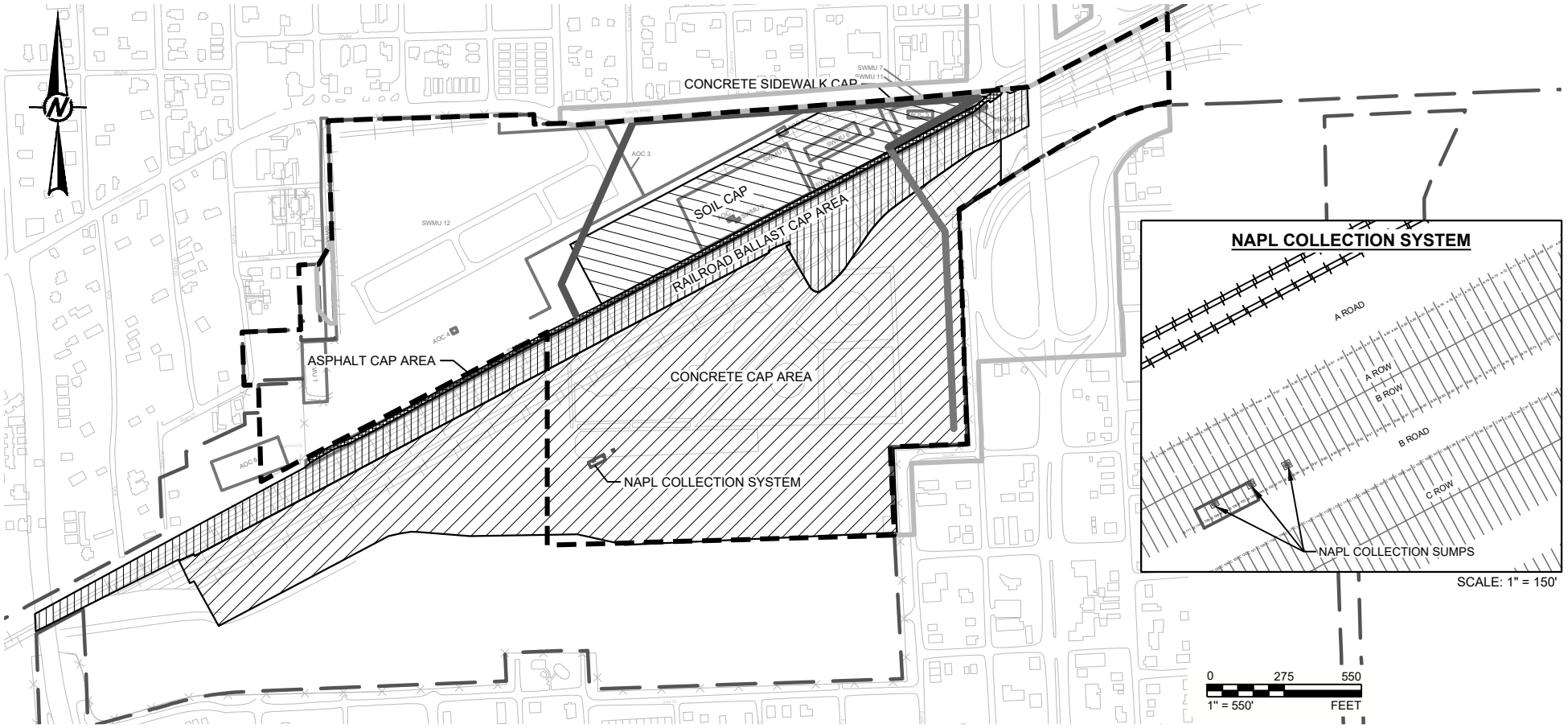

LEGEND

- UPRR PROPERTY BOUNDARY
- ROAD, PARKING LOT, SIDEWALK
- FENCE
- RAILROAD
- HISTORIC STRUCTURE AND FEATURE
- RAILROAD BALLAST CAP AREA
- ASPHALT CAP AREA
- SOIL CAP
- CONCRETE CAP AREA
- NAPL COLLECTION SYSTEM SUMP
- EXISTING NAPL COLLECTION SYSTEM (CONSTRUCTED FEB. 2019)
- PROPOSED SLURRY WALL (APPROX. 75 FT BGS)
- PROPOSED SLURRY WALL (APPROX. 50 FT BGS)
- PROPOSED CUMULATIVE PMZ (A-TZ, B-CZ/B-TZ, AND C-TZ)
- ON-SITE PMZ
- OFF-SITE PMZ

REFERENCE(S)

BASE MAP FROM ERM-SOUTHEAST, INC APAR ADDENDUM, FIG 3-1, DATED JUNE 2004.

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
HOUSTON WOOD PRESERVING WORKS

TITLE
POST-RESPONSE ACTION CARE - CAPPED AREAS, NAPL COLLECTION SYSTEM, AND SLURRY WALL

CONSULTANT
GOLDER

YYYY-MM-DD	2020-10-19
DESIGNED	AJD
PREPARED	AJD
REVIEWED	MH
APPROVED	ECM

PROJECT NO. 19119232 | REV. 0 | CP ATTACHMENT A SHEET 7 of 7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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Attachment A

ALTERNATE CONCENTRATION LEVELS

Union Pacific Railroad Company
Houston Wood Preserving Works
Houston, Texas

ATTACHMENT A
ALTERNATE CONCENTRATION LIMITS

Union Pacific Railroad will undertake groundwater at corrective action units at the Houston Wood Preserving Works. The Compliance Plan requires semiannual monitoring of chemicals of concern (COCs) at alternate point of exposure (POE) locations as specified in Compliance Plan Table V (Designation of Wells by Function).

1.1 Groundwater Protection Standard

The groundwater protection standard (GWPS) is proposed as an alternate concentration limit (ACL) based on the Texas Risk Reduction Program (TRRP) Protective Concentration Levels (PCLs) determined under Remedy Standard B. PCLs are the regulatory standards that apply at groundwater POEs for a particular groundwater exposure pathway, as set in the Title 30 Texas Administrative Code Chapter 350. Therefore, for this compliance plan, the proposed ACLs shall be based on TRRP PCLs. If the groundwater POE is located at a distance from the point of compliance (POC), such as where a plume management zone (PMZ) alternate POE, the ACL considers COC attenuation along the groundwater flow path between the POC and POE locations. These attenuation-based ACLs are referred to as attenuation action levels under TRRP. All Where applicable, pathways may include the following:

- Tier 1 Groundwater PCLs (Commercial/industrial) for Class 2 groundwater ingestion ($^{GW}GW_{ing}$);
- Tier 1 Groundwater PCLs (Residential) for Class 2 groundwater ingestion ($^{GW}GW_{Ing}$);
- Background (BKG); and
- Method Quantitation Limit (MQL).

The GWPS are specified in Compliance Plan Tables III (Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard) and IIIA (Table of Indicator Parameters and the Groundwater Protection Standard). Derivations of the GWPS are presented in the Affected Property Assessment Reports for Houston Wood Preserving Works.

Attachment B

WELL DESIGN AND CONSTRUCTION SPECIFICATIONS

Union Pacific Railroad Company
Houston Wood Preserving Works
Houston, Texas

ATTACHMENT B
WELL DESIGN AND CONSTRUCTION SPECIFICATIONS

New wells installed at the site and associated installation processes will be in compliance with the TCEQ guidance document as provided below. A work plan detailing proposed deviations from the guidance outlined below will be submitted to the executive director for approval. Existing monitoring wells utilized for monitoring may not meet all of the specifications outlined below, but will be considered acceptable for use upon approval of this Compliance Plan.

1. Well drilling methods that minimize potential adverse effects on the quality of water samples withdrawn from the well and that minimize or eliminate the introduction of foreign fluids into the borehole must be utilized.

2. All wells shall be constructed such that the wells can be routinely sampled with a pump, bailer, or alternate sampling device. Piping associated with recovery wells should be fitted with sample ports or an acceptable alternative sampling method to facilitate sampling of the recovered groundwater on a well by well basis.

3. Above the saturated zone the well casing may be one (1)-inch diameter or larger schedule 40 or 80 polyvinyl chloride (PVC) rigid pipe or stainless steel or polytetrafluoroethylene (PTFE or "teflon") or an approved alternate material. The PVC casing must bear the National Sanitation Foundation logo for potable water applications (NSF-pw). Solvent cementing compounds shall not be used to bond joints and all connections shall be flush-threaded. In and below the saturated zone, the well casing shall be stainless steel or PTFE.

   PVC or fiberglass reinforced resin may be used as an alternate well casing material in and below the saturated zone provided that it yields samples for groundwater quality analysis that are unaffected by the well casing material.

4. Any well that has deteriorated due to incompatibility of the casing material with the groundwater contaminants or due to any other factors must be replaced.

5. Screen length shall not exceed ten (10) feet within a given transmissive zone unless otherwise approved by the executive director. Screen lengths exceeding ten (10) feet may be installed in

groundwater recovery or injection wells to optimize the groundwater remediation process in accordance with standard engineering practice.

6. The intake portion of a well shall be designed and constructed so as to allow sufficient water flow into the well for sampling purposes and minimize the passage of formation materials into the well during pumping. The intake portion of a well shall consist of commercially manufactured stainless steel or PTFE screen or approved alternate material. The annular space between the screen and the borehole shall be filled with clean siliceous granular material (i.e., filter pack) that has a proper size gradation to provide mechanical retention of the formation sand and silt. The well screen slot size shall be compatible with the filter pack size as determined by sieve analysis data. The filter pack should extend no more than three (3) feet above the well screen. A silt trap, no greater than one (1) foot in length, may be added to the bottom of the well screen to collect any silt that may enter the well. The bottom of the well casing shall be capped with PTFE or stainless steel or approved alternate material.

   Groundwater recovery and injection wells shall be designed in accordance with standard engineering practice to ensure adequate well production and accommodate ancillary equipment. Silt traps exceeding one (1) foot may be utilized to accommodate ancillary equipment. Well heads shall be fitted with mechanical well seals, or equivalent, to prevent entry of surface water or debris.

7. A minimum of two (2) feet of pellet or granular bentonite shall immediately overlie the filter pack in the annular space between the well casing and borehole. Where the saturated zone extends above the filter pack, pellet or granular bentonite shall be used to seal the annulus. The bentonite shall be allowed to settle and hydrate for a sufficient amount of time prior to placement of grout in the annular space. Above the minimum two (2)-foot thick bentonite seal, the annular space shall be sealed with a cement/bentonite grout mixture. The grout shall be placed in the annular space by means of a tremie pipe or pressure grouting methods equivalent to tremie grouting standards.

   The cement/bentonite grout mixture or TCEQ approved alternative grout mixture shall fill the annular space to within two (2) feet of the surface. A suitable amount of time shall be allowed for settling to occur. The annular space shall be sealed with concrete, blending into a cement apron at the surface that extends at least two (2) feet from the outer edge of the monitor well

for above-ground completions. Alternative annular-space seal material may be proposed with justification and must be approved by the executive director prior to installation.

In cases where flush-to-ground completions are unavoidable, a protective structure such as a utility vault or meter box should be installed around the well casing and the concrete pad design should prevent infiltration of water into the vault. In addition, the following requirements must also be met 1) the well/cap juncture is watertight; 2) the bond between the cement surface seal and the protective structure is watertight; and 3) the protective structure with a steel lid or manhole cover has a rubber seal or gasket.

8. Water added as a drilling fluid to a well shall contain no bacteriological or chemical constituents that could interfere with the formation or with the chemical constituents being monitored. For groundwater recovery and injection wells, drilling fluids containing freshwater and treatment agents may be utilized in accordance with standard engineering practice to facilitate proper well installation. In these cases, the water and agents added should be chemically analyzed to evaluate their potential impact on in-situ water quality and to assess the potential for formation damage. All such additives shall be removed to the extent practicable during well development.

9. Upon completion of installation of a well, the well must be developed to remove any fluids used during well drilling and to remove fines from the formation to provide a particulate-free discharge to the extent achievable by accepted completion methods and by commercially available well screens. Development shall be accomplished by reversing flow direction, surging the well or by air lift procedures. No fluids other than formation water shall be added during development of a well unless the aquifer to be screened is a low-yielding water-bearing aquifer. In these cases, the water to be added should be chemically analyzed to evaluate its potential impact on in-situ water quality, and to assess the potential for formation damage.

   For recovery and injection wells, well development methods may be utilized in accordance with standard engineering practice to remove fines and maximize well efficiency and specific capacity. Addition of freshwater and treatment agents may be utilized during well development or re-development to remove drilling fluids, inorganic scale or bacterial slime. In these cases, the water and agents added should be chemically analyzed to evaluate their potential impact on in-situ water quality and to assess the potential for formation damage. All such additives shall be removed to the extent practicable during well development.

10. Each well shall be secured and/or designed to maintain the integrity of the well borehole and groundwater.

11. The above-ground portion of the well must be protected by bumper guards and/or metal outer casing protection when wells are located in traffic areas or outside the secured plant area.

12. Copies of drilling and construction details demonstrating compliance with the items of this provision shall be kept on site. This record shall include the following information:
    - < name/number of well (well designation);
    - < intended use of the well (sampling, recovery, etc.);
    - < date/time of construction;
    - < drilling method and drilling fluid used;
    - < well location (+ 0.5 ft.);
    - < bore hole diameter and well casing diameter;
    - < well depth (+ 0.1 ft.);
    - < drilling and lithologic logs;
    - < depth to first saturated zone;
    - < casing materials;
    - < screen materials and design;
    - < casing and screen joint type;
    - < screen slot size/length;
    - < filter pack material/size;
    - < filter pack volume (how many bags, buckets, etc.);
    - < filter pack placement method;
    - < sealant materials;
    - < sealant volume (how many bags, buckets, etc.);
    - < sealant placement method;
    - < surface seal design/construction;
    - < well development procedure;
    - < type of protective well cap;
    - < ground surface elevation (+ 0.01 ft. MSL);

- top of casing elevation (+ 0.01 ft. MSL); and,
- detailed drawing of well (include dimensions).

13. Construction or plugging and abandonment of each well shall be completed in accordance with the requirements of 16 TAC Chapter 76 and must be reported/certified to the TCEQ that such proper construction or plugging and abandonment has occurred following installation or plugging and abandonment. Well completion logs for each newly installed or replaced well shall be included with the report. The certification shall be prepared by a qualified geologist or geotechnical engineer. Each well certification shall be accompanied by a certification report, including an accurate log of the soil boring, which thoroughly describes and depicts the location, elevations, material specifications, construction details, and soil conditions encountered in the boring for the well. A copy of the certification and certification report shall be kept on-site, and a second copy shall be submitted to the executive director.

14. The well number must be clearly marked and maintained on each well at the site.

15. The elevation of the top of each well casing must be measured in feet above mean sea level to the nearest 0.01 foot.

16. Wells must be replaced at any time the well integrity or materials of construction or well placement no longer enable the well to yield samples representative of groundwater quality.

17. Soil test borings shall be plugged and wells removed from service with a cement/bentonite grout mixture so as to prevent the preferential migration of fluids in the area of the borehole. Certification of each plugging shall be reported in accordance with Provision 14. The plugging of wells shall be in accordance with 16 TAC Chapter 76 dealing with Well Drilling, Completion, Capping and Plugging.

18. A well's screened interval shall be appropriately designed and installed to meet the well's specific objective (i.e., either DNAPL, LNAPL, both, or other objective of the well). All wells designed to detect, monitor, or recover DNAPL must be drilled to intercept the bottom confining layer of the aquifer. The screened interval to detect DNAPL should extend from the top of the lower confining layer to above the portion of the aquifer saturated with DNAPL. In addition, the

sand packs for the recovery or monitoring well's screened interval shall be coarser than surrounding media to ensure the movement of NAPL to the well.

Attachment C

GROUNDWATER SAMPLING AND ANALYSIS PLAN

Union Pacific Railroad Company
Houston Wood Preserving Works
Houston, Texas

COMPLIANCE PLAN ATTACHMENT C
GROUNDWATER SAMPLING AND ANALYSIS PLAN
PART B PERMIT APPLICATION
UNION PACIFIC RAILROAD COMPANY
HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

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1.0 INTRODUCTION

This Groundwater Sampling and Analysis Plan (SAP) presents the procedures for the post-closure groundwater corrective action program for the Houston Wood Preserving Works (HWPW) in Houston, Texas to meet the requirements of 30 Texas Administrative Code (TAC) 335.163(4) and (5) and also 40 CFR 270.30(j). The HWPW facility is located 4910 Liberty Road in Houston, Harris County, Texas (hereafter, the Site). A Facility Site Map is provided in Permit Compliance Plan (CP) Attachment A.

The groundwater monitoring program will be performed as part of the corrective action monitoring program as specified in the Permit Section XI. The monitoring well network is listed on CP Table V and shown on CP Attachment A. Alternate POE wells have been designated within each of the three transmissive zones. In addition to the alternate POE wells, selected monitoring wells at the Site will continue to be monitored to evaluate potential groundwater conditions within the PCLE Zone and underlying GWBU.

Health and safety for the HWPW facility is performed under a program designed to ensure that personnel are able to perform routine sampling and operations and maintenance activities and to respond effectively to emergencies. A Site specific Health and Safety Plan (HASP) has been developed and will be updated as needed.

This GWSAP addresses the following activities to be conducted at the Site:

- Pre-Sampling Activities (Section 2);
- Fluid level measurement (Section 3);
- Groundwater sampling (Section 4); and
- Quality Assurance/Quality Control Plan (Section 5).

2.0 PRE-SAMPLING ACTIVITIES

2.1 Weather

Before the work day starts, the area weather forecast will be confirmed. Changing or dangerous weather conditions will be closely monitored. In the event of adverse weather, it will determine if work can continue without risking the health and safety of site personnel.

2.2 Well Inspection and Decontamination Procedures

The integrity of the monitoring wells will be checked prior to commencement of any well gauging or sampling. The concrete pad, manhole cover and PVC casing will be checked for damage. Condition of the wells including damage or irregularities will be noted on the Monitoring Well Evaluation Form (Appendix A).

Decontamination of all non-disposable field measurement, purging and sampling equipment will be performed before any gauging or purging/sampling activities begin, after each well, and at the end of the event. Decontamination will generally be limited to measuring devices since dedicated tubing will be used for sampling activities. The equipment will be decontaminated by the following procedure:

1) wash the equipment with non-phosphate soap;
2) rinse with deionized water;
3) rinse again with isopropyl alcohol; and
4) a final rinse with deionized water.

Decontamination fluids and purge water from the sampling activities will be drummed in labeled 55-gallon drums and left on-site at the Container Storage Area (CSA). Disposable equipment used for purging and sampling and personal protective equipment (PPE) will be stored in labeled 55-gallon drums and left at the CSA. An UPRR-approved disposal company will transport and dispose (T&D) of the investigative-derived wastes (IDW) in accordance with state and federal regulations.

2.3 Fluid Level Measurement

Fluid levels in the monitoring wells (Figure 1) at the Site will be gauged during each scheduled sampling event. Before fluid levels are measured, monitoring well caps shall be unlocked and the well should be left open to equilibrate with atmospheric pressure.

At each well, the presence of light and dense non-aqueous phase liquids (LNAPL and DNAPL, respectively) will be measured using a decontaminated oil-water interface probe, or equivalent measuring device. The probe will be lowered into the well until the instrument indicates contact of the probe with the NAPL surface, if present, then the top of the water surface, and to the total depth of the well to evaluate for the presence of DNAPL. The depth to NAPL and water measurements will be referenced to the surveyed reference point at the top of the well casing. Levels will be measured to the nearest 0.01 foot and recorded on the water level measurement form. The total depth of each well will also be measured to evaluate silt in the well. Fluid levels and total depth measurements will be recorded on the Fluid Level Monitoring Record (Appendix A).

3.0 GROUNDWATER PURGING AND SAMPLING

3.1 Low-Flow Well Purging

Prior to collecting groundwater samples from the Site, fluid levels will be measured from the monitoring well network (Section 3.0). Monitoring wells will be purged using a low flow sampling technique as described in the USEPA guidance document *Low-Flow (Minimal Drawdown) Ground Water Sampling Procedures (USEPA, 1995)*. Purging will be accomplished in such a way as to minimize disturbance of sediments at the bottom of the well, and therefore minimize turbidity of the water samples. Typically, this is accomplished by purging at a low flow rate (less than one liter per minute) with the pump intake near the middle of the screened interval, unless creosote DNAPL is present in the well. A peristaltic pump and dedicated tubing compatible with the chemicals of concern will be used during the purging and sampling for each well.

Purging of a well will be accomplished by purging at a rate of 0.1 liters per minute or less while monitoring the following field parameters every 5 to 10 minutes: specific conductance, pH, temperature, dissolved oxygen, oxidation-reduction potential (Redox), and turbidity. These measurements will be recorded on the groundwater sampling record (Appendix A). The odor and color of the purge water will also be noted. Meters will be calibrated before sampling each day, using the manufacturer's procedure. The well will be purged until these parameters stabilize or the well purges dry. If a well purges dry, a sample will be collected as soon as a sufficient volume of groundwater has entered the well to enable sample collection. The water level in the well will also be checked periodically during purging. The goal of low-flow sampling is not to lower the water column greater than one foot; however, under some circumstances where the geologic formation cannot sustain the low-flow rate, adjustments may be necessary.

Recommended criteria for establishing stabilization of the field parameters between successive measurements are as follows, and in this general order:

Parameter	Stabilization
Specific conductivity	10 percent
pH	0.1 standard units
Temperature	1 degree Celsius
Redox	+/-10 millivolts
D.O.	10 percent
Turbidity	less than 10 NTU (last measurement only) or 10 percent

Water will be collected in containers provided by the UPRR-approved laboratory. IDW (decontamination and purge water) will be stored in 55-gallon drums on Site at the CSA.

3.2 Sample Collection

Sample collection will be performed as soon as possible after purging. The collection of aliquots for the laboratory will be performed using the same dedicated pump or other appropriate sampling device as was used for purging. Because sampling will immediately follow well purging, substantial quantities of water from the well to be sampled will have moved through the pump and discharge tubing, thereby providing substantial rinsing of the sampling equipment with the water to be sampled. Sampling personnel will, at a minimum, wear a new pair of gloves at each well site and change gloves, as appropriate.

Samples will be withdrawn from the well at a low flow rate (similar to the flow rate used to purge the well) to minimize aeration of the sample during collection at the wellhead. Samples will be collected and containerized for laboratory analysis, taking into consideration the specific sample preservation methods for the methods described in Section 3.4. Field measurements such as water temperature, specific conductance, pH, D.O., Redox, odor, color, and turbidity of the unfiltered water sample will be recorded immediately preceding the collection of sample aliquots. These values will be recorded on the groundwater sampling record (Appendix A).

3.3 Sample Containers

Containers used to transport samples for laboratory analyses will be provided by the UPRR-approved laboratory performing the analyses. The bottles will be prepared and preserved according to EPA specifications (EPA, 1996). The bottles will not be opened until they are to be filled with sample water. The typical bottle type to be used and the minimum volume of water to be collected for each specific analytical parameter or method will be in accordance with the EPA analytical method. Substitutions of bottle type and sample volumes may be allowed if acceptable to the project manager and the laboratory performing the analyses and if compatible or improved over EPA requirements. Volume requirements should be confirmed with the laboratory prior to each sampling event to ensure that adequate sample volume is provided for QA/QC analyses.

3.4 Groundwater Analytical Plan

The alternate POE monitoring wells at the Site will be sampled semi-annually as presented on CP Table V: Designation of Wells and shown on CP Attachment A. The alternate POE monitoring wells at the Site will

be sampled semi-annually in January and July. In addition to the alternate POE wells, several monitoring wells will also be monitored to evaluate DNAPL thickness and as sentry wells for the D-TZ. These wells and their monitoring schedule are outlined on CP Table VIII: Compliance Schedule.

Using the list of COCs identified in the RCRA Facility Investigation Work Plan (SPTCo, 1994) for the Site, SAP Table 1 contains the analytical methods that will be used and CP Table III (Corrective Action Program Table of Detected Hazardous and Solid Waste Constituents and the Groundwater Protection Standard) and CP Table IIIA (Corrective Action Program Table of Indicator Parameters and the Groundwater Protection Standard) provide the specific lists of analytes for which groundwater samples will be analyzed.

3.5 Sample Storage and Transport

Samples for will be placed on ice and transported to the laboratory as soon as possible. The sample containers will be placed in an insulated ice chest containing ice immediately after collection to lower the sample temperature to 4^{o}C or less. Every effort will be made to maintain these samples at, or near this temperature, prior to and during shipment to the laboratory. Sample coolers will be either couriered or delivered via overnight delivery to the designated laboratory.

3.6 Sample Documentation

A sample documentation program will be implemented to document possession and handling of water samples from the time of field collection through laboratory analysis. The program will include:

- Sample labels which clearly identify sample locations and analyses to be performed;
- A custody seal placed on the shipping container to preserve the integrity of the sample from the time it is collected until shipped and opened in the laboratory;
- A sampling record (Appendix A) on which to log information about each sample collected during the monitoring event; and
- A chain-of-custody record will be used to establish sample possession from the time of collection to analysis (this form may be combined with, or supplemented by a sample analysis request form).

3.6.1 Sample Labels

To prevent misidentification of samples, labels will be affixed to each sample container. Information will be written on the label with a permanent marker. The labels will be sufficiently durable to remain legible even when wet and will contain the following information:

- Facility/project identification number;
- Sampling point identification name and/or number;
- Name or initials of collector;
- Date and time of collection;
- Analysis required (if space on label allows); and
- Preservative inside bottle, if applicable.

An alpha-numeric sample identification coding system consistent with the UPRR SysDat protocols will be used to uniquely identify each sample, including the duplicate sample. The sample identification will follow the following format:

Example: WG-1620-MW25A-20150123

Where "WG" is the designation for groundwater sample, "1620" is the SysDat Facility ID for the Site, "MW25A" is the unique sample location for monitoring wells, and "20150123" is the sample date (yyyymmdd format).

3.6.2 Sampling Record

A groundwater sampling record (Appendix A) will be maintained for all sample collection activities. The following specific data will be documented on a field form where applicable:

- Name of collector(s);
- Identification of well or sampling point;
- Climatic conditions, including estimated air temperature;
- Depth to bottom of well;
- Depth to water in wells referenced from top of casing (before and after well purging);
- Well purging method;
- Purge volume, time, and date;
- Well yield characteristics, if appropriate;

- Results of field analyses (pH, temperature, specific conductance, Redox, dissolved oxygen, and turbidity for each measurement period);
- Sample observations (color, odor, etc.);
- Sample withdrawal procedures;
- Types of sample containers used;
- Preservatives used in addition to ice;
- Sequence and time of field activities conducted;
- Field observations (e.g., broken lock, cracked casing, etc.);
- Cross reference to Chain-of-Custody; and
- Any other pertinent data.

Additional field forms will be completed as needed pursuant to the GWSAP. Any sampling activities will be documented on the appropriate field forms and will contain at a minimum the sample ID, sampling location, sampling time and date, sampling method, calibration of field equipment, field parameter measurements, and sample collector's name and signature.

3.6.3 Chain-Of-Custody Documentation

Evidence of collection, shipment, and laboratory receipt must be documented on a Chain-of-Custody record by the signature of the individuals collecting, shipping and receiving each sample. After samples have been collected, they will be maintained under strict chain-of-custody procedures. The procedures described below document the transfer of custody of the samples from the field to the designated analytical laboratory and the associated documentation requirements. The field sampling personnel will complete a Chain-of-Custody Record and Request for Analysis (CC/RA) form for each shipping container (i.e., cooler, ice chest or other container) of samples to be sent to the laboratory for analysis. The CC/RA for a shipping container will list only those samples in that shipping container. The sample collector will cross out any blank space on the CC/RA below the last sample number listed (on the part of the form where samples are listed).

The sampling personnel whose signature appears on the CC/RA is responsible for the custody of the sample from the time of sample collection until the custody of the sample is transferred to a designated laboratory, a courier, or to another project employee for the purpose of transporting the sample to the designated laboratory. The sample is considered to be in custody when the sample is: (1) in the direct possession of the sample custodian; (2) in plain view of the sample custodian; or (3) is securely locked in a restricted access area by the sample custodian.

Custody is transferred when both parties to the transfer complete the portion of the CC/RA under "Relinquished by" and "Received by". Signatures, printed names, company names, date, and time are required. Upon transfer of custody, the sampling personnel who relinquished the samples will retain a copy (pink copy) of the CC/RA. When the samples are shipped by a common carrier, a Bill of Lading supplied by the carrier will be used to document the sample custody, and its identification number will be entered on the CC/RA. Copies, receipts, or carbons of Bills of Lading will be retained as part of the permanent documentation in the project file. It is not necessary for courier personnel to sign the CC/RA.

The samples will be shipped to the selected analytical laboratory. When the samples are received by the laboratory, the CC/RA will be immediately signed along with the date and time of receipt. The top sheet (white copy) of the CC/RA will be returned with the final analytical report. The laboratory will maintain a record of sample handling according to the procedures described in *Review and Reporting of COC Concentration Data,* (RG-366/TRRP-13) (TCEQ, 2010).

4.0 DATA QUALITY ASSURANCE AND QUALITY CONTROL

The Quality Assurance/Quality Control (QA/QC) Plan has been developed to address general quality assurance (QA) issues pertaining to the sampling at the Site. This QA/QC Plan describes the specific protocols that will be followed for sample handling and storage, chain of custody and laboratory analysis. The information contained in this QA/QC Plan is meant to be used in conjunction with the sampling methods and procedures described in the associated GWSAP.

The goal of the QA/QC Plan is to assure that the data collected meet the data quality objectives of the GWSAP. All QA/QC procedures will be in accordance with applicable professional standards, government regulations and guidelines, and specific project goals and requirements. This QA/QC Plan details the approach that will be taken to provide precise, accurate, and representative data for evaluating groundwater conditions at the Site.

Analytical data collected pursuant to the GWSAP will be reviewed in order to evaluate if data are suitable for use to assess the effectiveness of the proposed response action. Analytical data will be supported by the QA documentation required by the Texas Commission on Environmental Quality (TCEQ) Texas Risk Reduction Program (TRRP) Regulatory Guidelines Document RG-366/TRRP-13 *Review and Reporting of COC Concentration Data* (TCEQ, 2010). The analytical data will be validated in accordance with TCEQ protocols.

4.1 Documents and Records

Field records, sample labels, and chain-of-custody documents will be completed and packing and shipping procedures will be performed by the field staff according to the instructions presented in Section 4 of the GWSAP.

The laboratory will prepare data packages that include the TRRP-13 (TCEQ, 2010) Laboratory Signature Page and Laboratory Review Checklist(s) (LRCs). The LRCs include Reportable Data, Supporting Data, and the Exception Report when there are exceptions noted on these checklists.

4.2 Analytical Procedures

Samples will be analyzed in accordance with the guidelines of EPA SW-846, *Test Methods for Evaluating Solid Waste-Physical/Chemical Methods* for the parameters detailed in the GWSAP. The procedures for laboratory analysis, with any modifications, are further documented in the laboratory standard operating procedures, which are maintained at the laboratory, and are listed in the laboratory's quality assurance plan.

4.3 Quality Control

Quality Control (QC) will be achieved by collecting and/or analyzing the appropriate field and laboratory QC samples to ensure that the analytical results meet the measurement objectives. Results from analyses of QC samples are used to quantify precision and accuracy and identify any problems or limitations of those data.

For this project, field QC will include the collection of field blanks and field duplicates. Equipment blanks will not be necessary because dedicated tubing will be used for groundwater sampling. A temperature blank will be included with every cooler and a trip blank will be included containing samples for VOC analysis. Laboratory QC will include calibration standards, method blanks, laboratory control samples and duplicates, matrix spikes/matrix spike duplicates, and analytical duplicates. The QC samples, their QA objectives, and acceptance limits are described in the following sections and are summarized in Table 5.

Field QC will be controlled by compliance with standard sample collection and handling methods and by the periodic collection of field QC samples. QC samples will be collected as blind samples so that the laboratory remains unaware of the nature of those samples and performs QC sample analyses by the same manner as all other sample analyses. The appropriate types and frequency of field QC samples depend on the sample type, sample matrix, and intended data use.

A field duplicate sample is a second sample collected at the same location as the original sample. It is collected simultaneously with or in immediate succession to the original sample using identical recovery techniques, and is treated in an identical manner during storage, transportation and analysis. Field duplicates measure the sampling and analytical variability (precision) associated with the groundwater sample concentrations. One sampling location will be selected at random for duplicate sampling (one duplicate for every 20 samples). At groundwater sampling locations, duplicate samples will be collected from the pump tubing in successive aliquots alternating with collection of the original sample. The field

duplicate will be submitted as a "blind" sample to the laboratory. The relative percent difference (RPD) between the original sample and field duplicate will be calculated for each parameter as part of the data evaluation. Field precision outside the acceptance limit of 25 percent RPD will indicate high variability, and therefore estimated concentrations, associated with the field duplicate and original sample.

A trip blank consists of analyte-free deionized water (ASTM Type II) that is supplied by the laboratory, transported to the sampling location, and transported to the laboratory for analysis without having been exposed to the sampling procedure. One trip blank is taken to the sampling location and is transported to the laboratory for each cooler containing field samples for volatile organic analytes. Trip blanks assess any cross-contamination of volatile organic compounds that may occur during sample transport.

Laboratory QC is necessary to control the analytical process, assess the precision and accuracy of analytical results, and identify assignable causes for atypical analytical results. Detailed laboratory QC requirements are contained within each individual method and Laboratory Quality Assurance Manuals.

4.4 Equipment Inspection, Testing, Calibration, and Maintenance

All sampling equipment testing and maintenance requirements are detailed in the manufacturer's specifications for a particular piece of equipment. Sampling equipment is inspected and tested upon receipt and is assured appropriate for use. Field instruments and equipment will be maintained in accordance with the manufacturer's instructions. Field instruments that fail two consecutive calibration requirements will be tagged as "nonfunctional" and returned to the manufacturer for repair or replacement. Acceptance criteria are detailed in the manufacturer's documentation for each instrument.

All laboratory tools, gauges, instruments, and equipment testing and maintenance requirements are contained within the laboratory's quality assurance plan. Testing and maintenance records are maintained and are available for inspection. Instruments requiring daily or in-use testing may include, but are not limited to, water baths, ovens, autoclaves, incubators, refrigerators, and laboratory pure water. Critical spare parts for essential equipment are maintained or are available through a preferred vendor status to prevent downtime. Maintenance records are available for inspection.

4.5 Data Validation, Interpretation, and Reporting

Field personnel will supply sample custody information to the data management staff, including sample logs and chain-of-custody documents. Laboratories will supply deliverables on the normal turnaround time schedule, unless expedited delivery of results is necessary. The data management staff will produce reports for review by the project's QA staff, and will make available data files that can be transferred into compatible software packages, if necessary. The data collected for this GWSAP will be considered Level II and Level III data.

Hard copy data packages will be sent directly by the laboratory to the project manager for review. Data review will include verification of completeness of data packages. The data reviewer will evaluate and describe data quality to identify measurement uncertainties or other factors that may affect data use (i.e., measurement goals not met). Data will be reviewed and validated as described in *Review and Reporting of COC Concentration Data,* (RG-366/TRRP-13) and the results of the review/validation will be summarized in a Data Usability Summary (DUS).

Data deliverables will be uncensored in that they will include a result for all analyses, even those below the project-required sample detection limit, as appropriate for the specific analytical instrument. Data collected during this investigation will be incorporated and managed in a database with the existing data from the Site.

Validation of groundwater analytical data will be conducted in accordance with the requirements of Section XI.F of the Permit.

5.0 REFERENCES

Southern Pacific Transportation Company (SPTCo), 1994. RCRA Facility Investigation Work Plan – Permit Number HW-50343-000. October 14, prepared by IC.

Texas Commission on Environmental Quality (TCEQ), 2010; *Review and Reporting of COC Concentration Data,* RG-366/TRRP-13, Revised May 2010

United States Environmental Protection Agency (EPA), 1995. *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures*. EPA 540/S-95/504. December.

———, 1996. *SW-846: Test Methods for Evaluating Solid Waste-Physical/Chemical Methods, Final Edition.* Office of Solid Waste and Emergency Response. December.

TABLES

TABLE 1

LIST OF ANALYTICAL PARAMETERS, ANALYTICAL METHODS, BOTTLE TYPES, PRESERVATIVES AND SAMPLE HOLDING TIMES
UPRR HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

Parameter	Analytical Method & Reporting Limit	Volume (ml.)	Container*	Preservative	Holding Time
VOCs	SW846, 8260B	3x40 mL VOA Vials	4 degrees C, HCL to pH<2	14 days	VOCs
SVOCs	SW846, 8270C - Low Level* SW846, 8270C - SIMs*	2 x 1-Liter Amber Glass	None	7days	SVOCs
RCRA Metals[1]	SW 6020	500	Plastic	HNO_3 to pH<2	6 months

Notes:
* - either method may be used if Sample Detection Limits (SDLs) satisfy the GWPS.
1 - RCRA Metals arsenic and lead will be analyzed during the groundwater sampling event in 2015 as a one-time event. Arsenic and lead may be added pending the initial results.

TABLE 2

QUALITY ASSURANCE/QUALITY CONTROL SAMPLE OBJECTIVES
UPRR HOUSTON WOOD PRESERVING WORKS
HOUSTON, TEXAS

SAMPLE TYPE	PURPOSE	QA OBJECTIVE
Field Duplicates Sampling Frequency: Once per every 20 samples or once per sampling day, whichever is greater.	Measure sampling and analytical precision	Precision: 25% RPD
Field Blanks Sampling Frequency: Once per sampling day.	To check crosscontamination during sample collection, sample shipment, and in the laboratory. Also to check sample containers.	Chemicals of concern not detected.
Matrix Spike/Matrix Spike Duplicate Prepared by the analytical laboratory	Measure accuracy (MS) and precision (MS/MSD) to indicate possible bias from matrix effects	Within laboratory control limits
Trip Blanks Frequency: Supplied by laboratory. One per every cooler containing groundwater samples for volatile organic compound analysis.	Quantify artifacts introduced during transport or storage of samples - measure of accuracy and representativeness	Volatile organic compounds not detected.
Laboratory Control Samples	Method and instrument are operating appropriately, measures accuracy and representativeness	Within laboratory control limits
Analytical Duplicates	Measure analytical precision	Within laboratory control limits
Laboratory Calibration Standards	Insures that sample concentration is accurately measured by instrument - also a measure of representativeness	Within laboratory control limits

APPENDICES

APPENDIX A

FIELD FORMS

MONITORING WELL EVALUATION RECORD

Pastor, Behling & Wheeler, LLC
2201 Double Creek Dr., Suite 4004
Round Rock Texas
Phone: (512) 671-3434 Fax: (512) 671-3446

Project Number: Date:

Project Name:

Weather Conditions:

Measuring Point of Well (MP): Measuring Device: Page _____ of _____

Well	Time	Depth to Water (ft. BMP)	Total Depth of Well (ft. BMP)	Well Stickup Length (ft. ABL)	Casing Type	Well Locked (Y/N)	Well Capped (Y/N)	Well Labeled (Y/N)	Protective Casing Present (Y/N)	Survey Marker Present (Y/N)	Pad Size and Condition	Remarks

Checked By:

GROUNDWATER SAMPLING RECORD

PAGE _____ of _____

Project Number:	Project Name:	Date:
Sample Number:	Starting Water Level (ft. BMP):	
Sampling Location (well ID, etc.):	Casing Stickup (ft.):	
Sampled by:	Starting Water Level (ft. BGL):	
Measuring Point (MP) of Well:	Total Depth (ft. BGL):	
Screened Interval (ft. BGL):	Casing Diameter (In ID):	
Filter Pack Interval (ft. BGL):	Casing Volume (gal.):	

QUALITY ASSURANCE

METHODS (describe):

Cleaning Equipment:

Purging: _____ Sampling: _____

Disposal of Discharged Water:

INSTRUMENTS (Indicate make, model, I.d.)

Water Level: _____ Thermometer: _____

pH Meter: _____ Field Calibration: _____

Conductivity Meter: _____ Field Calibration: _____

Filter / Filter Size: Other:

SAMPLING MEASUREMENTS

Time	Cum. Vol. (gal. or L)	Purge Rate (gal. or L /m)	Temp. (oC)	pH	Spec. Cond. (mmhos/cm)	Color	Turbidity & Sediment	Remarks

Water Level (ft. BMP) at End of Purge: | Sample Intake Depth (ft. BMP):

SAMPLE INVENTORY

Bottles Collected				Filtration	Preservation	Remarks
Time	Volume	Composition (G, P)	No.	(Y / N)	(type)	(quality control sample, other)

Comments:

Pastor, Behling & Wheeler, LLC

2201 Double Creek Dr., Suite 4004

Round Rock, Texas 78664

Phone: (512) 671-3434 Fax: (512) 671-3446

Attachment D

RESPONSE ACTION PLAN

Union Pacific Railroad Company
Houston Wood Preserving Works
Houston, Texas

XII. Hazardous Waste Permit Application Fee

In accordance with 30 TAC 305.53, complete Tables XII.A. - Hazardous Waste Units (For Application Fee Calculations) and XII.B. - Hazardous Waste Permit Application Fee Worksheet . Use the following information in calculating your fee. The application fee will be non-refundable once an initial review of the application has been completed. The applicant's fees are subject to evaluation by the technical staff of the Texas Commission on Environmental Quality (TCEQ). However, the TCEQ reserves the right to assess further fees as may be necessary.

A. The minimum permit application fee for a permit or a permit renewal for each hazardous waste facility to be used for Storage, Processing, Disposal, or Closure/Post-Closure Care (disposal has already occurred) of hazardous waste shall be $2,000, plus notice fee, and the maximum shall be $50,000, calculated according to these instructions:

1. Process Analysis - $1,000.00.

2. Management/Facility Analysis - $500.00.

3. A facility unit(s) analysis of $500 per unit is charged for the following:
   a. each cell of a landfill (note that multiple cells that are identical in type and use are subject to a single $500 fee);
   b. tanks and container storage areas (note that multiple tanks and container storage areas that are identical in type and use are subject to a single $500 fee)
   c. identical in type and use means the following:
      (1) made of the same material and same design;
      (2) the same size/capacity within + 10%;
      (3) store the same waste (as identified by USEPA hazardous waste number - 40 CFR 261 Subparts C & D); and
      (4) have the same management characteristics (e.g., storage only).

4. Site Evaluation - $100 per acre of surface used for hazardous waste management up to 300 acres. No additional fee thereafter. This shall be calculated as any acreage which will be permitted to manage hazardous waste. This shall include, for example, the entire area within the secondary containment of a tank farm, the area within a fence that surrounds individual units (other than the facility fence), or the area defined by the toe of the dike surrounding a landfill or impoundment, etc.

5. An applicant shall also include with each initial application a fee of $50 to be applied toward the cost of providing the required notice. An additional notice fee of $15 is required with each application for renewal.

B. The application fee for a major amendment or a Class 2 or 3 modification to a hazardous waste permit for operation, closure, or post-closure care is subject to the fees listed below:

1. A management/facility analysis fee of $500.

2. The notice fee is $50.

3. If a unit is added or a unit area is expanded for any purpose, $100 per additional acre is assessed, until the total additional acreage reaches 300 acres.

4. If one or more of the following reports are added or are significantly revised, the process analysis fee of $1000 is assessed:
   a. waste analysis plan;
   b. site-specific or regional geology report;
   c. site-specific or regional geohydrology report;
   d. groundwater and/or unsaturated zone monitoring;
   e. closure and/or post-closure care plan; or
   f. RCRA Facility Assessments (RFAs), or corrective action reports;
   g. Alternate Concentration Limit (ACL) demonstration or Development of Protective Concentration Limits (PCLs);
   h. Regulated Unit Facility Assessment, Corrective Action (CA) work plans or reports for Regulated Units; and/or
   i. RCRA Facility Investigation (RFI)/Affected Property Assessment (APA), Remedy Selection, Corrective Measure Implementation (CMI)/Remedial Action Plan for solid waste management units, and/or areas of concern;
   j. Facility Operations Area (FOA).

5. A unit analysis fee of $500 per unit is assessed if any of the following occur:
   a. if a unit is added (even if identical to units already in place, using the criteria discussed in A.3 above);
   b. if there are design changes in an existing unit; or
   c. if a unit status changes from closure to post-closure care;
   d. Changes in the number, location, depth, or design of wells approved in compliance plan or a permit (unless it is a replacement well);
   e. Changes in point of compliance and compliance monitoring program;
   f. Changes in Groundwater Protection Standards, indicator parameters, Alternate Concentration Limits or Protective Concentration Limits; and/or
   g. Changes in corrective action program.

C. The application fee for a minor amendment, a Class 1, or a Class 11 modification of a hazardous waste permit is $100 plus a notice fee of $50.

XII. HAZARDOUS WASTE PERMIT APPLICATION FEE

Table XII.A. – Hazardous Waste Units (For Application Fee Calculations)

Verbal Description of Unit	Rated Capacity	Surface Acreage[1]	# of Unit Types[2]	Identical Unit Justification[3]
Closed Surface Impoundment	5,065 yd^3	0.44	1	NA
		Total[4] 0.44	**Total[4]** 1	

1 Number of calculated acres.
2 Enter number of units except for units identical in type and use which only count toward a single $500.00 fee.
3 Explain justification for any units claimed as identical in type and use.
4 Enter these totals on the worksheet.

Table XII.B. - Hazardous Waste Permit Application Fee Worksheet

Name of Facility: Union Pacific Railroad Company Houston Wood Preserving Works

Solid Waste Registration Number: 31547

1. Process Analysis - $1,000..... $_____

2. Facility Management Analysis - $500..... $_____

3. Unit Analysis - _____ units @ $500 per unit..... $_____

4. Site Evaluation - _____ acres @ $100 per acre..... $_____

   (Maximum of 300 acres)

5. Minor amendment, Class 1, or Class 1[1] modification - $100..... $ 100.00

6. Cost of Providing Notice - $50 (+ $15 for a renewal)..... $ 50.00

Pay This Amount ☐ **Total** $ 150.00

Make Checks Payable To:

Texas Commission on Environmental Quality - Fund 549
(your canceled check will be your receipt)

Complete And Return With Payment To:

Texas Commission on Environmental Quality
Financial Administration Division - MC 214
P.O. BOX 13088
Austin, Texas 78711-3088

The applicant's fees are subject to evaluation by the technical staff of the Texas Commission on Environmental Quality (TCEQ). However, the TCEQ reserves the right to assess further fees as may be necessitated.

Please do not submit a photocopy of the check (or equivalent transaction submittal) with your application packet but provide only the following account information:

Check No.	Date of Check	Check Amount

XIII. Confidential Material **Not Applicable**

Any information requested in the previous Sections I. through XI. of this application which is deemed confidential shall be provided in this Section as a separate collective document and clearly labeled ***CONFIDENTIAL***.