

**AMENDMENT NO. 001; 04/27/15**RFP#: RB8-62BulkheadSite Name: Red and Bonita Mine SiteT.O.#: 0062Location: Silverton, COJob #: RB8-62Attachments: Yes No

Environmental Restoration, LLC (ER) is issuing Amendment 001 to provide answers to questions provided by bidders. The questions and answers are contained in Section 1. An additional scope of work involving provision of a PE-stamped ground Control Plan is described in Section 2. Following Section 2 are two attachments. Attachment 1 is a load diagram provided in response to question 12. Attachment 2 is a revised Schedule of Pricing that includes an additional line item for PE evaluation and development of a ground control plan (Section 2).

Section 1: Questions and Answers

1. It indicates that the injection pipe to be installed to as far back in the mine as possible, will be schedule 40 pvc pipe, it also indicates that all connections will be threaded, Threading schedule 40 pvc pipe is not a typical form of connection. ANSI doesn't recommend threading pvc pipe of less that schedule 80. Can the more typical form of connection, being glued bell sections or glued coupled sections be used? Do we want to change the material to schedule 80 pvc? **Use Schedule 80 threaded pipe.**
2. The anticipated completion date is mentioned twice, General Scope of Work 1.0, paragraph 3, complete work by, August 30th, 2015, and in the instructions to bidders 7.1 it is listed completion by September 30th, 2015. Which date is it? **September**
3. Installation of bypass pipes. Are the bypass pipes supposed to be 8", 316 stainless pipes from the cofferdams to a 316 stainless 8" Y section and then a 316 stainless 8" pipe thru the concrete pour? It indicates that all connections for pipe will be threaded, that is very uncommon for 8", 316 stainless schedule 40 pipe. The most common form of connection is flanges, bolts and seals. To thread together 8" pipe would be difficult, and threading on a 8" 316 stainless gate valve even more difficult. **Use flanges and bolts for 316 Stainless (schedule 40).**
4. Under OSHA requirements we will be expected to supply a 5 man rescue team within 30 minutes, are we to supply these men or will ER handle this requirement? **ER/EPA/Weston and DRMS will have personnel on site to comprise the OSHA required 5 man rescue team. People forming this team will be trained and practiced in initiating a response including firefighting and the use of SCBA's if necessary. ER will have the SCBAs and a satellite phone on site. Additionally, ER will make arrangements for support from the San Juan Mine Rescue Team.**
5. Bid item # 6 only mentions grout, since there is a requirement to grout 4 holes in



AMENDMENT NO. 001; 04/27/15

the bulkhead area is that what this is referring to? There is no mention of concrete in this item. **The comment does not appear to correctly reference the Item that is relevant to their question, and we do not understand the question. They reference Item 6, which is specific to Concrete Testing. Grouting the existing 4 drill holes (2" x 12 ft) is addressed in Item 1 re: Prepare the Rock Surface. This specifies a grout and PSI; there are no testing requirements.**

6. Can I get a list of the plan holders for this RFP? **No**

7. Can concrete trucks access the portal? **Concrete trucks can access the site, but not directly adjacent to the portal. Several concrete trucks for a private construction project passed the site at the toe of the mine dump directly beneath the portal. It is anticipated that this work will require staging a pump truck at the toe of the dump to supply the work area.**

8. We note that OSHA requirements for excavation safety at 1926.652 (c) (4) have been interpreted to pertain to underground tunnels, and thus will require a PE-Stamped Ground Control (shoring) plan.

- Does this plan already exist for the site?
 - If so, has all required control been installed in all work areas pertinent to this scope, and are the fixtures in good condition?
 - If not, where would the costs for this design, and the implementation of any ground control that may be required by the designer, be included?

EPA/DRMS/ER are continuing to research the PE requirement. In the meantime, bids for construction activities should be prepared with the assumption that DRMS engineering staff have concluded that there is no evidence of a need for shoring / ground support. Additionally, the Schedule of Pricing has been revised to include a line item for providing a PE evaluation and Ground Control Plan. If required, the Ground Control Plan will be due as a submittal by June 15, 2015. Costs for implementing ground control, if necessary, will be addressed after receipt of the analysis.

9. Please clarify what design role the Subcontractor is expected to take, given that a very detailed design is included in the bid package. It would not be legal under Colorado Law, or ethical, to simply review and stamp plans generated by others not working under our engineering supervision.

EPA/ER are not requesting a PE stamped bulkhead design plan at this point. The design was developed by qualified engineering staff and has been applied at multiple locations in CO.

Also, we are concerned that this language could be used to shift liability to the Subcontractor in the event of some aspect of failure as a result of the DRMS design.



AMENDMENT NO. 001; 04/27/15

If the Subcontractor is required to take design liability, then it will be necessary to have provision for time and cost for a proper design study and a means to fairly accommodate additional construction costs, if any, that may result of any changes in scope dictated by the final, stamped, design. **The design has been supplied as part of this RFP. Subcontractor will be responsible for construction in compliance with the design, but not the design itself.**

10. Is a 7 day week permitted? **Subcontractor should base schedule on a 6 day week. Working 7 days may be permitted as an exception with advanced approval from the RM. 7 day weeks will not be approved as the normal work week.**

11 Are night shifts permitted? **No. In addition to hazards associated with night work in rough terrain and challenges in visual appraisal of the water treatment system, ER anticipates a lodging shortage in Silverton during the construction period. Working night shifts would double the number of personnel requiring lodging as well as potentially stretch the resources available from other entities involved at the site.**

12. This project will be awarded on a 'Best Value' basis, with technical approach, schedule, equipment provided, and costs all being taken into consideration." What is the relative weighting of the listed factors? **All factors other than costs are weighed equal to cost. Award will be made to the bidder that demonstrates a responsible combination of sound approach, acceptable schedule, acceptable equipment and cost.**

13. **Item 1.0 Install Injection Pipe** - The description of the distance seems vague – "The CONTRACTOR will provide and install a 3/4-in. Schedule 40 PVC or HDPE injection pipe from the upstream end of the bulkhead to easternmost safely accessible location in the north heading of the Red and Bonita Mine shown on Figure 2. And further in the section: "Approximately 700-feet of injection pipe will be required...." Has the adit segment into which the injection pipe is to be installed been mucked out, ground secured, and does it have any utilities or ventilation?
The adit has been investigated and ventilation bag hung to approximately 600 feet inby of the portal. For purposes of the bid, assume that a total of 400 feet of injection pipe will be installed beyond the bulkhead position on the main eastward drift. The iron precipitate solids were removed from a center walking area (12 to 18 inches wide) down to the floor in 2013. The air was monitored during the previous entries following ventilation bag placement, and there was not a need for continued ventilation – however it is available for use as needed. (See Photo below)



AMENDMENT NO. 001; 04/27/15

How are varying lengths of pipe to be paid for? **ER will purchase additional pipe beyond what is described above.**

14. We note that the DRMS appears to be providing, and the specifications are requiring, very prescriptive and specific "means and methods" of form construction, which is normally left to the Contractor.

- What psi of total pressure (hydrostatic head of SCC mix plus final stroke pump overpressure) is the design rated for? **See Attachment 1.**
- Will ER take responsibility for failure of the forms if constructed according to plan?

If the subcontractor has identified any specific elements of the design that they believe are potential for failure of the forms or other features, then those need to be identified in the bid offer.

15. We note that the requirement for a 450 psi capability pump seems unusual and excessive for contact grouting (as differentiated from formation grouting) – example, a 3-stage Moyno as might be in a CG-550 unit only would have a typical delivery pressure of 261 psi when a new rotor and stator are used. We note that there are uncertainties as to the amount of grout take, possible re-drilling, etc. yet ER is asking for a lump sum bid price. What are the baseline assumptions beyond which a change of conditions would be in effect – 3 CF per hole in one operation and no re-drilling?

DRMS will provide a modification to indicate that the pump pressure capacity must be 200 psi versus 450 psi, which was intended as a not to exceed operating pressure, in the original RFP. The minimum specification is 90 psi for grout injection for a 3 minute minimum period.

The condition that would lead to a significant unknown quantity of grout required for the contact grouting is unlikely. If such a condition occurs beyond three cycles of re-drilling and 3 cubic feet re-grouting, then a separate unit pricing may be specified as based on changed conditions.

AMENDMENT NO. 001; 04/27/15

Adit at approximately 600 ft Inby on eastward main drift, note channel in muck

Section 2: Additional Scope of Work

With regard to the subject of PE evaluation and development of a stamped ground control plan, ER has revised the Schedule of Pricing to include a line item to perform this task. If this line item is exercised the work will involve the main work corridor (0-300') and the injection pipe installation zone (300-700'). Subcontractor will be required to provide a qualified Professional Engineer (PE) to survey the work areas and provide a PE-stamped ground control plan to ensure safe work conditions. ER will provide outside support during the engineers time underground. The final report will be due by June 15, 2015.



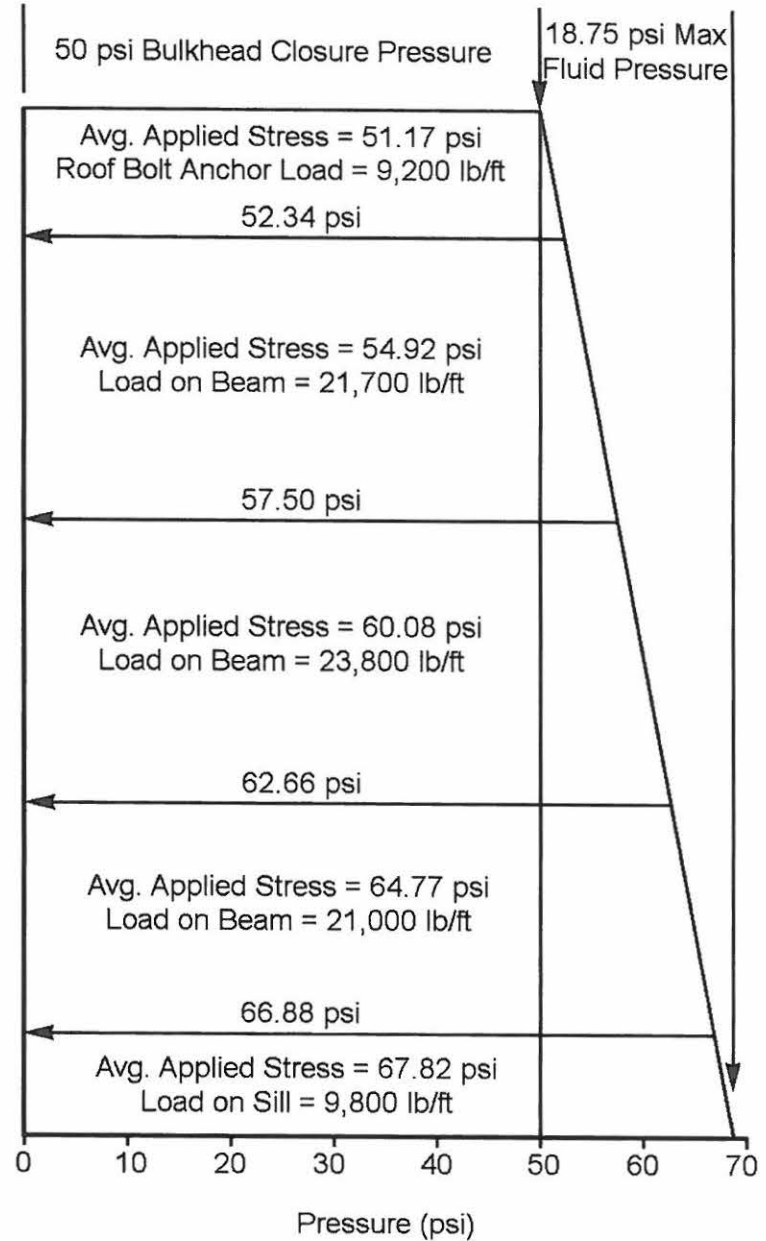
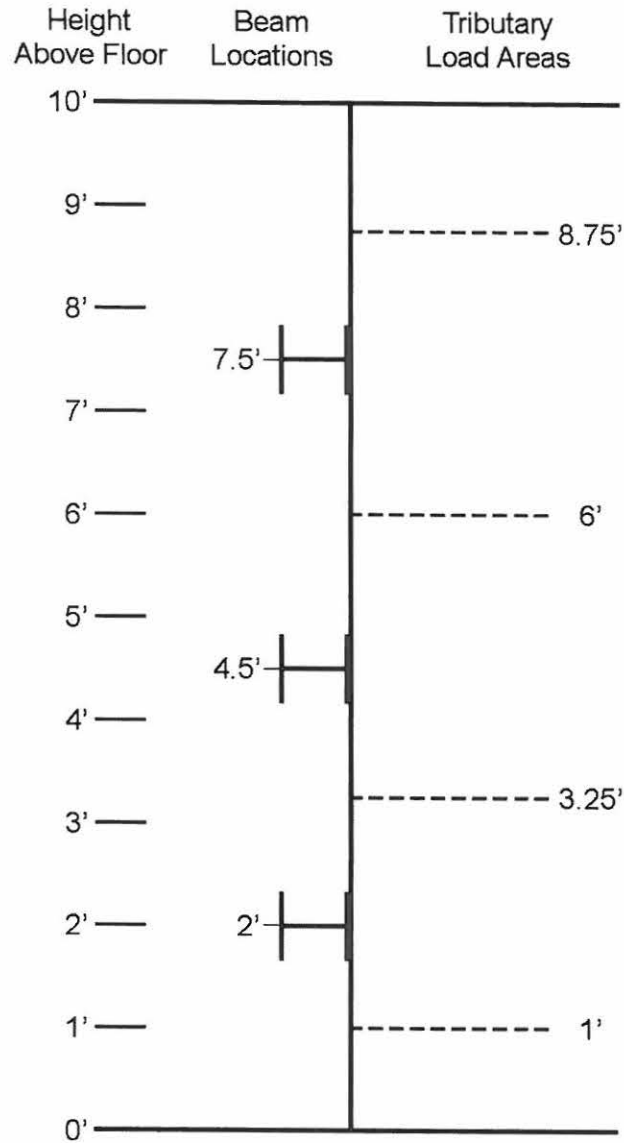
ENVIRONMENTAL RESTORATION, LLC

USEPA REGION 8
Request for Proposal RB8-62
Bulkhead Construction
Due Date May 08, 2015

AMENDMENT No. 001; 04/27/15

ATTACHMENT 1: LOAD DIAGRAM

RED AND BONITA BULKHEAD





ENVIRONMENTAL RESTORATION, LLC

USEPA REGION 8
Request for Proposal RB8-62
Bulkhead Construction
Due Date May 08, 2015

AMENDMENT No. 001; 04/27/15

ATTACHMENT 2: REVISED SCHEDULE OF PRICING



ATTACHMENT 2

SCHEDULE OF PRICING – REV 1

RFP# RB8-62BULKHEAD			Red & Bonita Mine	
ITEM	DESCRIPTION	EST. VOLUME	\$ PER UNIT	TOTAL
1.0	Mobilization	Lump Sum	\$	\$
2.0	Muck working areas	6 days	\$	\$
3.0	Install injection pipe	Lump Sum	\$	\$
4.0	Construct two cofferdams	Lump Sum	\$	\$
5.0	Install bypass pipe	Lump Sum	\$	\$
6.0	Prepare Bulkhead Location, Construct Forms and Install Accessories and Pump Grout	Lump Sum	\$	\$
7.0	DeNeef Grout	Lump Sum	\$	\$
8.0	Demobilization	Lump Sum	\$	\$
9.0	PE Evaluation and Ground Control Plan	Lump Sum	\$	\$
10.0	Bond cost		\$	\$
11.0	Total Cost (Items 1 through 6)			\$
12.0	List of equipment provided. Fill out attached form			
13.0	Provide details of three similar projects bidder has completed involving the construction of flow through bulkheads			
<p><i>Note: All charges, including up to five required onsite meetings for both superintendent and senior engineer, anticipated to be part of completion of the scope of work, should be included in the above bid. These charges include such items as all applicable taxes, license fees, handling fees, etc.</i></p> <p><i>Unbalanced bids, as determined through comparing bids to distribution of historic costs using the same technology, will either be returned for clarification or removed from consideration, at the sole discretion of ER.</i></p>				
Company Name:			Date:	
Project / Technical Contact:			Phone:	
EPA ID #:				

Please refer to RFP# RB8-62BULKHEAD regarding correspondence to your quotation. Any questions please contact the representatives below. Bid Due date defined within RFP.



ENVIRONMENTAL RESTORATION, LLC

USEPA REGION 8
Request for Proposal RB8-62Bulkhead
Construct Bulkhead
Due Date May 08, 2015

Request for Proposal
RFP# RB8-62 Bulkhead

Red & Bonita Mine Site
Silverton, San Juan County, Colorado

For

United States Environmental Protection Agency Region VIII
Emergency and Rapid Response Services Contract
Task Order # 0062

April 07, 2015



Table of Contents

Introduction

- 1.0 General Scope of Work**
 - 1.1 Site Background

- 2.0 Description of Work**
 - 2.1 Definitions
 - 2.2 Applicable and Relevant Regulations (ARAR's)

- 3.0 Project Technical Requirements**

- 4.0 General Services**

- 5.0 Project Specific Requirements**
 - 5.1 Cleanup Criteria
 - 5.2 Pricing Format
 - 5.3 Disposal

- 6.0 Project Terms and Conditions**
 - 6.1 General
 - 6.2 Safety
 - 6.3 Subcontractor Generated Waste
 - 6.4 Personnel
 - 6.5 Work hours
 - 6.6 Administrative / Project Specific
 - 6.6.1 Wages
 - 6.6.2 Daily Reports
 - 6.6.3 Submittals
 - 6.6.4 Flow-downs Provisions
 - 6.6.5 Bonds
 - 6.6.6 Liquidated Damages
 - 6.6.7 Lien Waivers
 - 6.6.8 Permits
 - 6.6.9 Schedule
 - 6.6.10 Construction Management Plan
 - 6.6.11 Patents / Proprietary Equipment / Technologies
 - 6.6.12 No Discharge to Storm Sewer or Waterways
 - 6.6.13 Access to Work



Table of Contents (continued)

7.0 Instruction to Bidders

- 7.1 Schedule of Solicitation
- 7.2 General Instructions
- 7.3 Bidders Responsibilities
- 7.4 Questions during Bidding
- 7.5 Pre-Bid Meeting & Site Showing
- 7.6 Receipt of Proposal
 - 7.6.1 Price and Administrative Proposal
 - 7.6.2 Technical Proposal
 - 7.6.2.1 Format of Technical Proposal
 - 7.6.2.2 Review of Technical Proposal
- 7.7 Award of Subcontract
- 7.8 Subcontract List

8.0 Measurement and Payment

- 8.1 Measurement, Payment and Definitions
 - Bid Item 1.0 Mobilization
 - Bid Item 2.0 Muck working area
 - Bid Item 3.0 Install Injection Pipe and remove vent bag
 - Bid Item 4.0 Construct two cofferdams
 - Bid Item 5.0 Install bypass pipe
 - Bid Item 6.0 Prepare bulkhead location, construct forms, install accessories, pump grout
 - Bid Item 8.0 Demobilization
 - Bid Item 9.0 Bond Cost

9.0 Final Inspection

Attachments as listed below:

Attachment A	Proposal Form
Attachment B	Schedule of Pricing
Attachment C	Technical Specifications
Attachment D	ERRS Flow Downs & Representations & Certifications
Attachment E	Wage Determinations (DBA & SCA)



1.0 General Scope of Work

The U.S. Environmental Protection Agency (EPA) has appointed Environmental Remediation, LLC (ER) of ERRS Region 8 Contract Number EPS81302, to procure and manage the installation of a bulkhead at the Red & Bonita Mine near Silverton CO.

The successful bidder / subcontractor shall mobilize all labor, material, equipment, and supplies necessary to perform the installation in accordance with the design provided in Attachment C.

Environmental Remediation LLC shall award a performance Subcontract as a result of this solicitation. The successful bidder will be selected based on the cost, appropriateness of equipment provided, past experience of company and key personnel and, ability to commence and complete work by August 30 2015.

1.1 Site Background

The Red & Bonita Mine consists of approximately 1.25 acres of waste rock and suspected tailings material, and an adit that drains at approximately 300 gallons per minute throughout the year into Cement Creek. The mine site is located in San Juan County, Colorado, approximately seven miles north of the Town of Silverton, Colorado, at 10,893 feet above mean sea level (AMSL). The mine was opened in the late 1890s and has not operated for almost 100 years. Since 2005, adit discharge rates have been observed to be increasing from approximately 200 to 300 gpm. The pH of discharge water is approximately 4, and contains high concentrations of several metals including aluminum, cadmium, lead, manganese and zinc. The discharge from the adit represents a significant percentage of the zinc load to the Animas River, which is impacting aquatic life for several miles below the confluence of Cement Creek and the Animas River.

In 2013 ER constructed a settling pond and supported underground operations designed to gather flow information necessary in determining feasibility of installing a bulkhead. A location approximately 270' inby was identified, and in 2014 ER supported EPA/ Colorado Division of Reclamation Mining & Safety (DRMS) packer testing of the location to determine if the chosen location was suitable for bulkhead construction. The results are contained in Attachment C.

2.0 Description of Work

The project work includes the installation of a structural bulkhead plug within the Red & Bonita adit approximately 270' inby. The bulkhead design was performed by DRMS and is included in Attachment C. Work includes mobilizing and demobilizing surface and underground equipment and materials to establish operations. Underground work tasks include providing Health & Safety, establishing necessary ventilation, temporary utilities and safe travel way in the underground workings; cleaning scaling and preparing the bulkhead location; controlling mine water flow and providing any devices necessary to surface in delivering material to and from work areas. The adit contains a very heavy sediment load and the subcontractor will be required to release the sediment in a controlled manner and in coordination with ER personnel managing water treatment during construction.

ER will conduct operations in oversight management of surface and underground work activities to include construction & maintenance of retention pond & water treatment, access road maintenance, office trailer, utilities to trailer and portable toilets.

The Scope of Work for the subcontractor includes; providing Health & Safety planning and implementation, payment and performance bonds, work plan and schedule development, participation in meetings as needed, obtaining all required licenses and permits (local, state, federal, other), mobilization, bulkhead installation, and demobilization. All project and design changes require approval prior to execution.



ER shall require the Subcontractor to provide all necessary labor, equipment, material, supplies, and testing to perform the work as described in the attached specification and as necessary to complete the performance requirements specified for all phases of work. All materials and supplies must be in compliance with the **Buy American Act**. All such costs must be priced into the line items defined in the pricing section of this RFP. Neither ER nor the EPA will entertain any costs not priced into the RFP line items.

The Subcontractor shall dispose of all generated mine related waste material(s) (i.e. water, muck, rock, etc.) as a result of construction from this site to the surface as directed by ER. The solids (iron precipitates) mucked and conveyed in the adit drainage flow from the first 300 feet shall be directed to the surface retention pond and/or repository (managed by ER). If it becomes necessary for waste material (mentioned above) to be shipped off site ER will provide this task in compliance with EPA's CERCLA off-site rule and all existing laws and regulations of the United States, State, County, Township or other Governmental agency, where applicable. All offsite disposal including manifesting, documentation, and final disposition shall be performed by the ER Response Manager and signed and approved by the EPA OSC prior to removal and transportation for disposal.

During work activities, the subcontractor shall remove from the vicinity of the work and haul all rubbish, trash, garbage, and construction debris to a roll off container staged in Gladstone that will be provided by ER. ER will also provide portable toilets.

2.1 Definitions

- **Generator** - U.S. Environmental Protection Agency, Region VIII
- **Contractor** – Environmental Restoration L.L.C. (ER)
- **Subcontractor** - The successful bidder which will perform all work on site
- **Work** - The term Work includes all engineering, labor, materials, equipment, services, and incidentals necessary to successfully complete the specifications described in this Request for Proposal and in the ERRS Region VIII Subcontract Agreement
- **ARARS** - Applicable or Relevant and Appropriate Regulations
- **Response Manager (RM)** – ER's Site Specific Project Manager
- **EPA OSC** – U.S. Environmental Protection Agency, On-Scene Coordinator
- **DRMS** - Colorado Division of Reclamation Mining & Safety

2.2 ARARs

Personnel on site will follow all pertaining ARARs in reference to MSHA and OSHA in performing work on this site.

3.0 Project Technical Requirements

Technical specifications are included in Attachment A. In addition to the schedule of pricing and list of equipment provided, bidders should include a narrative of how they intend to remove muck from the adit and deliver grout for bulkhead construction.

Performance Specification Contract

This RFP, and all work will be awarded based on the bidders meeting performance specifications. The bidders will be provided site background information, and a reasonable amount of preparation time to research site conditions and fully develop their approach. Due to seasonal access limitations an official site visit is not feasible, however the site is located along a public route that may be accessible by alternative conveyances if bidders choose to make their own arrangements.

Bidders will assume all risk associated with fully defining site conditions and ensuring the compatibility of their submitted technology and site conditions. It is the bidder's responsibility to carry out all research as



required to allow the bidder to guarantee their ability to construct the bulkhead in accordance with the specifications. Other than changes associated with unforeseen circumstances, change orders will not be considered. These include any and all potentially perceived changes resulting from ER / EPA schedule delays, undefined site conditions, changed site conditions, weather, site conditions misrepresented within this RFP / associated communications or any other factor. After award the successful bidder will be required to meet the construction requirements, for the area and depth designed, with no opportunity for change orders.

The technical site information provided within this RFP has been provided by USEPA & Colorado Division of Reclamation Mining & Safety and is based on the work of others. Environmental Restoration L.L.C. assumes no responsibility or liability for the accuracy, completeness, or integrity of any information within the RFP. It is the bidder's sole responsibility to confirm the validity and accuracy of all data and information provided within the RFP. Submittal of a proposal will serve as confirmation that bidders have confirmed all information within the RFP, or obtained sufficient other information to fully understand all site conditions and potential limitations that may hamper their technical approach.

The Bidders price, submitted within the line items in Section 5, represents the total amount paid to the bidder for successful completion of the milestones and project. Any costs not defined in these line items will not be eligible for reimbursement by ER or the EPA at any time, unless mutually agreed upon by ER and the Subcontractor. Unbalanced bids may be rejected, down scored, or returned to bidders for clarifications.

This project will be awarded on a 'Best Value' basis, with technical approach, schedule, equipment provided, and costs all being taken into consideration.

This procurement can be delayed, cancelled or terminated for any reason. All/any bids may be rejected.

4.0 General Services

Environmental Restoration L.L.C. (ER), under the U.S.EPA Region 8 ERRS Contract will serve as Prime Contractor for all site remediation activity. The bidder will be operating as a Subcontractor to ER. Other contractor's onsite may include Weston Services, as U.S.EPA Region 8's START Contractor. Weston may provide USEPA with technical guidance and sampling services as needed to substantiate performance milestones.

For the remainder of this section "Subcontractor" means winning bidder of this RFP.

The Subcontractor shall begin mobilization as defined within their proposed schedule. The Subcontractor shall perform rehabilitation of the Golf Tunnel to include construction of the bulkhead, and conduct full scale operations meeting the schedule and performance milestone defined within their RFP submittals. On demonstrated completion of meeting defined milestones, payment will be made.

Weekly progress meetings will be held on site to discuss the following topics:

- Current project status and schedule;
- Impacts to schedule;
- The agreed program of future work, including the subcontractor's proposed action to complete the work on time; and
- Actions to be taken to remedy delays.

5.0 Project Specific Requirements

As discussed in Section 3 of this RFP, ER intends to award a performance based contract where competing bidders propose their approach in construction of the bulkhead in a technical proposal and submitted as



part of the bidding process. Required content of the Technical Proposal are defined in Section 7.6.2 of this RFP. The RFP is limited to providers of the technologies listed in Section 2.0 of the RFP.

An award will be made after evaluating bidding contractor's technical proposal, schedule and costs. This RFP may be cancelled for convenience.

The successful bidder will be paid incrementally based on their success in reaching milestones defined later in this section. All costs associated with the bid must be placed into the pricing format defined in Section 8 of the RFP.

5.1 Cleanup

The subcontractor shall at all times keep the construction area free from accumulations of waste material or rubbish resulting from his work. Upon completion of the work, the subcontractor shall remove from the vicinity of the work and haul all rubbish, trash, garbage, and construction debris to roll off located in Gladstone provided by ER. The roll off location is less than one mile from the work site and directly en - route from the site to town (Silverton). Additionally, the subcontractor shall remove from the vicinity all unused materials, and the like, belonging to the subcontractor or used under the subcontractor's direction during construction. Contractor personnel may not use the project property for housing.

5.2 Pricing Format

The Subcontractor shall design, construct, install, operate, and remove any and all necessary apprentices, meeting the specified criteria established for the site, based on information obtained by the subcontractor during the bidding process, and meeting performance specifications found in this RFP and future contract documents.

5.3 Disposal

ER shall be responsible for disposal of any and all "contaminated waste streams" generated during construction including all industrial wastes associated with bulkhead installation, if necessary.

6.0 Project Terms and Conditions

6.1. General

The Subcontractor shall provide all engineering, analytical, labor, materials, and equipment necessary for the scope of work provided above per the following specification attachments and references. No other work shall be performed unless written direction is provided by the authorized Environmental Remediation LLC representative in the form of a written Change Order.

The Subcontractor shall research any and meet all requirements of the State of Colorado as to design and constructions laws, and fully investigates and comply with the need / potential need for a Professional Engineer's review and stamp for project plans. This review shall be fully represented in your submitted schedule and costs.

6.1.1 Insurance Requirements

Minimum Insurance Requirements per each subcontractor utilized under this SOW:

- Minimum of \$1,000,000.00 Comprehensive General Liability Insurance
- Minimum of \$1,000,000.00 Automobile Liability Insurance
- Workers Compensation Insurance – Statutory
- Insurance Environmental Restoration, LLC, shall be named as additional insured.



- Requirement that Environmental Restoration, LLC be notified in writing a minimum of 30 days prior to any change in, or cancellation of any or all of policy
- Date of certificate must be current and dated within 30 days of receipt by ER LLC

6.2. Safety

The Subcontractor personnel and equipment shall comply with all safety requirements set forth in applicable State, Federal and local laws and regulations. The Subcontractor shall ensure that all its employees perform the work in a safe manner by conforming to the Subcontractors and ER's Health & Safety Plan.

The Subcontractor will be liable for any and all damages it causes to the premises and /or property including the costs due the any disruption of business operations to nearby facilities.

The Subcontractor shall obtain all permits, licenses, and other forms of documentation required for compliance with such laws and regulations.

The Subcontractor personnel and equipment shall comply with all safety requirements set forth in applicable State, Federal and local laws and regulations including the requirements in MSHA and OSHA. The Subcontractor shall ensure that its employees perform the work in a safe manner. The Subcontractor shall also supply all spill containment equipment, safety equipment and materials required to comply with this statement of work.

The Subcontractor shall adhere to the provided ER health and safety plan as well as provided site specific health and safety plan for underground mining operations to be submitted for inclusion with the ER site plan and approved by the ER's Safety Officer which identifies potential hazards, worker protection and procedures for the scope of work described in this RFP. As per the submitted site-specific health and safety plan, the person(s) identified in the plan shall administer (In complete coordination and absolute cooperation with ER) and implement the plan with Subcontractor personnel. The Site Health and Safety of all personnel is the number one priority for this and all ER projects and worksites. All other ER Health and safety rules shall be followed.

The Subcontractor's Health and Safety Plan must also incorporate all aspects of safety as it applies to providing a safe environment for traffic, residents, pedestrians, and the general local population.

6.3 Subcontractor Generated Waste

All efforts shall be made by the Subcontractor to minimize waste generated during the underground and surface operation. Any unnecessary wastes generated and disposal expenses including associated costs will be the responsibility of the Subcontractor. The Subcontractor shall supply all spill containment equipment, safety equipment and materials required to comply with this statement of work.

Any chemicals brought to the site by the Subcontractor must be accompanied by an MSDS. The Subcontractor shall be responsible for storage, and spill containment of any chemicals brought to the site.

In addition to any reporting requirements imposed by law, the Subcontractor shall report to the Response Manager all spills and personnel exposures involving any waste from this site. Such reports for these incidents shall first be reported by telephone or personal contact immediately, or in no event longer than 24 hours following discovery of the incident and followed up in writing no later than seven days after the initial report.

6.4 Personnel

The Subcontractors work and tasks shall be given the constant attention and diligence necessary to facilitate the successful progress thereof, and shall cooperate with the ER's Response Manager and the



EPA's representative in every way necessary to the successful completion of the project.

The Subcontractor shall have at the job site at all times as his agent a competent superintendent thoroughly experienced with the scope of work involved, and capable of executing directions of ER without delay, and to promptly supply such materials, equipment, tools, labor and other incidentals as may be required. This superintendent shall be posted to the project for the life of the subcontract, and shall not be removed or replaced without approval by the ER Response Manager. The Superintendent shall be an agent of the Subcontractor and shall be authorized by the Subcontractor to propose and execute change orders.

The Subcontractor will only provide qualified workers who have the necessary training and experience as required by the site specific Health and Safety Plan. If a Subcontractor employee does not abide by the specific project requirements, they shall be immediately discharged from the site and not allowed to return unless authorized by ER. Replacement cost from anyone discharged from the site shall not be a cost to ER.

6.5 Work Hours

Bidders should state their anticipated weekly work schedule in proposal. Bulkhead installation is anticipated to meet the schedule provided by the subcontractor regardless of local weather conditions. Because site activity is time sensitive, schedule will be one of the factors evaluated as part of the proposal evaluation process. Due to the remote location and costs of maintaining personnel, ER requests a Mon-Sat 6 day work schedule. Bidders should clearly state if they do not plan to work 6 days per week with a full work crew.

6.6 Administrative / Project Specific

The following conditions apply in addition to the work agreement.

6.6.1 Wages. All work activities performed at the site shall be considered Davis Beacon Act work (see attached DBA Wage Determination), unless described as Service Contract Act work by ER. This includes all sub-tiers. Final definition of SCA / DBA work elements will be defined at the site walk or through later email correspondence. Certified payrolls are required to be submitted weekly.

6.6.2 Reports. Daily Reports; The Subcontractor will be required to maintain and submit a daily activity log which, at a minimum briefly describes the work performed each day, a list of labor and equipment used, and any problems encountered. Final format of the Daily plan will be based on winning bidders example (as required as part of the technical submittal).

Weekly Reports; The subcontractor will be required to submit an electronic copy of the weekly reports no later than 7 days following week end, containing at a minimum the following data;

- ✓ Any monitoring/testing data including meaningful readings from field instrumentation, meters, gauges, and sensors
- ✓ Underground work conditions
- ✓ Summary of Data and interpretations, operations trends, areas of noncompliance and corrective actions.
- ✓ Summary of weekly performance, work performance and any areas of concerns or non-compliance.
- ✓ Planned / upcoming events
- ✓ Field and laboratory analytical data
- ✓ Calculations

Monthly Reports

- ✓ Electronic copy of updated Schedule (see schedule requirements in this RFP)

Final Report

- ✓ Contractor will provide an electronic or three hard copies of the final report documenting the work and the as-built specifications of the bulkhead. Include an executive summary providing an overview of the project, the technology implemented, deviations from the work plan, any conditions that may be necessary for protection of human health and environment following installation, supporting data including such things as field logs, well logs, laboratory reports, manifests, permits, etc.

6.6.3 **Submittals.** All submittals required for permitting, and design will be sent to the Response Manager or designated representative in a timely manner in order for ER timely comments and approval. Please note that up to 10 days may be required for some technical submittals. ER will not be responsible for late submission of necessary submittals. All technical letters, data, correspondence, permit documents, and submittals shall reference the project name and ER Job Number (RB8-62 and should include transmittal numbers for tracking.

6.6.4 **Flow-down Provisions.** The attachments to the RFP contain ER's general conditions and government-required Flow-down clauses that are applicable to all Subcontractors including sub-tiers. Please review this document carefully and return them signed with your bid. Failure to complete all Attachments of the RFP may cause the proposal to be considered non-responsive.

6.6.5 **Bonds.** The Subcontractor shall provide Treasury Listed performance and payment bonds upon award within 5 days after Notification to Proceed is issued via e-mail to the Subcontractor. ER is to be listed as the obligee with penal sums as follows:

- 100 % performance and payment bonds of the total bid amount

6.6.6 **Liquidated Damages.** The liquidated damage amount is hereby established as One Thousand Dollars (\$1000.00) for each calendar day of unauthorized delay in completion of the RFP defined work as per milestones defined and agree to within the bidders schedule, submitted as part of this proposal.

6.6.7 **Lien Waivers.** Lien Waivers are required for any subcontractors utilized and required in order to receive payment by ER.

6.6.8 **Permits.** Subcontractor warrants that it has in effect and will maintain all permits, licenses, governmental authorizations and approvals required for the scope of work prior to commencing work.

6.6.9 **Schedule.** The subcontract is a performance based Subcontract with requirements that must be met as specified in this document. Project schedule, in the form of a Gantt Chart, is required from bidders as part of the bid submittals. Monthly updates of the Gantt schedule will be required and reviewed with the ER Response Manager.

The Subcontractor is required to maintain the schedule once submitted and approved by ER. No relief from the submitted and approved schedule will be allowed due to Subcontractor delays without written approval prior to the delay.

Prior to contract approval and notice to proceed, the Subcontractor shall have agreed upon a project schedule with the ER for the orderly completion of all project activities. These activities will include design, design modifications (if necessary), planning permits and approvals, material procurement, system install, and site remediation. This schedule shall be in the form of a Gantt schedule as identified in the original technical proposal.

Subcontractor must show that the sequence of operations, construction procedures and use of labor, materials and equipment will, in the opinion of the ER / EPA, ensure satisfactory progress for completion of the work within the times specified and in accordance with the requirements of the contract. All revisions required under this section shall be completed within two (2) calendar weeks of the date of contract approval.

All schedules submitted should meet the following minimum requirements:

- The schedule shall consist of discreet activities, which accurately represent the Subcontractor's proposed method of completing the entire project. The Schedule shall be sufficiently detailed to enable the Superintendent to integrate their own activities with the Subcontractor's program.
- The award date shall be shown as the start date of the schedule.
- The duration of each activity shall have one time estimate, which shall be in calendar days.
- Each scheduled activity shall reference a specific portion of the work and shall accurately show location of work and other pertinent details.
- The schedules provided by the Subcontractor shall be updated and submitted to the ER Response Manager at the monthly progress meetings either in person or via conference call.

Milestones for events defined within Section 7.6.2 shall be represented in the Schedule.

6.6.10 Construction Management Plan. The Subcontractor shall, within two (2) weeks of Contract award, prepare a Construction Management Plan for the site. At a minimum this plan shall address the following issues:

- Mobilization of temporary facilities, utilities, and equipment
- Material and Equipment Storage Plan
- Health and Safety Plan (HASP) including all training certifications
- Site Sampling/Testing Plan incorporating the minimum sampling/testing requirements of any structure or media requiring sampling/testing confirmation.
- Site Security Plan
- Responsibilities of the individual team members, including Subcontractor coordination
- Project communications, project controls, and contract administration for record keeping protocols.
- Construction quality control procedures for personnel and Subcontractors, including monitoring, inspections, and audits
- Land disturbance issues including:
 - Erosion and sediment control
 - Storm water control



- Site dewatering
- Dust control
- Odor control
- Noise and vibration control
- Operating hours
- Traffic control
- Waste minimization
- Litter, contaminated material, and waste management
- Equipment cleanup/decontamination

- Contingency Plan
 - Emergency procedures: weather, fire, medical, evacuation, mine rescue, etc
 - 24 hour Emergency contacts / local contacts

- List of key personnel with resumes

- Miscellaneous environmental issues such as
 - Air quality
 - Storage of dangerous goods (fuel)
 - Access cleaning
 - Sanitation facilities

It should be noted that many components of the Construction Management Plan are required as submittals in response to this RFP.

6.6.11 Patents / Proprietary Equipment / Technologies

All submitted proposals will serve as sworn testimonial that bidders technologies do not infringe on patents that they are unauthorized to use, or do not have access to, for any reason. If such a patent infringement occurs the bidder / subcontractor will be fully liable for all legal fees, court costs, penalties, fines, and any and all other costs associated with the infringement and as incurred by Environmental Restoration L.L.C. or the USEPA.

Bidders are to clearly define what proprietary system components, if any, exist within their proposed system. Claims of proprietary equipment / technology will not serve as sufficient remedy for unclear or vague proposals.

6.6.12 No Discharge to Storm Sewer or Waterways

Discharge of any type is prohibited from entering storm sewers or waterways. Discharge to sanitary sewers is limited to discharge permitted by and within the permit levels of the local State Agency. It is bidder's responsibility to obtain all such permits.

Discharge of mine water is to enter the on-site retention pond, which will be constructed and maintained by ER.

6.6.13 Access to Work

Bidder shall train ER / EPA staff and subcontractors on access and shut down procedures for use in emergency circumstance.

Bidder to provide access to site for all ER / USEPA representatives as needed for monitoring, sampling, testing or any other site activity.



7.0 Instructions to Bidders

7.1 Schedule of Solicitation

The following is the schedule of the solicitation unless changed by an addendum/change order. NOTE; The Schedule, as proposed by the bidder as part of the response to the RFP, constitutes a significant component of the evaluation criteria for proposals.

RFP issuance	April 2015
Mandatory site walk / pre bid meeting	N/A
Bid due date	May 08, 2015
Award	May 22, 2015
NTP	10 days after award of contract
Bonds Due	5 days after NTP
Mobilization (Start)	July 2015
Completion by	September 30 2015

7.2 General Instructions

The contract documents will be made available to qualified Bidders. At his/her own expense and prior to submitting his proposal, each Bidder shall (a) examine the Contract Documents, (b) visit the site and determine the local conditions which in any way affect the performance of the Work including the prevailing wages and other pertaining cost factors, (c) familiarize himself/herself with all Federal, State, and local laws, ordinances, rules, regulations, and codes affecting the performance of the Work including the cost of permits and licenses required for the Work, (d) make such surveys and investigations as he may deem necessary for performance of the Work at his/her bid price within the terms of the contract documents, (e) and determine the character, quality, and quantities of the Work to be performed and the materials and equipment to be provided.

7.3 Bidders Responsibilities

It is the bidder's responsibility to obtain any and all technical or other information required to design and install their respective technical approach. Any and all data provided within this RFP or obtained verbally, written or otherwise from USEPA, Environmental Restoration L.L.C., Weston or their employees, Subcontractors or representatives shall be used for informational purposes only. ER assumes no responsibility or liability for the validity or accuracy of any information provided. This data includes but is not limited to contaminant types and concentrations, geological and soil data, lateral and vertical extent of contamination and all site specific data.

7.4 Questions during Bidding

Any questions or explanation desired by offerors regarding the proposal documents shall be put in writing to the Response Manager of this office, Attention, (b) (6), via e-mail (b) (6)@erllc.com) by COB April 13, 2015. All information supplied not already in the bid documents will be forward to all bidders per an addenda. Oral interpretations provided to offerors before award will not be binding.

7.5 Receipt of Proposal

Bids are due **May 08, 2015 at 3:00 PM MST**. Pricing shall be submitted on the attached Schedule of Pricing form attached to this RFP. Fax or e-mail bids shall be accepted with the original to follow via regular mail.

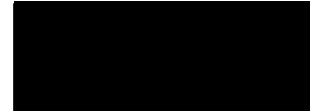


Pricing is required to be effective the duration of the contract.

Bidders shall submit three copies of their proposal.

A late proposal or modification of proposal may be grounds for elimination as a viable bid. Alternate proposals may be submitted but schedule may dictate little or no review of alternates.

Submit Proposals to: Environmental Remediation LLC
1666 Fabick Drive
St. Louis, MO 63026



**** Items to be submitted in the separate price proposal and technical proposal are as follows. Three copies are required and shall not be bounded. Any missing required documentation might cause rejection of proposal.

7.5.1 Price and Administrative Proposal

The following items must be submitted with the Price Schedule, Technical Proposal and Schedules:

- Proposal Form Cover Sheet
- Schedule of Pricing
- Executed ERRS Flow Downs & Representations and Certifications
- Insurance certificate naming ER as additionally insured
- Copy of Business License

7.6 Award of Subcontract

Bidders should note this is an EPA time-critical removal project and that bidder's inability to provide an aggressive, but realistic, schedule and demonstrated ability to provide all required resources on schedule, will be considered during the evaluation process. Be advised this RFP does not guarantee the work will be performed, and makes no guarantee on quantities. The actual quantities may be greater than or less than the quantity specified in the Scope of Work.

ER reserves the right, without qualification, to accept or reject any and all quotations, to award a subcontract as a result of this RFP, and to request additional clarifying information through written information on addenda's. All quotations should be submitted with the most favorable pricing. ER intends on awarding a "Best Value" subcontract based on a combination of technical proposal, past performance, references, schedule, and price.

ER and the USEPA reserve the right to ask for additional details and clarify technical proposals. Under no circumstance is ER's award of a contract to be construed as 'approval' of a technology or approach by either ER or the USEPA. Meeting the performance specification defined within this RFP remains the sole responsibility of the successful bidder.

Any exceptions to the RFP may cause the proposal to be rejected. Please ask all questions prior to submission of proposals and allow ample time for response. Due to project time constraints ER does not envision extending the proposed "due date" for proposals.

By submitting a Proposal the Bidder agrees/consents that ER in determining the successful bidder and their



eligibility for the award, may consider the Bidder's experience and facilities, conduct and performance under other contracts, financial condition, technical proposal, reputation in the industry, and other factors which could affect the Bidder's performance of the work.

7.7 Subcontractor List

Each bidder shall list in the spaces provided in the Proposal Form (1) the name and address of each Subcontractor proposed to perform any portion of the work described under this Request for Proposal if the total amount of the work exceeds 10% of the total Contract amount, and (2) the portion of the work to be performed by each Subcontractor.

8.0 Measurement and Payment

All items contained in the contract are herein defined and the manner and the method of measurement of any payment are described. The bid items on the Schedule of Pricing reflect the actual payment for all labor, equipment, materials and all other costs associated with the completion of the performance work and to be all inclusive of the complete scope of work. The costs shall include all incidentals such as engineering work, administrative work, mobilization, demobilization and miscellaneous costs. Payment will be made based on the bidder meeting the performance requirements specified.

Payment requests will be submitted and approved by the ER Response Manager based on the actual percentage of work performed in relation to performance and scheduled milestones. **Payments terms are 60 days after receipt and acceptance of a valid invoice.**

8.1 Measurement, Payment and Definitions

All items contained in the contract are herein defined and the manner and the method of measurement any payment is described. The bid items on the Schedule of Pricing reflect the actual payment for all engineering, labor, equipment, and materials in the project. Any work required for the successful completion of the work which is not itemized shall be considered incidental to the bid items.

Unbalanced bids, as determined through distribution of costs in historic costs using the same technology will either be returned for clarification or removed from consideration.

Bid Item 1.0 Mobilization

Upon receipt of the Notice to Proceed, the Subcontractor shall furnish, mobilize, move in, and install such temporary works and all safety equipment, supplies, and other items and equipment as are necessary for meeting safety regulations and the successful completion of the project work. The Subcontractor shall also operate and maintain such temporary works and equipment throughout the period of construction. All applicable temporary works shall fully comply with all rules and regulations. Subcontractor will need to plan site layout in coordination with ER and Weston's needs for water management.

1.1 Project Safety

OSHA has jurisdiction over workers and safety at this project, so the Subcontractor must be aware of all OSHA safety regulations that pertain to the work and jobsite. MSHA regulations are commonly referenced throughout this Bid Document where they are more stringent or more site-specific to underground mining tasks and operations. The Subcontractor must have a working knowledge of and follow all MSHA regulations governing underground-hardrock mining operations during the conduct of this project. **All of Subcontractor's employees working or entering underground MUST possess MSHA form 5023 40-hour underground hardrock miner training. Each piece of motorized underground equipment must conform to all applicable MSHA regulations.**

MSHA regulations will always be followed except in any cases where the equivalent OSHA rule is more stringent than MSHA. In case of accident or injury, OSHA has ultimate jurisdiction over workers and safety at this project.

The Mobilization Task includes establishment of all surface infrastructure, including placement of fire extinguishers, first aid kits, first-aid stretcher stations and flammable liquids storage, fuel storage, and all other MSHA required equipment and materials, including proper placarding and warning signs as required by MSHA regulations. Sanitation facilities and all MSHA first aid and safety equipment are required.

The Subcontractor will provide ER a safety inspection of the surface and underground work areas once they are established. The Inspection will be conducted by MSHA-certified inspectors of the Colorado Mine Safety and Training Program.

Copies of all proposed personnel safety certifications should be provided with the Health and Safety Plan. Certifications for personnel used after delivery of the HASP must be provided prior to the person being mobilized.

Costs for Bonds, Insurance, and preparation of the **Health and Safety Plan**, all safety equipment, required training, and establishment of safe operations on site shall also be included in the Mobilization Task. ER will not reimburse for additional training outside of initial mobilization costs.

1.2 Measurement and Payment for Mobilization

No measurement for payment shall be made for mobilization. Payment of full lump sum price bid will be made with the first monthly progress payment after completion of the work described above for mobilization.

Bid Item 2.0 Muck Working Areas

The first 300 feet of the main Red and Bonita crosscut heading and the first 25 feet of the 275-drift must be mucked-out. The floor of the mine has accumulated metal hydroxide precipitates and silt deposits to a thickness of up to three feet. The subcontractor will muck these deposits into the 300-plus gallon per minute mine discharge such that the deposits will flow out of the mine as a slurry, which will be routed to a water treatment system and retention ponds that will be operated by others. The subcontractor must coordinate mucking operations with the operator of the water treatment system (ER) such that the system is not overwhelmed and the discharge from the ponds is adequately clarified as determined by the EPA.

2.1 Measurement and Payment for Mobilization

Payment for mucking operations will be made on a daily rate. Bidders should include a daily rate in the schedule of pricing and provide a description of their proposed method of mucking the adit understanding that ER/EPA may limit production rates to allow for proper management of sediment loads.

Bid Item 3.0 Install Injection Pipe and remove Excess Vent Bag

The subcontractor will provide and install a 3/4-in. Schedule 40 PVC or HDPE injection pipe from the upstream end of the bulkhead to easternmost safely accessible location in the north heading of the Red and Bonita Mine shown on Figure 2 of the design. The injection pipe will have threaded connections and will be carried by hangers spaced every ten-feet installed in the back (roof) of the adit. The hangers will be installed into holes drilled into the mine roof and secured with epoxy or by using compression fittings. The injection pipe will be clamped to the hangers. At the bulkhead location, a stainless steel "Y" connection will be threaded to the injection pipe and will eventually be threaded to the 3/4-in. Schedule 40 water sampling and pressure measurement stainless steel pipe shown on the Plates. The other port on the "Y" connector will be fitted with a stainless steel check valve rated to 600 psi minimum

that will prevent backflow through the check valve during fluid injection operations and force injected fluid into the injection pipe. When injection is not occurring, the check valve will remain open to allow pressure reading and water sampling of the mine pool at the water side of the bulkhead. Approximately 700-feet of injection pipe will be required, with sufficient hangers, clamps, angles and fittings to route the pipe to the east end of the adit.

Currently, vent bag is installed for approximately 400' beyond the bulkhead location. Subcontractor shall remove the vent bag beyond the bulkhead location and bring it to the surface and relinquished to ERLLC. It is hoped that the vent bag can be reused on future projects, so care should be taken during removal to avoid damage if possible.

3.1 Measurement and Payment

No measurement for payment shall be made for installing the injection pipe. Payment will be made by lump-sum in accordance with the amount bid on the Bid Schedule. The bid amount must include all of the Subcontractor's cost of whatever nature to perform the task as required, including all costs for labor, tools, equipment, supplies, materials, taxes, permits and fees.

Bid Item 4.0 Construct Two Upstream Cofferdams

The upstream end of the bulkhead will be sited as close to the intersection of the main crosscut heading and the 275-drift as possible. Construct upstream concrete or plastic sheeting covered sandbag cofferdams in the main crosscut beyond Station 2+75, and in the 275-drift, at locations chosen by the subcontractor. The cofferdams will have a height at least 3-ft. above the existing adit floor. Water passing under, around or through the cofferdams must be eliminated in order to facilitate construction and concrete filling of the bulkhead form. Include a 8-in. nominal inside diameter, Schedule 40, type 316-stainless steel bypass pipe penetration through the cofferdam centered approximately 1-ft. 6-in. above the tunnel rock invert (floor), a minimum of 1-ft. 6-in. below the top of the cofferdam, and extending at least 1-ft. into the upstream pond. The pipe inlet will be protected from blockage by a fully-enclosed screened metal trash rack or perforated plastic pipe connected to the bypass pipe that rises at least 2-ft. above the top of the cofferdam.

4.1 Measurement and Payment

No measurement for payment shall be made for constructing the cofferdams. Payment will be made by lump-sum in accordance with the amount bid on the Bid Schedule. The bid amount must include all of the Subcontractor's cost of whatever nature to perform the task as required, including all costs for labor, tools, equipment, supplies, materials, taxes, permits and fees.

Bid Item 5.0 Install Bypass Pipe

The entire length of the construction bypass pipe from cofferdam inlets to the downstream outlet shall be completed using threaded connections throughout, before starting construction of the bulkhead forms. A "Y" connector will be required to combine the pipes from each coffer dam into a single pipe through the bulkhead location. Clearing the broken rock ballast below the bypass pipe alignment through the bulkhead construction area is required so that the entire length of, 8-in. nominal inside diameter (ID), Schedule 40, type 316-stainless steel pipe, stainless steel fittings and fixtures through the bulkhead and the 8-in. stainless steel gate valve can be supported from solid rock at approximately 5-ft. intervals along the pipe. Steel rebar chairs or solid concrete blocks are to be utilized for pipe support within the bulkhead and stabilized by wire ties to resin anchored eyebolts embedded approximately 1-ft. into the floor and adjacent rib. All bypass pipe tie-downs must be able to resist uplift force generated during concrete placement in bulkhead forms. If the pipe supports or wire ties within the bulkhead are disturbed during construction of the bulkhead forms they shall be reinstalled before the final bulkhead form inspection and filling.

A temporary 8-in. diameter steel, wrought iron, HDPE or other downstream (air side) water diversion pipe must be completed, connected and functioning to bypass the flow of acid mine drainage before

starting work on the bulkhead forms. See plans and sections noted above. The length of the water diversion tail-pipe must extend to the portal and be installed prior to constructing the forms. The permanent connection between the stainless steel pipe and gate valve shall include Teflon tape, or other thread sealant.

The 8-in. stainless steel pipe through the bulkhead will include two (2) 14.5-in. by 14.5-in. square, 1/2-in. thick stainless steel thrust plate/water-stops that have been continuously fillet welded, on both sides of the plates, around the bypass pipe 4-ft. and 11-ft. inside the bulkhead from the water side (upstream) bulkhead form. The 8-in. stainless steel gate valve should be centered approximately 2-ft. from the air side (downstream) face of the concrete bulkhead.

5.1 Measurement and Payment

No measurement for payment shall be made for installing the bypass pipe. Payment will be made by lump-sum in accordance with the amount bid on the Bid Schedule. The bid amount must include all of the Subcontractor's cost of whatever nature to perform the task as required, including all costs for labor, tools, equipment, supplies, materials, taxes, permits and fees..

Bid Item 6.0 Prepare Bulkhead Location, Construct Forms and Install Accessories and Pump Grout

Prepare Rock Surfaces in Bulkhead Location

Scale loose rock from the roof and walls, exposing fresh, clean and sound rock. The mine rails, if present and all broken rock ballast and ties will be removed from the floor in the bulkhead construction area, in the vicinity of Station 2+75. Solid rock will be exposed by scaling, prying up loose rock, and washing the floor and ribs clean to permit measuring the maximum tunnel height and width through the length of the bulkhead location. Four drill holes into the ribs of the adit (2-in. diameter, 12-foot long) must be grouted full with Type V neat cement grout at a minimum pressure of 90 psi.

Bulkhead Surface-Profiling

After scaling and washing are completed and loose rock, ballast, ties, and rail are removed, the bulkhead area will be inspected, measured and profiled in reference to tunnel centerline on 0.5 -ft. stationing. The profiling is to verify that the bulkhead design parameters remain valid, and to verify measurement for payment of Concrete placement. The rock surface irregularity along a parallel marked string-line shall be profiled along each tunnel rib, the back (roof) and the floor on 0.5 -ft. stationing. The EPA shall inspect the rock surfaces for geologic structures and weaknesses that could compromise the design. Two copies of the completed bulkhead surface profile shall be provided to ER.

Once the bulkhead area has been approved by EPA, complete work as specified in sections 2.0 through 7.3. **Note: ER will provide the electronics specified in Attachment C pages 33 through 36. Subcontractor will be responsible for installation in accordance with instructions/manuals provided with the components.**

6.1 Measurement and Payment

No measurement for payment shall be made for bid item Prepare Bulkhead Location, Construct Forms and Install Accessories and Pump Grout. Payment of full lump sum price bid will be made with the first monthly progress payment after completion.

Bid Item 7.0 DeNeef Tube Grouting

In addition to contact grouting, DeNeef tubes will be installed and grouted to reduce any additional leakage along the concrete/bedrock contact. Subcontractor must use DeNeef products or approved equivalent as described in the technical specifications. Proposed alternatives will be evaluated by EPA/DRMS. DeNeef tube grouting shall not take place until all contact grout operations have been completed. A representative for DeNeef shall be present during grouting.



7.1 Measurement and Payment

No measurement for payment shall be made for DeNeef Tube Grouting. Payment of full lump sum price bid will be made with the first monthly progress payment after completion.

Bid Item 8.0 Demobilization

Upon completion of the work under this Contract, the Subcontractor shall remove forms, all temporary facilities, underground temporary infrastructure, and equipment. The Subcontractor shall remove from the work site all rubbish, unused materials, and shall fill and dress all holes and disturbances made for convenience, and leave all areas in good order and condition, subject to the approval of the ER Response Manager and the USEPA On-site Coordinator.

8.1 Measurement and Payment

No measurement for payment shall be made for Demobilization. Payment of full lump sum price bid will be made with the first monthly progress payment after completion of the work described above for demobilization.

Bid Item 9.0 Bond Cost

The mandatory 100% Performance and Payment Bond price will be provided as a lump sum item. Original signed bonds are to be provided within 5 business days to the ER Program Manager [REDACTED] in ERs Saint Louis office. Additionally if for any reason the price were to increase additional bond coverage will be required.

9.1 Measurement and Payment

No measurement for payment shall be made for bonds. Payment of full lump sum price bid will be made with the first monthly progress payment after submission of bonds.

9.0 Final Inspection

Before final acceptance, all ground occupied by the Subcontractor shall be cleaned of all rubbish, excess materials, temporary structures, equipment, and all parts of the work site shall be left in a neat and presentable condition. This work shall be done to the satisfaction of the ER Response Manager. A final inspection of the work site shall be done by the ER Response Manager and the Subcontractor for final acceptance of the work.

A final punch list shall be made by ER and the Subcontractor during the final inspection which will detail to fully outline to the Subcontractor:

- a) Work to be completed, if any;
- b) Work not in compliance with the drawings or specifications, if any;
- c) Unsatisfactory work for any reason, if any.

Any deficiencies found during this final inspection shall be identified in writing from the ER Response Manager, and corrected immediately by the Subcontractor.

Final payment to the Subcontractor shall be made in accordance with the ER work Agreement and receipt of lien waivers.



ATTACHMENT A
PROPOSAL FORM COVER SHEET

To:	Environmental Remediation LLC	From:	
	1666 Fabick Dr.		(company name)
	St. Louis, MO 63026		(street address, city, state and zip)
			(telephone number)
<hr/>			
Site Name:	Red & Bonita Mine Bulkhead Construction #: RB8-62		
Location:	Gladstone Area, Silverton, San Juan County, CO		

The Subcontractor proposes to provide all engineering, labor, materials, and equipment necessary for the scope of work provided above and per Request for Proposal RB8-62 Bulkhead and all attached drawings and specifications relative to the terms and conditions provided for the consideration of the bid prices provided herein on the pricing schedule.

The Subcontractor agrees they have examined the RFP and the extent of the scope of work, have examined the any provided drawings, specifications, attachments, and examined and understands all existing local conditions relative to site access, city codes and permits, hazards, labor, and any other conditions affecting, or which may be effected by, the scope of work.

The Subcontractor acknowledges receipt of the following addenda:

Addenda # _____



ATTACHMENT B
SCHEDULE OF PRICING

RFP# RB8-62BULKHEAD				Red & Bonita Mine
ITEM	DESCRIPTION	EST. VOLUME	\$ PER UNIT	TOTAL
1.0	Mobilization	Lump Sum	\$	\$
2.0	Muck working areas	6 days	\$	\$
3.0	Install injection pipe	Lump Sum	\$	\$
4.0	Construct two cofferdams	Lump Sum	\$	\$
5.0	Install bypass pipe	Lump Sum	\$	\$
6.0	Prepare Bulkhead Location, Construct Forms and Install Accessories and Pump Grout	Lump Sum	\$	\$
7.0	DeNeef Grout	Lump Sum	\$	\$
8.0	Demobilization	Lump Sum	\$	\$
9.0	Bond cost		\$	\$
10.0	Total Cost (Items 1 through 6)			\$
11.0	List of equipment provided. Fill out attached form			
12.0	Provide details of three similar projects bidder has completed involving the construction of flow through bulkheads			

Note: All charges, including up to five required onsite meetings for both superintendent and senior engineer, anticipated to be part of completion of the scope of work, should be included in the above bid. These charges include such items as all applicable taxes, license fees, handling fees, etc.

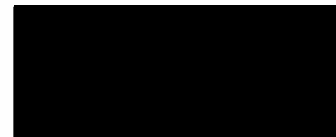
Unbalanced bids, as determined through comparing bids to distribution of historic costs using the same technology, will either be returned for clarification or removed from consideration, at the sole discretion of ER.

Company Name:	Date:
Project / Technical Contact:	Phone:
EPA ID #:	

Please refer to RFP# RB8-62BULKHEAD regarding correspondence to your quotation. Any questions please contact the representatives below. Bid Due date defined within RFP.

Submit Proposals to: Environmental Remediation LLC
1666 Fabick Drive
St. Louis, MO 63026

Attention:





ATTACHMENT C
TECHNICAL SPECIFICATIONS

Red and Bonita Mine Bulkhead Construction Requirements and Specifications

Prepared for the United States Environmental Protection Agency
by
The Colorado Division of Reclamation, Mining and Safety
Inactive Mine Reclamation Program

PROJECT LOCATION

The Red and Bonita Mine is located on the east side and approximately 200 vertical feet above Cement Creek, ten miles north of Silverton, in San Juan County, Colorado (Figure 1). The site is accessed from Silverton via County Road 110, north 6.4 miles to County Road 52, then County Road 52 northbound along the east side of Cement Creek to the Red and Bonita Mine.

WORK SUMMARY

The project work will involve construction of a hydraulic bulkhead in the Red and Bonita adit. Bulkhead construction will consist of ventilation of the working area of the mine to minimum 19.5 percent oxygen at all times (vent bag has been installed to the bulkhead location), mucking out sections of the adit, coffer dam construction, bypass pipe installation, cleaning and scaling at the bulkhead location, inner and outer bulkhead form construction, placement of concrete in formwork, and bulkhead contact grouting after the concrete has cured. The PROJECT MANAGER, as that term is used in this document, shall be the U.S. Environmental Protection Agency On Scene Coordinator, or the On Scene Coordinator's designee.

PROJECT WORK DESCRIPTION

ITEM 1.0: PREPARE BULKHEAD LOCATION AND BYPASS PIPE

Preparation of the Bulkhead Location includes construction of the upstream cofferdams, installation of the bypass pipe, and cleanup, scaling and preparation of the bulkhead location, all in accordance with these specifications, and drawings as follows:

- ◆Plate 1. Longitudinal Cross Section of Forms, Steel Beam Supports and Contact Grout Holes,
- ◆Plate 2. Plan View of Bulkhead Forms with Steel Beam Supports,
- ◆Plate 3. Air Side Form Face,
- ◆Plate 4. Air Side #9 Rebar Cage Plus Contact Grout Holes

Muck working areas of Red and Bonita Mine

The first 300 feet of the main Red and Bonita crosscut heading and the first 25 feet of the 275-drift must be mucked-out (Figure 2). The floor of the mine has accumulated metal hydroxide precipitates and silt deposits to a thickness of up to three feet. The CONTRACTOR will muck these deposits into the 300-plus gallon per minute mine discharge such that the deposits will flow out of the mine as a slurry, which will be routed to a water treatment system and retention ponds that will be operated by others. The CONTRACTOR must coordinate mucking operations with the operator of the water treatment system such that the system is not overwhelmed and the discharge from the ponds is adequately clarified as determined by the PROJECT MANAGER.

Install Injection Pipe

The CONTRACTOR will provide and install a 3/4-in. Schedule 40 PVC or HDPE injection pipe from the upstream end of the bulkhead to easternmost safely accessible location in the north heading of the Red and Bonita Mine shown on Figure 2. The injection pipe will have threaded connections and will be carried by hangers spaced every ten-feet installed in the back (roof) of the adit. The hangers will be installed into holes drilled into the mine roof and secured with epoxy or by using compression fittings. The injection pipe will be clamped to the hangers. At the bulkhead location, a stainless steel “Y” connection will be threaded to the injection pipe and will eventually be threaded to the 3/4-in. Schedule 40 water sampling and pressure measurement stainless steel pipe shown on the Plates. The other port on the “Y” connector will be fitted with a stainless steel check valve rated to 600 psi minimum that will prevent backflow through the check valve during fluid injection operations and force injected fluid into the injection pipe. When injection is not occurring, the check valve will remain open to allow pressure reading and water sampling of the mine pool at the water side of the bulkhead. Approximately 700-feet of injection pipe will be required, with sufficient hangers, clamps, angles and fittings to route the pipe to the east end of the adit.

Construct Two Upstream Cofferdams

The upstream end of the bulkhead will be sited as close to the intersection of the main crosscut heading and the 275-drift as possible. Construct upstream concrete or plastic sheeting covered sandbag cofferdams in the main crosscut beyond Station 2+75, and in the 275-drift, at locations chosen by the CONTRACTOR. The cofferdams will have a height at least 3-ft. above the existing adit floor. Water passing under, around or through the cofferdams must be eliminated in order to facilitate construction and concrete filling of the bulkhead form. Include a 8-in. nominal inside diameter, Schedule 40, type 316-stainless steel bypass pipe penetration through the cofferdam centered approximately 1-ft. 6-in. above the tunnel rock invert (floor), a minimum of 1-ft. 6-in. below the top of the cofferdam, and extending at least 1-ft. into the upstream pond. The pipe inlet will be protected from blockage by a fully-enclosed screened metal trash rack or perforated plastic pipe connected to the bypass pipe that rises at least 2-ft. above the top of the cofferdam.

Install Bypass Pipe

The entire length of the construction bypass pipe from cofferdam inlets to the downstream outlet shall be completed using threaded connections throughout, before starting construction of the bulkhead forms. A “Y” connector will be required to combine the pipes from each coffer dam into a single pipe through the bulkhead location. Clearing the broken rock ballast below the bypass pipe alignment through the bulkhead construction area is required so that the entire length of, 8-in. nominal inside diameter (ID), Schedule 40, type 316-stainless steel pipe, stainless steel fittings and fixtures through the bulkhead and the 8-in. stainless steel gate valve can be supported from solid rock at approximately 5-ft. intervals along the pipe. Steel rebar chairs or solid concrete blocks are to be utilized for pipe support within the bulkhead and stabilized by wire ties to resin anchored eyebolts embedded approximately 1-ft. into the floor and adjacent rib. All bypass pipe tie-downs must be able to resist uplift force generated during concrete placement in bulkhead forms. If the pipe supports or wire ties within the bulkhead are disturbed during construction of the bulkhead forms they shall be reinstalled before the final bulkhead form inspection and filling.

A temporary 8-in. diameter steel, wrought iron, HDPE or other downstream (air side) water diversion pipe must be completed, connected and functioning to bypass the flow of acid mine drainage before starting work on the bulkhead forms. See plans and sections noted above. The

length of the water diversion tail-pipe must extend to a discharge location outside the adit portal selected by the PROJECT MANAGER. The permanent connection between the stainless steel pipe and gate valve shall include Teflon tape, or other thread sealant.

The 8-in. stainless steel pipe through the bulkhead will include two (2) 14.5-in. by 14.5-in. square, 1/2-in. thick stainless steel thrust plate/water-stops that have been continuously fillet welded, on both sides of the plates, around the bypass pipe 4-ft. and 11-ft. inside the bulkhead from the water side (upstream) bulkhead form. The 8-in. stainless steel gate valve should be centered approximately 2-ft. from the air side (downstream) face of the concrete bulkhead.

Prepare Rock Surfaces in Bulkhead Location

Scale loose rock from the roof and walls, exposing fresh, clean and sound rock. The mine rails, if present and all broken rock ballast and ties will be removed from the floor in the bulkhead construction area, in the vicinity of Station 2+75. Solid rock will be exposed by scaling, prying up loose rock, and washing the floor and ribs clean to permit measuring the maximum tunnel height and width through the length of the bulkhead location. Four drill holes into the ribs of the adit (2-in. diameter, 12-feet long) must be grouted full with Type V neat cement grout at a minimum pressure of 90 psi.

Bulkhead Surface-Profiling

After scaling and washing are completed and loose rock, ballast, ties, and rail are removed, the bulkhead area will be inspected, measured and profiled in reference to tunnel centerline on 0.5 -ft. stationing. The profiling is to verify that the bulkhead design parameters remain valid, and to verify measurement for payment of Concrete placement. The rock surface irregularity along a parallel marked string-line shall be profiled along each tunnel rib, the back (roof) and the floor on 0.5 -ft. stationing. The PROJECT MANAGER shall inspect the rock surfaces for geologic structures and weaknesses that could compromise the design. A copy of the completed bulkhead surface profile shall be provided to the PROJECT MANAGER.

ITEM 2.0: CONSTRUCT UPSTREAM BULKHEAD FORM

Construct the upstream (waterside) bulkhead form. No. 1 grade Douglas Fir, or equivalent, is required for the timber lagging, post and sill supports. This form design is based on designs that have previously proven successful.

Construction of the upstream bulkhead shall be in accordance with these specifications, and drawings as follows:

- ◆Plate 1. Longitudinal Cross Section of Forms, Steel Beam Supports and Contact Grout Holes,
- ◆Plate 2. Plan View of Bulkhead Forms with Steel Beam Supports,
- ◆Plate 3. Air Side Form Face,
- ◆Plate 4. Air Side #9 Rebar Cage Plus Contact Grout Holes

The contractor may alter the construction sequence or specifications for the form work only with prior approval of the PROJECT MANAGER, providing a demonstration to the PROJECT MANAGER's satisfaction that the integrity of the final reinforced concrete bulkhead is not compromised.

The upstream bulkhead form construction sequence is as follows:

2.1 Cut a roughly level slot perpendicular to the tunnel axis, directly across the floor for the approximately 9-ft. long W 4x13 steel sill beam. Smooth irregularities in the slot using concrete grout as necessary. The sill beam will be cut in the field to assure that both ends of the beam are in close proximity, less than 1-in., of the tunnel wall on each end, assuring that the base of the outer 8-in. x 8-in. posts (or the four 2-in. x 10-in. composite posts) will bear against one flange of the W 4x13 beam. This is essential because the sill beam will align the three 8-in. x 8-in. posts across the tunnel on the water side form. The central 8-in. x 8-in. post shall be no more than 2-ft. 11-1/2-in. apart, center-to-center or 2-ft. 4-in. skin-to-skin. The recommended minimum center-to-center distance between the central post and one of the side posts is 2-ft. 7-1/2-in. or 2-ft. 0-in. skin-to-skin. This minimum spacing permits minimal access through the bulkhead form to the cofferdam, if required. The maximum 2-ft. 4-in. skin-to-skin distance between posts is, controlled by the strength of the 3 x 10-in. nominal (2-1/2 x 9-1/4-in. dressed) lagging.

2.2 Two 1-3/8-in. or 1-1/2-in. diameter holes will be drilled at least 6-in. apart, directly in line in front of the beam, three foot deep into the floor rock at each end of the beam. The holes will contain Grade 75 #8 resin-grouted threadbar dowels. The threadbar dowels are to project at least 3-in. upward through holes cut through the 6-in. leg of an at least 1-ft. long L 6x4x1/2 angle bracket. Threadbar nuts with washers will be attached and tightened to restrain the beam during filling of the form. The locations are as close as reasonable to the ends of the beam, as indicated on attached plates.

2.3 Stand the central 8-in. x 8-in. roof-to-floor post vertically near the tunnel centerline. Stand the two outside posts to minimize the distance the 3-in. x 10-in. lagging is cantilevered beyond the outside posts and as close as reasonably possible, but not more than 6-in.. The outside posts can be tilted to reduce the cantilevered distance, but only to the extent that the open span between the central post and the outside post does not anywhere exceed 2-ft. 4-in.

Hitches are to be cut into the back and floor for all posts to provide relatively flat bearing surfaces. Wedges will be used as needed to further tighten the posts. Bolt a 9-in. long 6-in. x 4-in. angle iron (L6x4x1/2) to the roof on the upstream side and against the top of each 8-in. x 8-in. post with one #8 fully resin-grouted threadbar un-tensioned dowels embedded at least 3-ft. into holes into the roof. Threadbar nuts with washers will be attached and tightened to restrain the post during filling of the form. See the attached plates.

2.4 Position the center of a cut-to-fit approximately 6-ft. long W 6x20 beam 2-ft. up from the floor of the tunnel and across the upstream face of the three 8-in. x 8-in. or the composite 4 each 2 x 10-in. posts. This is indicated on attached plates. Securely fasten the beam to all three posts, possibly with a lag screw anchored plate or bracket. Two 8-in. long L6x4x1/2 angle-iron will be fillet welded to beam, before the beam is taken into the tunnel, to stiffen the central post. If it is possible to determine the positions of the outer posts before moving the beam into the tunnel similar angles should be fillet welded to also brace the outer posts. These short angles are indicated on the attached plates.

2.5 Position the center of a similar cut-to-fit approximately 6-ft. long W 6x20 beam 4-ft. 6-in. up from the floor of the tunnel and across the upstream face of the three 8-in. x 8-in. or the composite 4 each 2 x 10-in. posts. This is indicated on attached plates. Securely

fasten the beam to all three posts, possibly with a lag screw anchored plate or bracket. Two 8-in. long L6x4x1/2 angle-iron will be fillet welded to beam, before the beam is taken into the tunnel, to stiffen the central post. If it is possible to determine the positions of the outer posts before moving the beam into the tunnel similar angles should be fillet welded to also brace the outer posts. These short angles are indicated on the attached plates.

2.6 Position the top of the third cut-to-fit 6-ft. long W 6x20 beam 6-ft. 9-in. up from the floor of the tunnel and across the upstream face of the three 8-in. x 8-in. or the composite 4 each 2 x 10-in. posts. This is indicated on the attached plates. Securely fasten the beam to all three posts, possibly with a lag screw anchored plate or bracket. Two 8-in. long L6x4x1/2 angle-iron will be fillet welded to beam, before the beam is taken into the tunnel, to stiffen the central post. If it is possible to determine the positions of the outer posts before moving the beam into the tunnel similar angles should be fillet welded to also brace the outer posts. These short angles are indicated on the attached plates.

2.7 Tunnel rib brackets, roughly 1-ft. 2-in. long L6x4x1/2 angle iron, anchored with two fully resin-grouted Grade 75 threadbar bolts in 1-3/8-in. or 1-1/2-in. diameter holes drilled 4-ft. deep and approximately 7-1/2-in. apart into the ribs at positions centered approximately 2-in. above and 2-in. below both ribside ends of the three W 6x20 beams. The rib brackets will also be centered approximately 2-ft., 4-ft. and 6-ft. above the floor. The irregularity of the tunnel ribs will necessitate individually installing the angle iron rib brackets. The attached plates indicate the bracket and locations. The #8 resin-grouted threadbar bolts are to project upward at least 3-in. through holes cut through the 6-in. leg of a L 6x4x1/2 angle bracket. Threadbar nuts with washers will be attached and tightened to support the design loading on the beam ends during filling of the form.

2.8 Bolt an approximately 8-in. long 6-in. x 4-in. angle iron (L6x4x1/2) to the roof on the upstream side and against the top of each 8-in. x 8-in. post with one #8 fully resin-grouted threadbar dowel embedded at least 3-ft. into a hole drilled in the roof. Threadbar nuts with washers will be attached and tightened to restrain the post during filling of the form. See attached plates.

2.9 The PROJECT MANAGER will make a final inspection of the waterside cofferdam, bypass pipe, W 4x13 sill beam, posts, W 6x20 bulkhead support beams, bolting and angle iron brackets will be inspected and must be approved before proceeding.

2.10 Place individual 3-in. x 12-in. nominal (2-1/2-in. x 11-1/4-in. dressed) or 2-in. x 4-in. (1-1/2-in. x 3-1/2-in. dressed) boards laid flat as lagging (form planks) from tunnel rib to tunnel rib, completely across the tunnel and against the 8-in. x 8-in. post supports, starting at the floor. The lagging boards are to be individually cut to fit the ribside profile. The lagging is to be stacked skin-to-skin on top of each other from the floor to the roof. The lowest and uppermost pieces of lagging will have to be cut to fit the floor and back profiles. The uppermost piece of lagging will require additional restraint between the posts by the #8 resin-grouted threadbar bolt brackets, indicated on the attached plates.

Wherever it is not possible to span the tunnel width with a single piece of lagging the lagging pieces will be butted together at the center of one of the central post. Lag bolt or nail each continuous piece of 3-in. x 12-in. lagging to at least two posts. Wherever possible wedges are to be driven between the ends of each piece of 3-in. x 12-in. lagging and the adjacent tunnel ribsides from the water side, before the next piece of lagging is cut to fit, placed, and fastened. If 2-in. x 4-in. lagging is employed the individual boards will

have to be nailed to the underlying board and the stack fastened to the central posts approximately every 12-in. Wedges are to be driven from the water side wherever gaps develop between the boards and the adjacent rock to tighten and support the cantilevered ends.

The pieces of lagging that contain the 8-in. nominal ID (4.500-in. OD) Schedule 40 stainless steel bypass pipe will have to be cut or slotted to fit as closely as possible around the bypass pipe, caulked and reinforced as necessary. Similarly, the lagging penetration for the upstream portion of the 3/4-in. nominal ID (1.050-in. OD) Schedule 40 water sampling and pressure measurement stainless steel pipe through the water side bulkhead needs to be drilled or cut, caulked and reinforced as necessary. The 3/4-in. pipe is to be positioned no closer than 2-ft. from either tunnel rib and at least 3.5-ft. up from the floor. The 3/4-in. pipe can contain two, at most, threaded union connections within the bulkhead provided these permanent connections include Teflon tape, or other thread sealant.

Drive or inject caulking material continuously between the lagging and the rock around the perimeter of the bulkhead form and the tunnel rock. Before the last of the lagging is placed between the central posts the final inspection of the cofferdam and bypass water inlet through the access opening must be performed. After that inspection, close the access opening.

2.11 Provide and install vibrating wire piezometer, cabling and data logger. CONTRACTOR will provide and install rst Instruments model PPA0094, 5.0 MPa piezometer, 300-FT. of armored cable, and model DT2055B ten-channel data logger as directed by the PROJECT MANAGER. **Armored cable is required.** Information on the rst Instruments equipment is included as Appendix D. Equivalent equipment from alternative manufacturers is acceptable if approved by the PROJECT MANAGER.

The piezometer will be hung on the water side of the bulkhead form and cable strung through the bulkhead location such that it will not be damaged during pouring of the concrete bulkhead. The cable will then be run on existing or newly installed hangers to the adit portal, and connected to the data logger installed in a secure location designated by the PROJECT MANAGER.

2.12 Nail the 1/2-in. thick plywood, or particle board, against the inner form face of the lagging (form planks). The plywood, or particle board, will have to be cut to fit the tunnel roof, ribs and floor perimeter profiles and around the bypass and water sampling and pressure measurement pipes.

Drive or inject caulking material into open spaces and continuously between the plywood, or particle board, and the rock around the perimeter of the tunnel.

2.13 Install DeNeef tube as described in Item 10.1.

2.14 Erect the two-way, shrinkage and temperature, 12-in. center-to-center, waterside, #6 rebar cage, with minimum 3.5-in. and maximum 9-in. clearance from the plywood form face, for eventual concrete cover as long-term protection against potential sulfate attack.

2.15 Stockpile the #9 steel reinforcing bars, 1/2-in. plywood or particle board and 3-in. x 12-in. or 2-in. x 4-in. lagging for the air side bulkhead form and the 3/4-in. Schedule 40 stainless water sampling and pressure measurement pipe sections necessary to complete

the water sampling and pressure measurement pipe in the bulkhead construction area before proceeding with construction of the air side bulkhead form.

ITEM 3.0: CONSTRUCT DOWNSTREAM BULKHEAD FORM

Construct the downstream (air side) bulkhead form. No. 1 grade Douglas Fir, or equivalent, is required for the timber lagging, post and sill supports. This form design is based on designs that have previously proven successful.

The downstream bulkhead form is nearly a mirror image of the upstream form. **The construction sequence for ITEM 3.0 principally repeats ITEM 2.0 as set forth above.** The same drawings as referenced in Item 2.0 above shall govern this section of the work. There are certain differences in the form and rebar cage construction as shown on the drawings, and in construction procedures as described in this section as follows:

3.1 It will not be possible to close the access opening through the two central posts into the bulkhead until:

- a) The lagging, except for the access opening, is erected, wedged tight from the air side and caulked to the adjacent rock,
- b) The air side lagging is fitted, caulked and reinforced around the 8-in. bypass pipe and the air side water sampling and the 3/4-in. water sampling and pressure measurement pipe penetration are made through the lagging.
- c) The plywood or particle board is nailed to the lagging outside the access opening with a penetration hole for the 3/4-in. water sampling and pressure measurement pipe and the pipe sections then connected and inserted through the form, caulked and reinforced,
- d) The concrete form release compound is applied to the plywood or particle board outside the access opening,
- e) The two-way #9 rebar cage is erected, on 9-in. spacing, center-to-center, with minimum 3.5-in. and maximum 9-in. of clearance from the plywood form face, as long-term protection against potential sulfate attack, outside the access opening area,
- f) The vertical #9 rebars in front of the access opening are tied to the lowest horizontal bar and temporarily tied to the vertical bars alongside the access opening,
- g) The horizontal #9 bars, that will eventually be positioned in front of the access opening, will be hung from the uppermost horizontal bar, that has been carefully tied into all crossing vertical bars, so that the other two or three bars can be lowered into their final positions and tied into the cage from outside the access opening,
- h) The PROJECT MANAGER's final inspection of the interior of the bulkhead to verify that the bulkhead forms, rebar cages, and pipes have been constructed as designed and the rebar cages and pipes are placed, supported and tied down as specified and
- i) A final wet vacuum cleaning of the bulkhead floor has been completed immediately before starting to fill the bulkhead form.

3.2 NOTE: Pulling and lowering the rebar into position in front of the access opening and closing the access opening between the two central posts by inserting the lowest piece of precut lagging, complete with the plywood and form releasing compound, can only begin when the concrete filling of the form approaches that level of the lowest open lagging position. This delay is necessary in case there is a breakdown of some kind requiring entry into the bulkhead form.

ITEM 4.0 INSTALL AND REMOVE CONCRETE PUMPING AND CONVEYANCE SYSTEM

The bulkhead concrete will be pumped from the base of the mine waste rock dump through a slick-line. The contractor shall furnish and install a concrete pumping and conveyance system that is sufficient and capable of handling the pressures and pumping dynamics associated with the physical project constraints and the project requirements. The pump must be capable of pumping the mix at a sufficient pressure to completely fill the bulkhead forms. The pumping and conveyance system must be sized, configured and installed to prevent blockages (i.e. through appropriate line sizing and pre-screening concrete ahead of the pump), and allow fast and easy cleanout of blockages if they occur.

After the concrete is placed into the bulkhead forms, the Contractor shall remove the temporary conveyance system including removal of all piping and hoses.

ITEM 5.0 PROVIDE AND PLACE CONCRETE INTO BULKHEAD FORM

The CONTRACTOR shall fill the bulkhead form as a monolithic, single pour by continuously pumping the form full with approximately 27-cu.yd. of 4,000psi concrete. The profiling completed under Item 1.0 will be the basis for calculating the actual cubic yard volume for concrete required.

The CONTRACTOR must use the concrete mix design in Appendix A for 4,000 psi, self compacting concrete (SCC), or equivalent as approved by the PROJECT MANAGER. **Portland-cement used in the mix shall be type V Sulfate resistant cement. Additionally, Xypex Admix C-1000 or equivalent shall be added to the mix design as concrete waterproofing.** Xypex shall be added to the mix design per manufacturer's specifications included in Appendix C.

It is critical that the concrete be placed to prevent honey combing. It is also critical that the bulkhead be completed in a single, continuous concrete pour, but if the concrete filling process is interrupted for more than 6 hours, the Contractor must prepare a construction (cold) joint before resuming concrete filling by:

- a) Entering the bulkhead and using a plywood support, move roughly to the center of the form,
- b) Shoveling an approximately 1-ft. deep trench across the surface of the fresh concrete and
- c) Applying a bonding agent to the surface of the fresh concrete (such as ThoRoc's "Epoxy adhesive 24LPL").

ITEM 6.0 CONCRETE TESTING

A set of three 6-in diameter by 12-in long cylindrical test samples are to be collected from each 5 cubic yards of concrete pumped to the bulkhead location. Sampling may occur at the concrete trucks, and is not required at the bulkhead location.

Approximately 6 sets of three samples each are to be collected. The concrete test samples are to be prepared in accordance with ASTM Designation C 31/C 31M-98, *Standard Practice for Making and Curing Concrete Test Specimens in the Field*. The 6-in diameter by 12-in long test specimens will be molded and rodded in plastic molds, marked for identification, placed in heavyweight plastic bags and stored on a level surface in the tunnel near the bulkhead location. After 7 days, two samples from each set will be transported in carefully packed boxes to a testing lab for final curing in a moist room. One test sample from each set will be tested for the seven-day compressive strength and the other for the 28-day compressive strength. The final sample from each set for the second 28-day test will remain underground in a safe location as near to the bulkhead location as possible. After 28 days they will be transported to the testing lab for the final set of test beaks.

ITEM 7.0 CONTACT GROUTING

If the PROJECT MANAGER approves the 7-day mean concrete compression strength test results as equal or exceeding 3,000psi, the upper 4-ft. of the downstream bulkhead form can be stripped to provide access for drilling and contact grouting.

ITEM 7.1 DRILL CONTACT GROUT HOLES

Once approval of the minimum 3,400 psi, 28-day compressive strength is received from the PROJECT MANAGER, the CONTRACTOR can establish the Contact Grouting operations. Drilling equipment and supplies are set up at the downstream bulkhead location. The upper 4-ft. of the downstream bulkhead form can be stripped to provide access for drilling and contact grouting. Hole size chosen must be compatible with the contractor's packer size and grouting equipment. Jackleg drilling may be used to advance the contact grout holes. Drilling must be done wet; water for drilling can be supplied by a jack-tank arrangement.

Drilling Logs

Contractor must log contact-grout drill holes on a pre-printed drilling log form, which must include the date the hole was drilled, the number or designation of the hole, the total depth drilled, and the position of the concrete-bedrock contact in the drill hole. Copies of contact grout hole drilling logs shall be provided to the PROJECT MANAGER.

Drilling Procedure

Drill one or more of the three longer concrete/bedrock contact grout holes toward known high locations in the adit roof area (as established by profiling in Item 1.0 above), between approximately 7.5-ft. and 14-ft. from the downstream bulkhead face, as directed by the PROJECT MANAGER. Otherwise follow the pattern shown on the attached plates. The length of these grout holes must be sufficient to penetrate about 6-in. into the rock, as indicated by a decrease in the drilling advance rate and by a change in the color of the circulation water and cuttings. NOTE: THE POSITION OF THE CONCRETE-BEDROCK CONTACT MUST BE RECORDED ON THE DRILL LOG FOR ALL HOLES. These longer holes must be grouted first.

Following grouting of the longer holes, drill the four shorter concrete/rock contact grout holes toward high locations in the granite roof area between approximately 1-ft. and 7.5-ft. from the downstream bulkhead face, if any are known from the profiling conducted in Item 3.0. The length of these grout holes must be sufficient to penetrate about 6-in. into the rock, as indicated by a decrease in the drilling advance rate and by a change in the color of the circulation water and cuttings. NOTE: THE POSITION OF THE CONCRETE-GNEISS CONTACT MUST BE RECORDED ON THE DRILL LOG FOR ALL HOLES.

ITEM 7.2 ESTABLISH CONTACT GROUT OPERATIONS

The contractor shall establish and conduct the Contact Grouting Program in conformance with these specifications, and generally accepted industry practice, as set forth by the Portland Cement Association Handbook, *Cementitious Grouts and Grouting*. Grout shall consist of a neat type-V cement grout. Mix water must be free of deleterious substances (mine discharge water is not permitted to be used for mixing grout). Water must be supplied from clean sources and pumped in from surface, or via at least two portable tanks that can be brought into the tunnel during grouting.

Upon completion of the Contact grouting work, the Contractor shall remove all equipment and materials from the underground work area, including any un-used cement.

Grouting Logs

The Contractor must record all grouting activities on pre-printed grout logs approved beforehand by the PROJECT MANAGER. The log must include the date, hole number, grout mix data (W:C ratio and density), injection pressure, grout take in cubic feet, and all other variables used to grout the hole.

Grouting Equipment

The Contractor must batch, mix, and inject cement grout at the bulkhead location. Neat cement grout may not be mixed and batched at surface or pumped through the slick line installed under Item 4.0. A high-shear colloidal mixer unit specifically designed for batching and mixing neat-cement grouts is required (e.g. *ChemGrout CG-600/8CF/A, CG-620/A or equivalent specification coloidal unit*). Pumping units may be positive displacement piston-type or progressive-cavity (Moyno) type (e.g. *Chem Grout CG-600/8CF/A, CG-030, CG-L4A etc.*) The unit must supply grout to a maximum pressure of 450 psi. (www.chemgrout.com)

A re-circulating-type grout delivery manifold system is required. The manifold and valve system must allow for continuous recirculation of grout back to the grout holding tank. Pressure to the hole being grouted is controlled by closing/opening the return-circulation valve. Suitable diaphragm-protected pressure gauges with appropriate dial scales are required, and headers on the mechanical packers at each hole must be equipped with a gauge and shut-off or holding valve that will maintain grout pressure in the hole when the delivery manifold is disconnected.

ITEM 7.3 PROVIDE AND INJECT CONTACT GROUT

The PROJECT MANAGER must be present during all grout-injection work. The Contractor must record all grouting activities on pre-printed grout logs, format of which is approved beforehand by the PROJECT MANAGER. The log must include the date, hole number, grout mix data (W:C ratio and density), injection pressure, grout take, and all other variables used to grout the hole.

Grout Mix Design and Density Measurement

Grout shall consist of a neat Type-V cement grout (Type-V cement and water). Cement must be Type-V sulfate resistant. Mix water must be free of deleterious substances (mine discharge water is not permitted to be used for mixing grout). Water must be supplied from clean sources and pumped in from surface, or via at least two portable tanks that can be brought into the tunnel during grouting.

The injected mix shall have a water-cement ratio of 2:1 by weight. Depending on take and pressure, the contractor's mixing and pumping equipment must be capable of varying the water-cement ratio from 0.6:1 to 3:1 as directed by the PROJECT MANAGER. Admixtures that control bleed, improve flowability, reduce water content, and retard set may be used in the grout, subject to review and acceptance by the PROJECT MANAGER.

Grout specific gravity and density must be measured per ASTM C109 or API RP-13B-1, at a frequency of no less than one test per-batch conducted prior to injection, and recorded on grouting logs. The Baroid Mud Balance used in accordance with API RP-13B-1 is an approved device for determining grout density.

Grouting Procedure

A mechanical or inflatable packer compatible with the hole size used in Item 7.1 above is to be set at least 6 inches outboard of the concrete/bedrock contact and roughly halfway up the grout hole. Grout injection pressure should reach at least 90 psi, but not more than 450 psi. The minimum grout pressure is to be maintained for three minutes or until three bags (3-cubic feet) of grout have been injected, or whenever grout returns from an adjacent grout hole.

If the grout take in one hole reaches three cubic feet without reaching the minimum 90 psi injection pressure, grouting is to be stopped, the packer pressure released, the packer removed and the grout allowed to reach initial set for 8 hours. The CONTRACTOR will make an immediate written record of the grout take after each grouting cycle for each hole.

If grout refusal occurs, or when the minimum grout pressure is reached and held for three minutes, the hole is to be grouted full and not re-grouted. If other grout holes have been drilled they can be grouted during the initial set time. After initial set in each grouted hole, the packer will be reset at the face of the bulkhead and the remainder of the hole filled with grout using a vent-tube return through the packer.

A hole that had greater than 3 cubic feet of take will be re-drilled and the grouting process repeated after the initial grout set, as directed by the PROJECT MANAGER. The set time can be shortened provided the measured tunnel temperature indicates that this is reasonable, and the PROJECT MANAGER concurs. The grout holes will be re-drilled and re-grouted until the minimum grout pressure can be maintained for three minutes.

ITEM 8.0 DENEUF TUBE GROUTING

In addition to contact grouting, DeNeef tubes will be installed and grouted to reduce any additional leakage along the concrete/bedrock contact. CONTRACTOR must use DeNeef products or approved equivalent as described below and included in Appendix B. Consultation with the manufacturer's representative is required. A site inspection by the manufacturer's representative

may be required by the PROJECT MANAGER. DeNeef tube grouting shall not take place until all contact grout operations have been completed.

ITEM 8.1 SUPPLY AND INSTALL DENEEF TUBE

CONTRACTOR must supply and install 1/2-in. DeNeef Injecto® tube per manufactures guidance and recommendations. The tube must be continuously tight against the rock. Two complete rings shall be installed along the adit perimeter at locations established by the PROJECT MANAGER . Grout tube must be installed prior to completing the downstream bulkhead form, and must be attached to the rock perimeter per manufacture's specification. The injection point for each ring shall penetrate the formwork at the edge of the form.

ITEM 8.2 PROVIDE AND INJECT DENEEF GROUT

Following certification by the PROJECT MANAGER that all 28-day concrete breaks have met design compressive strength, DeNeef grout tubes shall be grouted. Contractor must supply and inject DeNeef Injecto® PURE grout and Flex Cat PURE or alternate grout product recommended by the manufacturer and approved by the PROJECT MANAGER. Grout shall be injected into both grout tube rings to reduce or eliminate any seepage along the concrete/bedrock contact. Grout and catalyst shall be mixed and injected in accordance with manufacturer's recommendations. Manufacturer's mix recommendations of 1% catalyst to resin shall be adhered to.

CONTRACTOR shall supply and setup all equipment required to inject the grout tubes. Grout tube injection pressures must reach a minimum of 90 psi, but shall not exceed 450 psi.

ITEM 9.0 STRIP FORMS AND INSTALL VALVE AND PRESSURE GAUGE EQUIPMENT

After completion of the contact grouting program, permanent protective supports will be placed under and around the valve manifold for its protection. The remainder of the downstream (air side) form will be also be stripped, and all the removed materials taken outside for proper disposal during project de-mobilization. A stainless steel globe valve rated to 600 psi will be permanently attached to the threaded end of the 3/4-in. water sampling and pressure measurement pipe. Provide and install a stainless steel analog pressure gauge with a psi range of 0-600, 20 psi major graduations, and 2 psi minor graduations. All pipe and valve connections will be made using Teflon tape, or other thread sealant. All fittings, pipe, and valves are schedule-40 stainless steel.

PROJECT OBSERVATION

The PROJECT MANAGER will be at the project site periodically to monitor construction activities and ensure that each work item is completed and constructed to design specifications. It is the Contractor's responsibility to schedule inspections with the PROJECT MANAGER so as not to delay the work. The following items must be observed and approved by the PROJECT MANAGER before proceeding with the next step of the work:

Item/Task	INSPECTION ITEM
ITEM 1.0	Prepared bulkhead area will be inspected, measured and profiled. Profile provided to the PROJECT MANAGER.

ITEM 2.0 The PROJECT MANAGER will make a final inspection of the cofferdams, bypass pipe, bulkhead sill, posts, bracing, bolting and angle iron brackets and this must be approved before placing the last of the lagging, closing the water side access opening.

The PROJECT MANAGER must perform final inspection of the interior of the bulkhead to verify that the bulkhead forms, rebar cages, and pipes have been constructed as designed and the rebar cages and pipes are placed, supported and tied down as specified, and a final wet vacuum cleaning of the bulkhead floor has been completed immediately before starting to fill the bulkhead with concrete.

ITEM 3.0 The PROJECT MANAGER will make a final inspection of the waterside cofferdam, bypass pipe, W4x13 sill beam, posts, W6x20 bulkhead support beams, bolting and angle iron brackets will be inspected and must be approved before closing the waterside access opening.

The PROJECT MANAGER's final inspection of the interior of the bulkhead to verify that the bulkhead forms, rebar cages, and pipes have been constructed as designed and the rebar cages and pipes are placed, supported and tied down as specified, and a final wet vacuum cleaning of the bulkhead floor has been completed immediately before starting to fill the bulkhead form.

ITEM 5.0 The PROJECT MANAGER must be present during all concrete placement into the Bulkhead forms.

ITEM 6.0 After all the seven day test results have been received from the lab, the gate valve can be closed and the temporary air side (downstream) bypass pipe can be disconnected, provided the mean 7-day concrete compression strength test results exceed 3,000 psi and if approved by the PROJECT MANAGER.

ITEM 7.0 The PROJECT MANAGER must be present during all grout injection work. Grout holes can be re-drilled and the grouting process repeated after the initial set time as directed by the PROJECT MANAGER. The set time can be shortened provided the measured tunnel temperature indicates that is reasonable, and the PROJECT MANAGER concurs. Drilling and Grouting Logs must be provided to the PROJECT MANAGER.

ITEM 8.0 The PROJECT MANAGER must be present during all DeNeef grout tube injection.

Figure 1: Red and Bonita Location Map



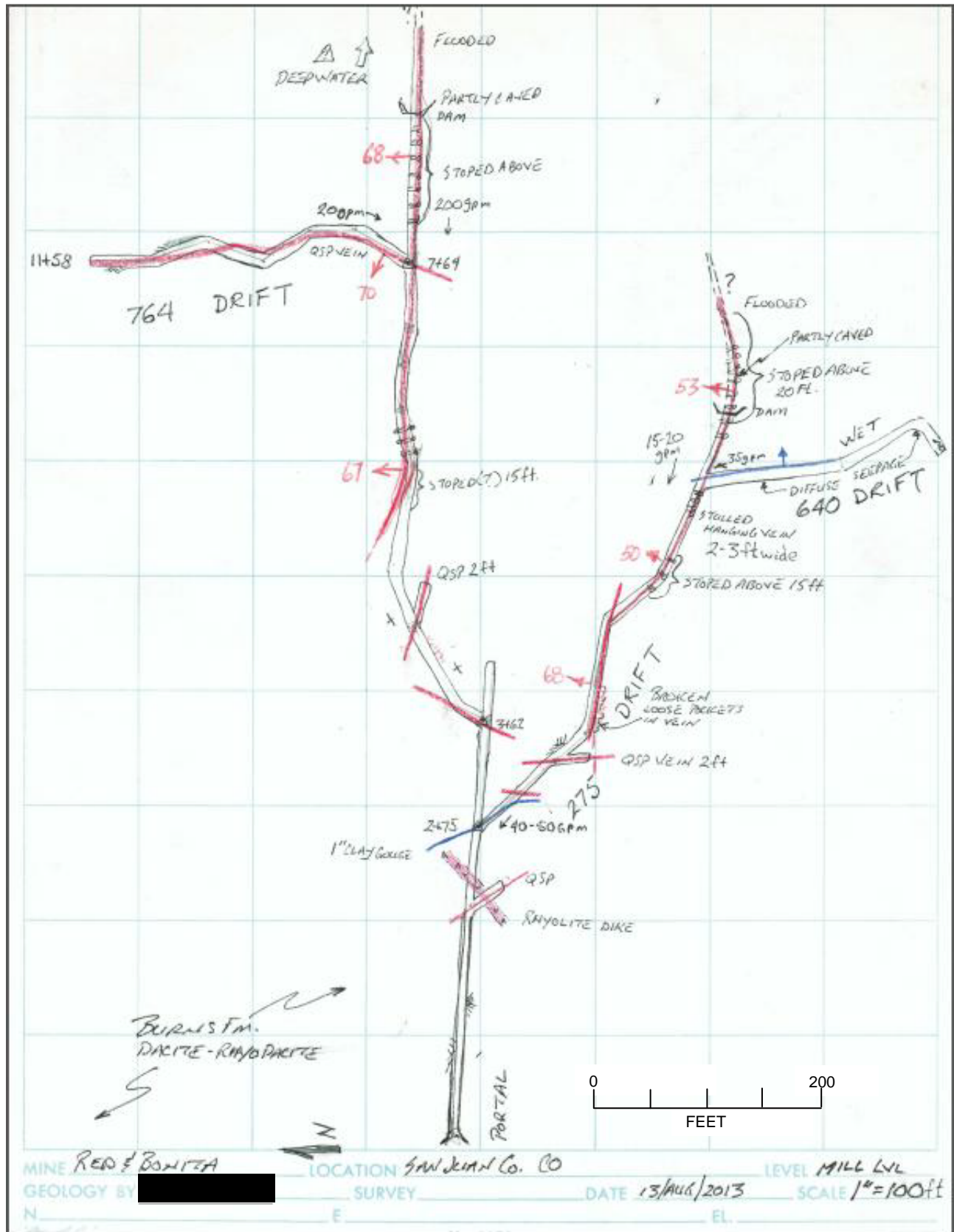


Figure 2: Red and Bonita Mine Map

LONGITUDINAL CROSS SECTION OF BULKHEAD

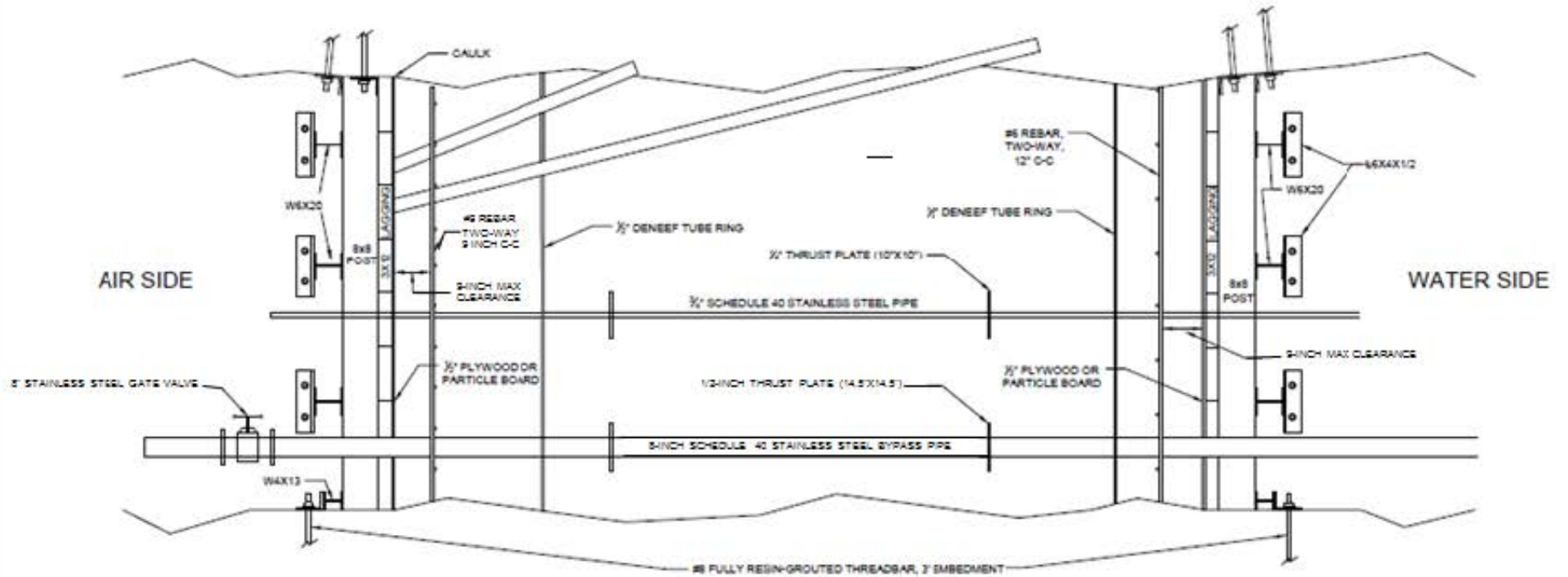
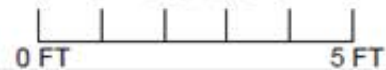


PLATE 1

RED AND BONITA
MINE BULKHEAD

SCALE



COLORADO
Division of Reclamation,
Mining and Safety
Department of Natural Resources

PLAN VIEW OF BULKHEAD

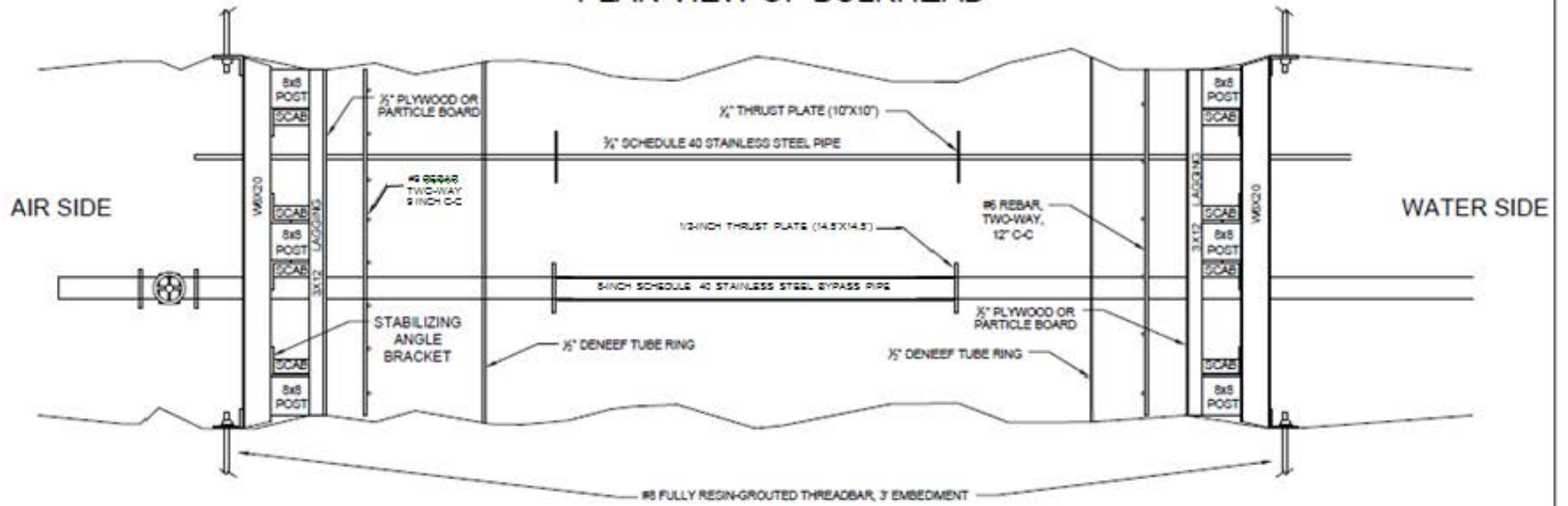


PLATE 2

RED AND BONITA
MINE BULKHEAD

SCALE



COLORADO
Division of Reclamation,
Mining and Safety
Department of Natural Resources

AIR SIDE FORM FACE

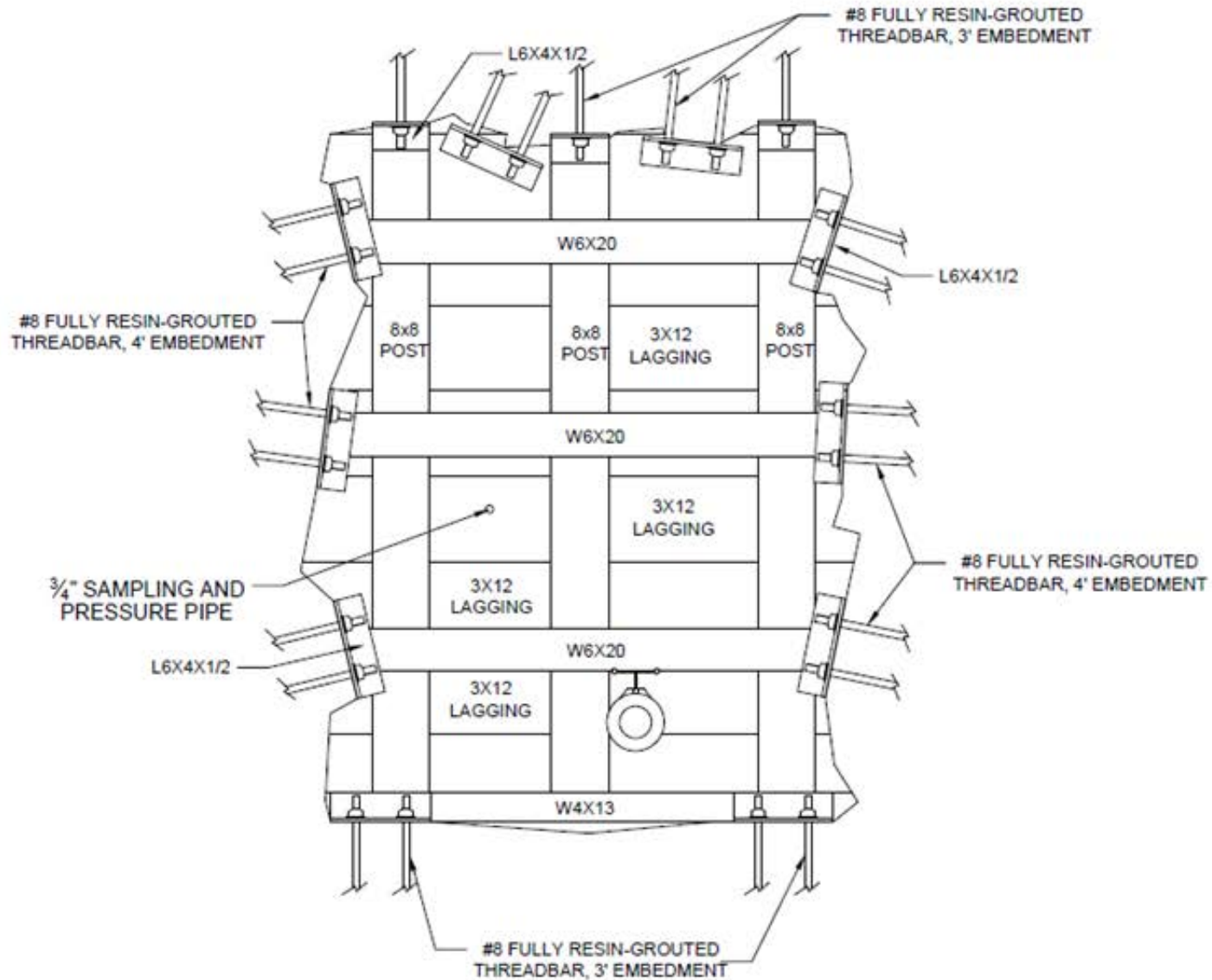
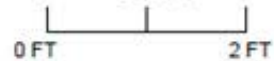


PLATE 3

SCALE



RED AND BONITA
MINE BULKHEAD



COLORADO
Division of Reclamation,
Mining and Safety
Department of Natural Resources

AIR SIDE #9 REBAR CAGE AND CONTACT GROUT HOLES

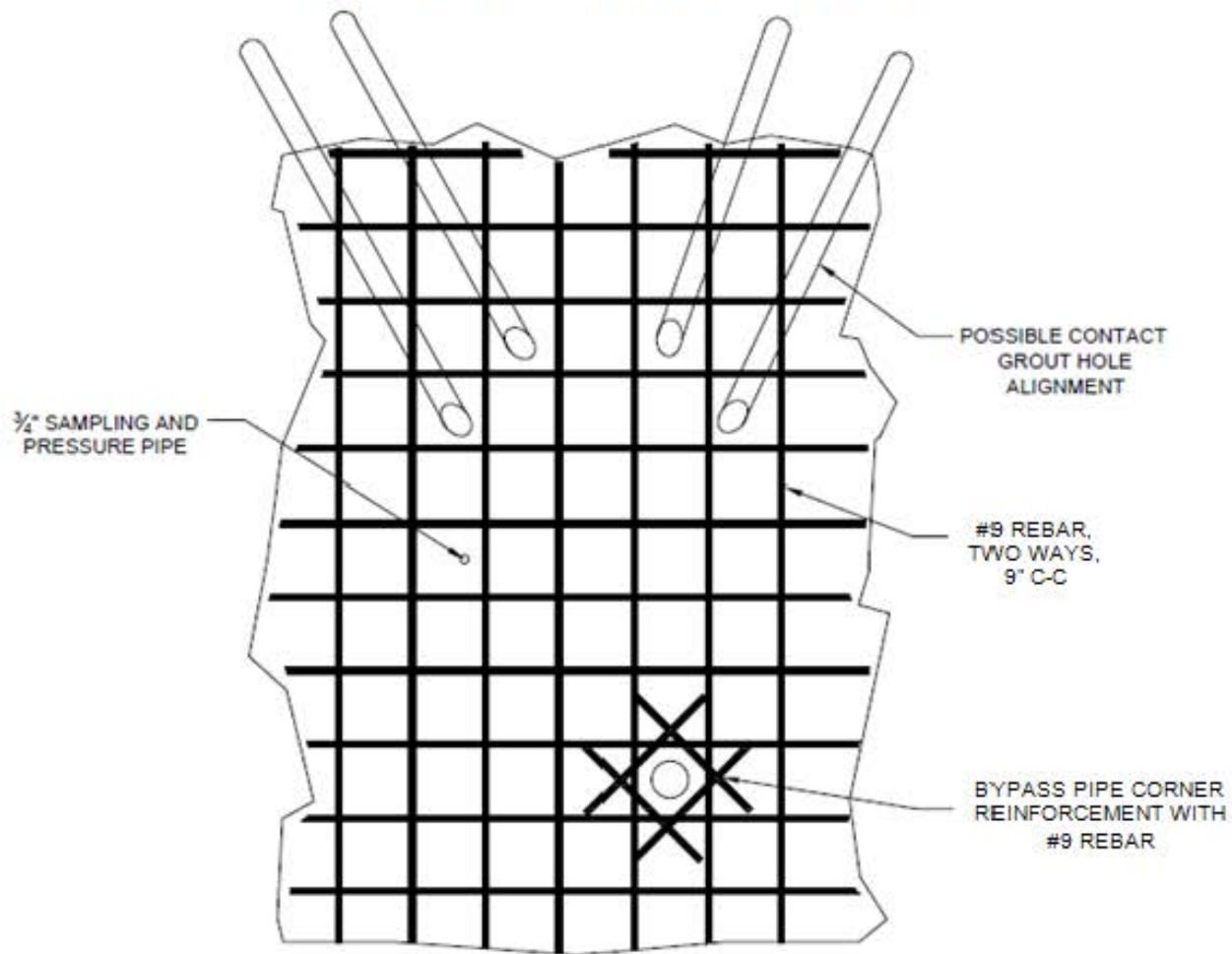
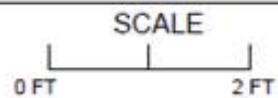


PLATE 4



RED AND BONITA
MINE BULKHEAD



COLORADO
Division of Reclamation,
Mining and Safety
Department of Natural Resources

APPENDIX B
DE NEEF GROUT INFORMATION



INJECTO®PURE

Product Description

Injecto PURE is an ultra low viscosity hydrophobic polyurethane designed to be used with INJECTO® Grout Tube for sealing construction joints. Injecto PURE grout expands on contact with water and quickly cures to a tough, flexible foam that is resistant to most organic solvents, mild acids, alkali, petroleum and micro-organisms.

Phthalate free- no phthalate-based plasticizers
Unregulated for transport- no hazmat shipping
Reformulated TDI free-all MDI based technology.
Environmentally friendly-NSF/ANSI 61 approved.



INJECTO PURE when combined with Flex Cat PURE is certified by WQA to NSF/ANSI 61 for materials safety only, as verified and substantiated by test data. Please refer to WQA website(www.wqa.org) for use ratios and limitations

Product Advantages

- Contains no volatile solvents
- Single Component
- Controlled reaction time
- Improved low temperature performance
- Flex Cat PURE liquid to -40°F

Applications

- Repairing existing leaky joints
- Waterstop for new concrete structures
- Injection through these grout tubes to form a flexible waterstop in concrete joints:

INJECTO® Tube
 SIS INJECTO® Tube
 BENTOJECT
 TRIOJECT

Properties

Injecto PURE Grout		
Solids	100%	ASTM D2369
Viscosity	200 cps at 77°F	ASTM D2196
Color	Pale Yellow	
Density	1.02 g/cm ³	ASTM D4659
Flashpoint	>270°F	ASTM D93
Corrosiveness	Non-corrosive	
Flex Cat PURE		
Viscosity	15 cps at 77°F	ASTM D2196
Color	Clear to pale gray	
Flashpoint	221°F	ASTM D93
Injecto PURE Cured		
Density free	about 3 PCF	ASTM D3574
Tensile	>174 psi	ASTM D3574
Elongation %	100	ASTM D3574

Packaging & Handling

- Injecto PURE: 5 gallon metal pail
50 gallon metal drum
- Flex Cat PURE: 25 fl.oz. in 1 qt. metal cans

Injecto PURE is sealed under dry nitrogen because it is sensitive to moisture, and should be stored in original containers in a dry area. Storage temperature must be between 40°F and 90°F. Once the packaging has been opened, the useful life of the material is greatly reduced and should be used as soon as possible. Shelf life: 2 years.

Installation Guidelines

Warning: Consult the Technical Data Sheets and MSDS before using.

Installation Instructions: For detailed installation instructions refer to the DeNeef technical bulletin for your application.

Catalyst: Shake catalyst can 2-3 minutes. Pour the desired amount of Injecto PURE into a clean dry pail. Measure 1% Flex Cat PURE and pour it into the pail. Stir until adequately mixed. Exceeding the recommended amount of catalyst may adversely affect the reaction and quality of the cured foam. (1 catalyst can capful=0.5 oz; 1.3 oz/gal resin = 1%)

Injection: Injectable tubes should be adequately flushed with water prior to the injection of grout. During injection the grout will follow the path of least resistance. When the material has stopped penetrating it will continue to expand against the limits of the confined space and compress within itself, forming a dense, closed cell foam. See INJECTO Grout Tube Installation procedures for more detail.

Extreme conditions: For application procedures in extreme temperatures and specific environments or equipment recommendations call the DeNeef Technical Service Department.

Cleaning: Clean all tools and equipment which have been in contact with the resin with DeNeef Washing Agent before resin has cured. Products should be disposed of according to local, state, and federal laws.

Health and Safety

Always use protective clothing, gloves and goggles consistent with OSHA regulations. Avoid eye and skin contact. Do not ingest. Refer to MSDS. For emergencies, call CHEMTREC 1-800-424-9300.

Limitations

Low temperatures will significantly affect viscosity. Injecto PURE is not designed for void filling and must be used in compression. If site temperatures are extremely low, heat bands or heated water baths may be used on the pails before and during installation to maintain the product's temperature. Avoid splashing water into open containers, as the material is water activated. Avoid exceeding 90°F when warming.

CAUTION: pH NOTICE. Water used to activate PURE Grouts must be in the pH range of 3-10 for optimum foam quality.

Rev. 02/2013

www.deneef.com

Technical Service 1-800-732-0166

We hope the information here will be helpful. It is based on data and knowledge considered to be true and accurate and is offered for the users' consideration, investigation and verification, but we do not warrant the results to be obtained. Please read all statements, recommendations or suggestions in conjunction with our conditions of sale, which apply to all goods supplied by us. No statement, recommendation or suggestion is intended for any use which would infringe any patent or copyright. W. R. Grace & Co.-Conn., 62 Whittemore Avenue, Cambridge, MA 02140.

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GRACE



INJECTO® Tube Groutable Hose Waterstop System

Product Description

INJECTO is an injectable waterstop system that provides a conduit for the placement of DeNeef chemical grouts. The 1/2" (12mm) permeable tube is installed before the concrete pour, but not injected until after the shrinkage associated with the curing concrete process is complete. This allows the cracks to open fully before permanently sealing the interfaces and voids within construction joints, pipe penetrations, slurry walls, and slab connections with chemical grout.



Figure 1. Injecto Tube Kit.

Product Advantages

- Fast, simple installation
- No special tools required
- Low pressure injection
- Permanent seal after injection
- Injectable anytime after concrete cure
- INJECTO System Warranty

Applications

- Sealing cold and construction joints
- Sealing pipe penetrations
- Sealing joints between slurry walls and slabs

INJECTO Tube may be used with the following chemical grouts:

- Flex SLV PURe with 1% Flex Cat PURe
- Flex LV PURe with 1% Flex Cat PURe
- Superflex AR Acrylate prepared according to data sheet.

Properties

Typical Properties	
Outside Diameter	1/2 Inch
Inside Diameter	5/16 Inch
Length	Maximum 25 ft.
Weight	4.5 lbs per 25 ft.
Operating temperature	Up to 158°F
Tensile strength steel wire	Approx. 261,000 psi
Diameter filter pores	35 microns

Note: The data shown above reflects typical results based on laboratory testing under controlled conditions. Reasonable variations from the data shown above may result.

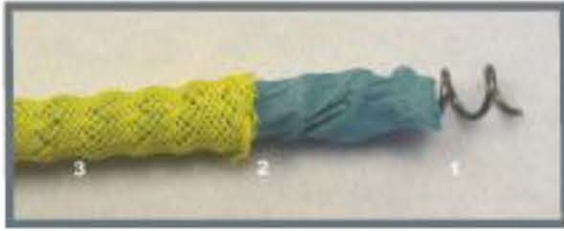
Packaging & Handling

INJECTO Tube is supplied in 100 ft. kits to allow the system to be cut to length on site. The maximum recommended cut length of INJECTO Tube to be installed between packers is 25 ft. (see figure #1)

- Yellow INJECTO Tube: 100 ft.
- Clear PVC Packer Tubing : 18 ft.
- Blue trumpets: 12 pieces.
- Anchoring clips: 100 pieces.
- 1 Pallet = 40x100 ft. kits = 4000 ft.

Unlimited shelf life when stored in a dry place.

Injecto Tube Construction



A high strength spiral wire coil (1) prevents collapse during concrete placement, while the non-woven filter membrane (2) prevents the tube from being clogged with concrete particles. A bright yellow reinforced mesh sleeve (3) protects the tube and allows for easy inspection before the pour. Wherever old to new concrete surfaces join, the INJECTO Tube system can be easily installed.

Installation Guidelines

The yellow INJECTO Tube is installed onto the hardened concrete during formwork installation. In case of rough surfaces, any gap between INJECTO Tube and the surface should be filled with SWELLSEAL®WA.

The yellow INJECTO Tube is cut to the required length on the job site. (recommended length 25 ft. or less). The cut ends are smoothed with a twist, then the blue trumpets are installed over the yellow INJECTO Tube and screwed down to the stop mark inside the trumpet. (Figure 3)

The yellow INJECTO Tube is attached to the concrete with the anchoring clips between the inner and outer reinforcing bars. Attach the anchoring clips to the concrete every 12 inches with concrete anchors or nails applied with a powder actuated system (see figures 5, 6 & 7)

The blue trumpets provide a connection between the yellow INJECTO Tube and the clear packer tubing. Trumpets on adjacent runs should be installed with the wide ends of the trumpets (where the yellow INJECTO Tube is attached) in line with each other and the two trumpets separated by 2-3 inches (see figure 8). This will help avoid cross contamination of the yellow INJECTO Tubes during the grouting operation.

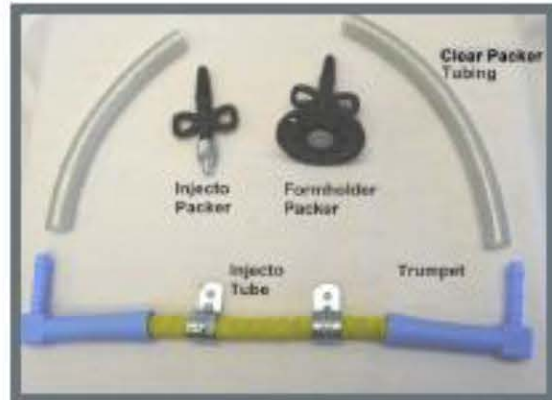


Figure 3. Injecto Tube shown with blue trumpets



Figure 4. Position of trumpets.



Figure 5. Anchoring clips on injecto.

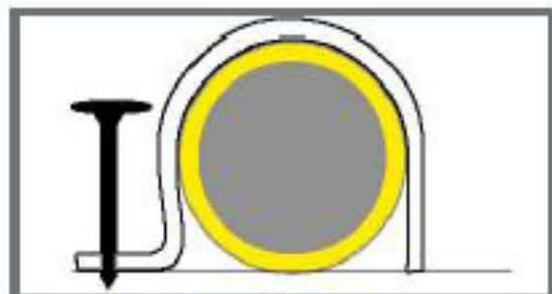


Figure 6. Nailing anchor clips

Always terminate the yellow INJECTO Tube into a trumpet and allow for a minimum of 2-1/2" of concrete cover. Do not run the yellow INJECTO Tube outside the formwork.

Attach the clear packer tubing over the serrated end of the trumpets. Then cut the appropriate length of packer tubing as required to reach a formholder packer or to extend outside the formwork. The clear packer tubing should be secured with tie wire to the rebar to prevent movement during the pour.

The formholder packers can be either nailed to wooden formwork or attached to the rebar with steel tie wire if metal forms are used. If formholder packers are used, attach the clear packer tubing directly to them. If the clear packer tubing is being run outside the formwork, protect the open ends with a plastic cap or tape and take measures to protect them from damage during formwork installation and stripping.

The INJECTO Tube System is ideal for unique and problem details such as pipe penetrations and attaching to conventional PVC waterstops that may encounter very high head pressures (see figures 9 and 10).

CAUTIONS:

1. The yellow INJECTO Tube must be installed in direct contact with the joint over its full length, to allow proper and complete distribution of the injection resin. If the concrete is not smooth enough to allow full contact, use SWELLSEAL® WA to create a smooth surface. Press INJECTO into the SWELLSEAL WA.
2. Do not cross the yellow INJECTO Tubes. Yellow should never touch yellow or cross contamination could occur during the grouting operation.
3. The ends and beginnings of yellow INJECTO Tube lengths should be done as in figures 4 and 8 to prevent cross contamination during the resin injection process.

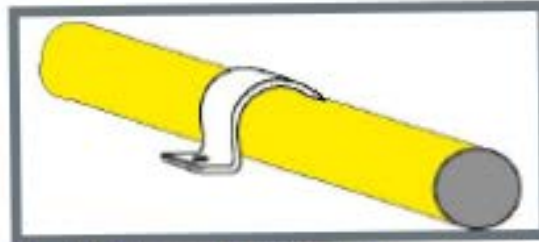


Figure 7. Placement of anchor clips

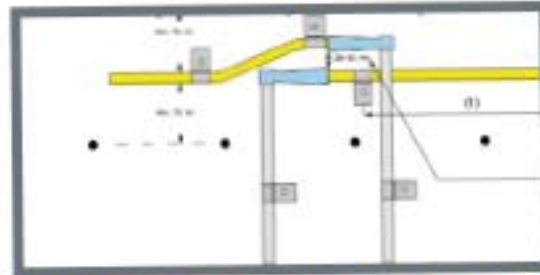


Figure 8. End and beginning of injecto tube lengths.

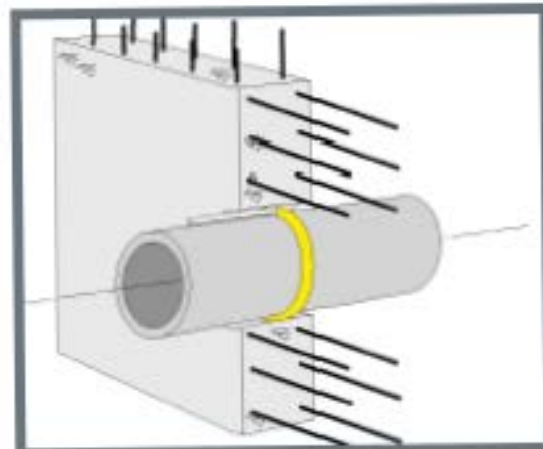


Figure 9. Pipe Sealing

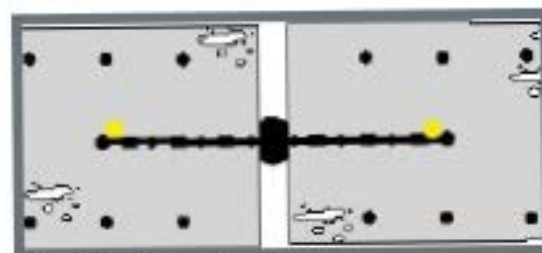


Figure 10. PVC Waterstop

4. Concrete coverage must be a minimum of 2 ½" on all sides. After concrete has cured for the recommended 28 days, any water infiltrating into the joint will be collected by the system and appear through the clear packer tubing. The tubing should either protrude out of the concrete at easily accessible places or be connected to a formholder packer.

The INJECTO Tube system is designed to provide a delivery system for waterproofing resins, which are injected into the structure in accordance with the instructions found in the selected injection resins technical data sheets. Consult with the DeNeef Technical Department for assistance in selecting the appropriate sealing resin for each condition.

Always use protective clothing, gloves and goggles consistent with OSHA regulations during use. Avoid eye and skin contact. Do not ingest. Refer to Safety Data Sheet (SDS) for detailed safety precautions.

In the event of an EMERGENCY call:

CHEMTREC 800-424-9300.

Limitations

INJECTO Tube waterstop system must be installed by an Approved DeNeef INJECTO Applicator in accordance with the INJECTO Manual for Warranty to be effective. Concrete cover must be a minimum of 2 ½" on all sides.

Revised 04/2013

Health and Safety

www.deneef.com

Technical Service 1-800-732-0166

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GRACE

APPENDIX C
XYPEX CONCRETE ADMIXTURE INFORMATION



ADMIX C-1000

07160 | CEMENTITIOUS CRYSTALLINE

Concrete Waterproofing

Description

Xypex is a unique chemical treatment for the waterproofing, protection and improvement of concrete. XYPEX ADMIX C-1000 is added to the concrete mix at the time of batching. Xypex Admix C-1000 consists of Portland cement, very fine treated silica sand and various active, proprietary chemicals. These active chemicals react with the moisture in fresh concrete and with the by-products of cement hydration to cause a catalytic reaction which generates a non-soluble crystalline formation throughout the pores and capillary tracts of the concrete. Thus the concrete becomes permanently sealed against the penetration of water or liquids from any direction. The concrete is also protected from deterioration due to harsh environmental conditions.

Xypex Admix C-Series

The Admix C-Series has been specially formulated to meet varying project and temperature conditions. **Xypex Admix C-500** is specifically formulated to meet modern concrete practices that incorporate additives such as fly ash and slag. For most concrete mix designs adding the Admix C-500 will have minimal or no effect on setting time. **Xypex Admix C-1000** is designed for typical Portland cement-rich concrete, where normal to a mild retarded set is desired. **Xypex Admix C-2000** is designed for projects where extended retardation is required due to high ambient temperatures or long ready-mix delivery times. See Setting Time and Strength for more details. Consult with a Xypex technical services representative for the most appropriate Xypex Admix for your project.

Recommended for:

- Reservoirs
- Sewage and Water Treatment Plants
- Secondary Containment Structures
- Tunnels and Subway Systems
- Underground Vaults
- Foundations
- Parking Structures
- Swimming Pools
- Precast Components

Advantages

- Resists extreme hydrostatic pressure from either positive or negative surface of the concrete
- Becomes an integral part of the substrate

- Highly resistant to aggressive chemicals
- Can seal static hairline cracks up to 0.4 mm
- Allows concrete to breathe
- Non-toxic
- Less costly to apply than most other methods
- Permanent
- Added to the concrete at time of batching and therefore is not subject to climatic restraints
- Increases flexibility in construction scheduling

Packaging

Xypex Admix C-1000 is packaged in 60 lb. (27.2 kg) pails and 50 lb. (22.7 kg) bags. Admix C-1000 is also available in cartons containing 10 lb. (4.5 kg), 12 lb. (5.5 kg), and 15 lb. (6.8 kg) soluble bags. For specific projects, contact the manufacturer for availability of custom sized packaging.

Storage

Xypex products must be stored dry at a minimum temperature of 45°F (7°C). Shelf life is one year when stored under proper conditions.

Dosage Rates

Xypex Admix C-1000:

2% - 3% by weight of cement

Xypex Admix C-1000 NF (No Fines Grade):

1% - 1.5% by weight of cement

NOTE: Under certain conditions, the dosage rate for No Fines Grade may be as low as 0.8% depending on the quantity and type of total cementitious materials. The maximum use level is 2% by weight of cement for potable water applications.

Consult with Xypex's Technical Services Department for assistance in determining the appropriate dosage rate and for further information regarding enhanced chemical resistance, optimum concrete performance, or meeting the specific requirements and conditions of your project.

Test Data

PERMEABILITY

U.S. Army Corps of Engineers CRD C48-73, "Permeability of Concrete", Aviles Engineering Corp., Houston, USA

Two concrete samples containing Xypex Admix at 3% and 5% respectively, and an untreated control sample

were tested for water permeability. Both the treated and untreated samples were subjected to a pressure of 150 psi (350 ft. water head). Results showed moisture and permeated water throughout the untreated sample after 24 hours. However, the Xypex Admix samples showed no leakage, and water penetration of only 1.5 mm after 120 hours (5 days).

U.S. Army Corps of Engineers CRD C48-73,
"Permeability of Concrete", Setesco Services, Pte Ltd.,
Singapore

Six Xypex Admix-treated and six untreated concrete samples were tested for water permeability. Pressure was gradually increased over five days and then maintained at 7 bars (224 ft. water head) for 10 days. While the six reference samples showed water leakage beginning on the fifth day and increasing throughout the test period, the Xypex Admix samples showed no water leakage at any time during the test.

DIN 1048, "Water Impermeability of Concrete",
DICTU S.A., Dept. of Engineering and Construction Mgt.,
Santiago, Chile

Concrete samples 120 mm thick containing Xypex Admix were tested with the same size reference samples for water impermeability. Samples were subjected to hydrostatic pressure for 28 days. Water totally permeated the untreated samples but no water penetration was detected in any of the Xypex Admix-treated samples.

COMPRESSIVE STRENGTH

ASTM C 39, "Compressive Strength of Cylindrical Concrete Specimens", HBT Agra, Vancouver, Canada
Concrete samples containing Xypex Admix at various dosage rates (1%, 2% and 5%) were tested against an untreated concrete control sample. Compressive strength test results after 28 days indicated a significant strength increase in the samples incorporating Xypex Admix. The compressive strength increase varied between 5% and 20% (depending on the Xypex Admix dosage rate) over that of the reference sample.

ASTM C 39, "Compressive Strength of Cylindrical Concrete Specimens", Kleinfelder Laboratories,
San Francisco, USA

At 28 days, the compressive strength test of the concrete containing Xypex Admix measured 7160 psi as compared to the reference sample at 6460 psi (a 10% increase).

CHEMICAL RESISTANCE

JIS, "Chemical Durability Test", Japanese Utility
Company, In-house Test Report, Tokyo, Japan

Concrete samples containing Xypex Admix were tested against five samples containing other admixtures and against a control sample, to determine resistance to cor-

rosion and deterioration caused by contact with aggressive chemicals. All samples were soaked in a 5% sulfuric acid solution at 20°C for six months. Various evaluations and measurements were assessed every month during the test period, including: photographic comparisons, relative dynamic modulus of elasticity, percentage change in length, weight and flexural rigidity. Although the Xypex Admix sample was subjected to acid conditions well outside its published range, the results confirmed Xypex with the best performance among the seven samples tested.

"Sulfuric Acid Resistance Test",
Aviles Engineering Corporation, Houston, USA

Concrete samples containing Xypex Admix at different dosage rates (3%, 5% and 7%) were tested against untreated control samples for sulfuric acid resistance. After immersion in the sulfuric acid, each sample was tested for weight loss on a daily basis until a weight loss of 50% or a definite response trend was obtained. The percentage weight loss of the samples containing Xypex Admix tested significantly lower than the control samples.

"Sulphate Resistance Test",
Taywood Engineering Ltd., Perth, Australia

Xypex Admix-treated concrete samples were immersed in an ammonium-sulphate solution and tested for "resistance in a harsh environment". The performance of the Xypex crystalline technology was compared with five other concretes, including one containing a sulphate-resistant cement. Each of the test samples was cured for seven days and then placed in an ammonium-sulphate solution (132 g/litre) for 180 days. The rate of corrosion was determined by measuring weight loss, and length change was noted on a weekly basis. The Xypex crystalline technology substantially improved concrete performance as compared to the reference concrete and tested very similar to the sulphate-resistant concrete. The Xypex Admix-treated samples also provided the highest level of protection as measured by change in length.

FREEZE/THAW DURABILITY

ASTM C 666, "Freeze/Thaw Durability",
Independent Laboratory, Cleveland, USA

After 300 freeze/thaw cycles, the Xypex Admix-treated samples indicated 94% relative durability.

POTABLE WATER EXPOSURE

NSF 61, "Drinking Water System Component-Health
Effects", NSF International, Ann Arbor, USA

Exposure testing of potable water in contact with Xypex-treated samples indicated no harmful effects.

Directions for Use

Xypex Admix C-1000 must be added to the concrete at the time of batching. The sequence of procedures for addition will vary according to the type of batch plant operation and equipment:

1. READY MIX PLANT - DRY BATCH OPERATION Add Xypex Admix in powder form to the drum of the ready-mix truck. Drive the ready-mix truck under the batch plant and add the balance of the materials in accordance with standard concrete batching practices. Mix materials for a minimum of 5 minutes to ensure that the Xypex Admix has been thoroughly dispersed throughout the concrete.

2. READY MIX PLANT - CENTRAL MIX OPERATION Mix Xypex Admix with water to form a very thin slurry (e.g. 15 - 20 lb./6.75 - 9 kg of powder mixed with 3 U.S. gallons/ 13.6 litres of water). Pour the required amount of material into the drum of the ready-mix truck. The aggregate, cement and water should be batched and mixed in the plant in accordance with standard practices (taking into account the quantity of water that has already been placed in the ready-mix truck). Pour the Admix slurry into the truck and mix for at least 5 minutes to ensure even distribution of the Xypex Admix throughout the concrete.

3. PRECAST BATCH PLANT Add Xypex Admix to the rock and sand, then mix thoroughly for 2 - 3 minutes before adding the cement and water. The total concrete mass should be blended using standard practices.

NOTE:

- i. It is important to obtain a homogeneous mixture of Xypex Admix with the concrete. Therefore, do not add dry Admix powder directly to wet concrete as this may cause clumping and thorough dispersion will not occur.
- ii. Concrete containing the Xypex Admix does not preclude the requirement for design of crack control, construction joint detailing and measures for repairing defects in concrete (i.e. honeycombing, tie holes, cracks beyond specified limits).

For further information regarding the proper use of Xypex Admix for a specific project, consult with a Xypex technical services representative.

Setting Time and Strength

The setting time of concrete is affected by the chemical and physical composition of ingredients, temperature of the concrete and climatic conditions. Xypex Admix C-1000 is designed for typical Portland cement-rich concrete, where normal to a mild retarded set is desired. Concrete containing the Xypex Admix C-1000 may develop higher

ultimate strengths than plain concrete. Trial mixes should be carried out under project conditions to determine the setting time and strength of the concrete dosed with Xypex Admix C-1000. Consult with a Xypex technical services representative for the most appropriate Xypex Admix for your project.

Limitations

When incorporating Xypex Admix, the temperature of the concrete mix should be above 40°F (4°C).

Technical Services

For more instructions, alternative installation methods, or information concerning the compatibility of the Xypex treatment with other products or technologies, contact the Technical Services Department of Xypex Chemical Corporation or your local Xypex representative.

Safe Handling Information

Xypex is alkaline. As a cementitious powder or mixture, Xypex may cause significant skin and eye irritation. Directions for treating these problems are clearly detailed on all Xypex pails and packaging. The Manufacturer also maintains comprehensive and up-to-date Material Safety Data Sheets on all its products. Each sheet contains health and safety information for the protection of workers and customers. The Manufacturer recommends you contact Xypex Chemical Corporation or your local Xypex representative to obtain copies of Material Safety Data Sheets prior to product storage or use.

Warranty

The Manufacturer warrants that the products manufactured by it shall be free from material defects and will be consistent with its normal high quality. Should any of the products be proven defective, the liability to the Manufacturer shall be limited to replacement of the product ex factory. The Manufacturer makes no warranty as to merchantability or fitness for a particular purpose and this warranty is in lieu of all other warranties expressed or implied. The user shall determine the suitability of the product for his intended use and assume all risks and liability in connection therewith.

APPENDIX D
RST INSTRUMENTS INFORMATION



Vibrating Wire Piezometers



The RST Vibrating Wire Piezometer provides excellent long-term accuracy, stability of readings and reliability under demanding geotechnical conditions. Vibrating Wire Piezometers are the electrical piezometers of choice as the frequency output of VW devices is immune to external electrical noise, and able to tolerate wet wiring common in geotechnical applications.

Operating principle

Vibrating Wire Piezometers contain a high tensile steel wire with a fixed anchor at one end and are attached to a diaphragm in contact with water pressure at the other end. The wire is electrically plucked, with the resonant frequency of vibration proportional to the tension in the wire. This frequency induces an alternating current in a coil which is detected by the readout unit, such as the VW2106 Vibrating Wire Readout, and can then be converted to a pressure. The frequency output is immune to external electrical noise, and able to tolerate wet wiring common in geotechnical applications. Highly reliable lightning protection is incorporated in the vibrating wire transducer.

The frequency signal is exceptionally immune from cable effects, including length (to several kilometers), splicing, resistance, noise pickup, and moisture. The vibrating wire coil circuit contains no semiconductor devices and has built-in ionized gas discharge device protection against transient damage. As a result, the vibrating wire piezometer provides excellent reliability in typical geotechnical situations – i.e. long outdoor cables buried in saturated soil.

The piezometer is equipped with a standard sintered stainless steel porous filter to prevent soil particles from contacting the diaphragm. A thermistor is built into the piezometer body to permit temperature measurement and temperature compensation of the piezometer. Standard construction is all stainless steel. RST vibrating wire piezometers are shipped with extremely tough polyurethane-jacketed foil-shielded cable for maximum endurance in field conditions.



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Applications

- Assessing performance and investigating stability of earth fill dams and embankments.
- Slope stability investigations.
- Monitoring water levels in wells and standpipes.
- Monitoring pressures behind retaining walls and diaphragm walls.
- Monitoring pore pressures during fill or excavation.
- Monitoring pore pressure in land reclamation applications.

Features

- Field proven reliability and accuracy.
- Will tolerate wet wiring common in geotechnical applications.
- Immune from external electrical noise.
- Signal transmission of several kilometers.
- Cable lengths may be changed without affecting the calibration.
- High accuracy, i.e. a low pressure vented model will measure water level changes as small as 0.5 mm (0.02 in.).
- Thermistor for temperature measurement is standard.
- Negligible displacement of pore water during the measurement process.
- Hermetically sealed, stainless steel construction.
- Heavy case to minimize reading errors caused by overburden pressure.
- Data logger compatible.
- Integral lightning protection.



specifications + ordering info

Vibrating Wire Piezometers



vibrating wire piezometer specs

DESCRIPTION	SPECIFICATION
Over range	2 X F.S.
Resolution	0.025% F.S. minimum
Accuracy	0.1% F.S.
Operating Temperature	-20 to 80°C (-4 to 176°F)
Diaphragm Displacement	<0.001 cc at F.S.
Thermal Zero Shift	<0.05% F.S./°C
Materials	Hermetically sealed stainless steel housing
Thermistor Type	NTC 3K Ohms @ 25°C
Thermistor Interchangeability	±0.2°C
Thermistor Resolution	0.1°C
Filter	50 micron sintered filter. (High air entry alumina filter 1, 3, 5 Bar available)

vibrating wire piezometer options

- Heavy-duty bodies for embankment use.
- Push-in drive points for soft soils
- High air entry ceramic filters to exclude air
- Low range and vented piezometers
- Titanium construction for use with corrosive fluids
- Multi-point/mixed type sensor strings
- Kevlar® reinforced cable

optional equipment

- VW2106 Vibrating Wire Readout
- Data loggers
- Terminal stations
- Electrical cable
- Cable splice kits
- Installation geotextile and socks
- Increased lightning protection

electrical cable specs

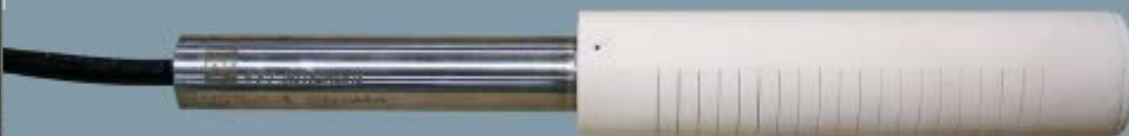
PART #	DESCRIPTION
EL380004	Two twisted pairs cable with polyurethane jacket.

Other types of cables, depending on site conditions and atmospheric reference requirements, are available upon request. These include vented, FEP, PVC, polyurethane, and armored varieties.

ordering info

PART #	DESCRIPTION	PRESSURE RANGE	DIMENSION
VW2100	Standard model for general applications.	0.35, 0.7, 1.0, 2.0, 3.0 MPa	19 mm Ø X 130 mm
VW2100-HD	Heavy duty piezometer for direct burial in fill and large dam embankments.	0.35, 0.7, 1.0, 2.0, 3.0, 5.0, 7.5, 10 MPa	25.4 mm Ø X 146 mm
VW2100-KHD	Heavy duty piezometer for direct burial in fill and large dam embankments.	1.0, 2.0, 3.0, 5.0, 7.5, 10 MPa	38.1 mm Ø X 146 mm
VW2100-HHP	High pressure transducer with NPT port.	5.0, 7.5, 10, 25, 50, 75, 100 MPa	25.4 x 143 mm
VW2100-OP	Drive point model with CPT adapter.	0.07, 0.175, 0.35, 0.7, 1.0, 2.0, 3.0, 5.0, 7.5 MPa	33 mm Ø X 432 mm
VW2100-L	Low Pressure, unvented.	70, 175 kPa	25 mm Ø X 133 mm
VW2100-LV	Low Pressure vented.	70, 175 kPa	25 mm Ø X 133 mm
VW2100-M	Miniature version – 17.5 mm diameter.	0.35, 0.7, 1.0, 2.0, 3.0 MPa	17.5 mm Ø X 133 mm
VW2100-MM	Micro-miniature version – 11.1 mm diameter.	0.35, 0.7 MPa	11.1 mm Ø X 165 mm
PPA0094	Heavy duty piezometer with bladder.	0.35, 0.7, 1.0, 2.0, 3.0, 5.0, 7.5, 10 MPa	25.4 mm Ø X 146 mm Bladder O.D.: 1.65 in

High temperature models and metallic cable are available by special order. High temperature ranges include: 0 to 100°C; 0 to 150°C; and 0 to 200°C.



PPA0094 - Heavy Duty Piezometer with Bladder

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readouts | dataloggers | terminal stations

DT2055B Ten Channel Data Logger



The DT2055B Ten Channel Data Logger is a low cost, battery powered data logger, designed for reliable, unattended monitoring of up to 10 sensors which may be any mix of vibrating wire sensors and thermistors, typically 5 vibrating wire sensors with their associated thermistors.

It is a purpose built logger ideal for remote locations or Instruments that require frequent reliable data recording. It connects to all vibrating wire sensors including piezometers, crack meters, and strain gauges. However, the DT2055B Ten Channel Data Logger will not connect to vibrating wire sensors with auto resonant circuitry.

Vibrating wire sensors have unique advantages in geotechnical applications, as the frequency output of the gauge is immune to external electrical noise, able to tolerate wet wiring without signal degradation, and able to transmit the signal up to 1.6 kilometers without loss.

Data logger setup and data collection is done using the Ultra-Rugged Field PC[®] or a laptop. Multi-Channel Host Software is also included.

A single gland option (DT2055B-T) is also available for Multi-point Vibrating Wire Piezometer Strings or Thermistor Strings.



As shown here, the DT2055B can also be equipped with an optional radio antenna (L900) to incorporate it into an rstar wireless system. RST's rstar system uses wireless technology to provide continuous data acquisition.



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applications

Ideal for applications that require reliable, unattended monitoring of up to five vibrating wire sensors.

features

HARDWARE

Option for radio antenna for incorporation into an RST rstar wireless system for acquiring data.

Robust construction.

4MB memory.

Weather resistant NEMA 4X (IP65) enclosure.

Battery powered for remote sites.

100 year memory backup.

Compatible with all VW sensors - excluding those with auto resonant circuitry.

-40°C to 60°C (-40°F to 140°F) operating range.

0.01µs vibrating wire resolution.

16 bit analog/digital converter.

SOFTWARE

User friendly Windows[®] host software included at no additional cost.

Compatible with most spreadsheet software.

Data stores in CSV format, and opens in Micro-soft[®] Excel.

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specifications + ordering info

DT2055B Ten Channel Data Logger



general specifications

DESCRIPTION	SPECIFICATION
Frequency Accuracy	0.01% Full Scale
Resolution	1 part in 65,000
Memory	Over 120,000 records including: time, 5 channels frequency, frequency ² , 5 channels temperature
Power Source	1 1/3 lithium primary battery
Battery Life	Over 5 years / 2 memory fills depending on temperature and use
Communication	USB type B connector
Dimensions	120 x 122 x 91 mm (4.7 x 4.8 x 3.6 in.)
Temperature Range	-40°C to 60°C (-40° to 140°F)
Enclosure	NEMA 4X (IP65)

data storage specifications

DESCRIPTION	SPECIFICATION
Memory	4 MB
Data Transfer	5,000 data points per second
Interval Mode	10 seconds to 1 day
Variable Rate Mode	16 user programmable sampling rates
Time Format	Month / day / year Hour / minute / second
Memory Full Behaviour	*Wrap-around* or *fill & stop* option

optional equipment

Communications cable
L930 radio option

ordering info

PART #	DESCRIPTION
DT2055B	Ten Channel Data Logger
DT2055B-T	Ten Channel Data Logger - Single Gland
103200-AR2-RST8	Ultra-Rugged Field PC ²



Setup the data logger and collect data using the Ultra-Rugged Field PC².

Screenshot of DT2055B Mobile software as shown on the Ultra-Rugged Field PC².



Ten Channel Data Logger with Single Gland; optional connector available; contact RST for complete details.

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ATTACHMENT D
ER VENDOR PACKAGE

Attachment D	ERRS Flow Downs & Representations & Certifications
Attachment E	Wage Determinations (DBA & SCA)



ENVIRONMENTAL RESTORATION, LLC

USEPA REGION 8
Request for Proposal RB8-62
Bulkhead
Due Date May 8, 2015

ATTACHMENT E
WAGE DETERMINATIONS