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Retrospective Case Study in Wise County, Texas

STUDY OF THE POTENTIAL IMPACTS OF HYDRAULIC FRACTURING ON DRINKING WATER RESOURCES

United States Environmental Protection Agency
Office of Research and Development

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U.S. Environmental Protection Agency
Office of Research and Development
Washington, DC

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Acronyms and Abbreviations

ADQ	audits of data quality
ANOVA	analysis of variance
bbl	barrels
bcf	billion cubic feet
BTEX	benzene, toluene, ethylbenzene, and xylene
Cl/Br	chloride to bromide ratio
Cl/I	chloride to iodide ratio
CLP	Contract Laboratory Program
DIC	dissolved inorganic carbon
DO	dissolved oxygen
DOC	dissolved organic carbon
DRO	diesel-range organics
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
EDR	Environmental Data Resources, Inc.
ft	feet
ft/mile	feet per mile
ft/yr	feet per year
GC/MS	gas chromatography/mass spectrometry
GMWL	global meteoric water line
GPS	global positioning system
GRO	gasoline-range organics
GWERD	Ground Water and Ecosystems Restoration Division
HPLC	high performance liquid chromatography
ICP-OES	inductively coupled plasma-optical emission spectroscopy
ICP-MS	inductively couple plasma-mass spectrometry
K/Rb	potassium to rubidium ratio
L/min	liters per minute

MCL	maximum contaminant level
MDL	minimum detection limit
PW	production well
µg/L	micrograms per liter
µS/cm	microsiemens per centimeter
MCFPD	thousand cubic feet per day
mg/L	milligrams per liter
min	minutes
NaCl	sodium chloride
$NaHCO_3$	sodium bicarbonate
NIST	National Institute of Standards and Technology
NRMRL	National Risk Management Research Laboratory
NURE	National Uranium Resource Evaluation
NWIS	National Water Information System
OSWER	Office of Solid Waste and Emergency Response
ORD	Office of Research and Development
PI	Principal Investigator
PW	Produced Water
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QL	quantitation limit
RCRA	Resource Conservation and Recovery Act
RSKSOP	Robert S. Kerr Environmental Research Center Standard Operating Procedure
SMCL	secondary maximum contaminant level
SpC	specific conductivity
STORET	STOrage and RETrieval
SVOC	semi-volatile organic compounds
tcf	trillion cubic feet

TDS	total dissolved solids
TIC	tentatively identified compound
TIMS	thermal imagery mass spectrometry
TPS	total petroleum system
TRRC	Texas Railroad Commission
TSA	Technical System Audit
TXWDB	Texas Water Development Board
USGS	U.S. Geological Survey
VOC	volatile organic compound

Preface

The U.S. Environmental Protection Agency (EPA) is conducting a study of the potential impacts of hydraulic fracturing for oil and gas on drinking water resources. This study was initiated in Fiscal Year 2010 when Congress urged the EPA to examine the relationship between hydraulic fracturing and drinking water resources in the United States. In response, EPA developed a research plan (*Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources*) that was reviewed by the Agency's Science Advisory Board (SAB) and issued in 2011. A progress report on the study (*Study of the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources: Progress Report)*, detailing the EPA's research approaches and next steps, was released in late 2012 and was followed by a consultation with individual experts convened under the auspices of the SAB.

The EPA's study includes the development of several research projects, extensive review of the literature and technical input from state, industry, and non-governmental organizations as well as the public and other stakeholders. A series of technical roundtables and in-depth technical workshops were held to help address specific research questions and to inform the work of the study. The study is designed to address research questions posed for each stage of the hydraulic fracturing water cycle:

- Water Acquisition: What are the possible impacts of large volume water withdrawals from ground and surface waters on drinking water resources?
- Chemical Mixing: What are the possible impacts of surface spills of hydraulic fracturing fluid on or near well pads on drinking water resources?
- Well Injection: What are the possible impacts of the injection and fracturing process on drinking water resources?
- Flowback and Produced Water: What are the possible impacts of surface spills of flowback and produced water on or near well pads on drinking water resources?
- Wastewater Treatment and Waste Disposal: What are the possible impacts of inadequate treatment of hydraulic fracturing wastewaters on drinking water resources?

This report, *Retrospective Case Study in Wise County, Texas*, is the product of one of the research projects conducted as part of the EPA's study. It has undergone independent, external peer review in accordance with Agency policy and all of the peer review comments received were considered in the report's development.

The EPA's study will contribute to the understanding of the potential impacts of hydraulic fracturing activities for oil and gas on drinking water resources and the factors that may influence those impacts. The study will help facilitate and inform dialogue among interested stakeholders, including Congress, other Federal agencies, states, tribal government, the international community, industry, non-governmental organizations, academia, and the general public.

Authors

Douglas G. Beak, US EPA/ORD/NRMRL

Michael D. Overbay, US EPA/Region 6

Susan C. Mravik, US EPA/ORD/NRMRL

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Executive Summary

In December 2009, Congress urged the U.S. Environmental Protection Agency (EPA) to conduct a study to better understand the relationship between hydraulic fracturing for oil and gas on drinking water resources. This report provides the results of one of five retrospective case studies conducted as a component of EPA's national study on potential impacts of hydraulic fracturing on drinking water resources (US EPA, 2011a, 2011b). Retrospective case studies focused on investigating reported instances of drinking water contamination in areas where hydraulic fracturing has already occurred. This report describes the retrospective case study in north central Texas, conducted at three locations in Wise County where both conventional and unconventional gas production occurred in the past. Currently unconventional gas production occurs from the Mississippian-aged Barnett Shale. Additional information on Wise County site selection can be found in Study Plan (US EPA, 2011b).

The Barnett Shale extends throughout the Bend Arch-Fort Worth Basin (formed during the Mississippian age 320 to 360 million years ago), which extends south from the Muenster Arch, near the Oklahoma border, to the Llano Uplift in Burnet County and west from the Ouachita Thrust Front, near Dallas, to Taylor. Gas production from the Barnett Shale depends upon recent advances in horizontal drilling and hydraulic fracturing technologies to enhance and create fracture porosity, permeability, and gas flow. Water-quality samples were collected from 16 domestic wells and 4 surface water bodies at three locations within Wise County (Locations A, B, and C) during five sampling rounds in September 2011, March 2012, September 2012, December 2012, and May 2013. Additionally, three production wells (gas wells) were sampled—two that had been completed in the Barnett Shale and one that had been completed in the overlying Boonesville Bend Conglomerate formation. Domestic wells sampled in Wise County were screened primarily in the Trinity aquifer with one exception, a well that was screened in an alluvial deposit.

The geochemistry of water samples was investigated by analyzing major ions, trace metals, methane/ethane gas concentrations, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), glycol ethers, diesel and gasoline range organics (DRO and GRO), and selected stable isotopes ($\delta^{18}O_{H2O}$, $\delta^{2}H_{H2O}$, and $^{87}Sr/^{86}Sr$). Major ion data collected from this study were compared to historical water-quality data retrieved from the literature and national water-quality databases, including the U.S. Geological Survey (USGS) National Water Information System (NWIS), the State of Texas Water Development Board (TXWDB), and the USGS National Uranium Resource Evaluation (NURE) databases. These data sources provide water-quality data for samples collected before 1993 (except NWIS), and therefore, before Barnett Shale gas recovery. The NWIS only contains data for Wise County from 1994. Statistical comparisons using analysis of variance (ANOVA) and Kruskal-Wallis tests were made between the data collected from this study and both the historical data on a countywide basis and on a reduced-area (3-mile radius) basis to specifically focus on historical water samples collected near the sample locations of this study.

Two primary water types were identified in Wise County (calcium-bicarbonate and sodium-bicarbonate), although occasionally other water types were identified. These water types were found to divide Wise County into two distinct regions along a line running from northeast to southwest. North of this line the water type was primarily calcium bicarbonate and to the south, sodium-bicarbonate. This trend is consistent with the reported geology of the Trinity aquifer. In the northern portion of the county, the aquifer comprises two geologic formations, the Paluxy and the Twin Mountains formations, and in the

southern portion of the county, it comprises the Paluxy, Glen Rose, and Twin Mountains formations. There were no apparent patterns associated with the other water types found in the historical databases, and they appeared to be randomly distributed throughout Wise County. This suggested that there may be differences in ground water chemistry on a local scale or that wells in these databases may exhibit impacts from unknown sources. This lack of patterns for the other water type illustrates the need to also examine changes in water quality on a more local scale (3-mile radius) rather than using only the countywide scale to compare the historical data with a specific study location.

An examination of chemical parameters that could potentially show impacts of deep formation brine on drinking water was conducted. Historical data for Location A showed few differences in these parameters both countywide and within the 3-mile radius. In general, Location C was similar to Location A. Any differences in these parameters could be explained by local variations in ground water and did not point to a specific source for Locations A and C. Therefore, there were no observable impacts for study Locations A and C. Study Location B, however, did show differences in several parameters (chloride, specific conductivity, calcium, potassium, magnesium, sodium, bromide, iodide, and strontium), most notably chloride and specific conductivity based, on comparisons with historical data and time trends. Differences in water quality at Location B were identified at two wells, WISETXGW01 and WISETXGW08, which always exceeded the chloride secondary maximum contaminant level (SMCL) during the time frame of this study. The exceedances ranged from 2.2× to 7.9× the SMCL for chloride. These differences also prompted the Texas Commission on Environmental Quality to notify local homeowners in the vicinity of Location B of the SMCL exceedances (see Appendix D). In addition, WISETXGW05 showed differences for calcium, magnesium, barium, and strontium using site specific background data.

Dissolved gases were detected at all study locations (64% of the wells), and most detections were for methane. The methane concentrations in groundwater ranged from 0.0007 to 0.0242 milligrams/L (mg/L) with a median concentration of 0.0016 mg/L. These low-level concentrations of methane were generally too low for isotopic analysis. Published data for the Trinity aquifer for locations outside of the study areas showed methane concentration that ranged from 0.0144 to 0.0347 mg/L (Zhang et al., 1998). Therefore, the methane concentrations observed during the study were likely background methane concentrations that exist in the aquifer.

The analysis of organic chemicals was to evaluate the potential occurrence in ground water and surface water of chemicals generally documented as components of hydraulic fracturing fluids. When detected, concentrations of organic compounds did not exceed EPA drinking water standards, and there were no repeated detections in any sample of organic chemicals known to be associated with hydraulic fracturing. Low-level detections of VOCs, SVOCs, and DRO compounds (in surface water) were observed at some locations during some of the sampling rounds. There were no detections of glycol ethers in ground water or surface water samples, one detection of GRO compounds in a ground water sample, and an SVOC (bis-(2-ethylmethyl) phthalate) was detected in two wells. DRO was detected only in surface water and could not be related to a specific source. There were no historical data for DRO or GRO; and there were no detections of any SVOCs in the historical databases. Several detections of VOCs (detected in 6% of the samples) could be linked to activities (vehicular traffic and generators) occurring nearby during the sampling. The detected VOCs were tert-butyl alcohol, methyl tert-butyl ether, ethyl tert-butyl ether, tert-amyl methyl ether, m+p-xylene, o-xylene, and 1,2,4-trimethylbenzene (in 2% of the detections) and benzene (in 6% of the detections). Historical water-quality databases did include some information on organic chemicals in ground water, but chemicals potentially associated with hydraulic fracturing were rarely detected (two detections of benzene).

As noted in the analysis of the historical databases, most of the trace elements (with the exception of arsenic, iron, and manganese) were not detected or were found in very low concentrations. Arsenic, iron, and manganese concentrations were similar to what would be expected in the ground water, based on the historical information used. The secondary MCL exceedances in this study for iron and manganese are likely due to naturally occurring conditions in the aquifer, which is also supported by the analysis of the historical data. Arsenic is naturally occurring as well, but did not exceed the maximum contaminant level (MCL).

Two study wells had elevated concentrations of chloride and SPC, WISETXGW01 and WISETXGW08. When compared with concentrations found in the historical data, this indicated that an impact may have occurred and prompted a more detailed site-specific evaluation. There were significant differences between the site-specific background (wells chosen prior to sampling to serve as background) and the impacted wells WISETXGW01 and WISETXGW08. There is also evidence that WISETXGW05 was potentially different from the site-specific background. An effort to screen for and identify potential sources of contamination was initiated. The identity of the source or sources of contamination was problematic because of limited site-specific information on the composition of potential source fluids and by the very limited understanding of the local hydrology at study Location B. However, this analysis was a useful method for screening potential sources of contamination. Through the use of geochemical fingerprinting, isotopic analysis, and isotopic fingerprinting, the likely source of the observed impacts to WISETXGW01 and WISETXGW08 was brine contamination of the Trinity aquifer. Landfill leachate was not indicated as a potential source for WISETXGW01 and WISETXGW08; and halite/road salt is a very unlikely source for the observed impacts at study Location B. The source of the brine contamination in WISETXGW01 and WISETXGW08 is not known; however, there are several potential pathways by which brine impacts could occur (no implied order of importance): brine migrating from underlying formations along current and historical well bores; brine migrating from underlying formations along natural fractures; leaks from the reserve pits and/or impoundments; and brine migrating from a nearby brine injection well. The data collected as part of this study were not sufficient to distinguish between these potential pathways, and other data such as local hydrology or ground water chemistry from monitoring wells does not exist. Because of this, potential pathways and sources of the impacts could not be determined in this study location. The observed impacts to WISETXGW05 could also be related to potential brine contamination; WISETXGW05 could have also been contaminated by landfill leachate. Although, other sources of potential contamination were identified (based on literature) for WISETXGW05, the source or sources of the observed impacts could not be determined using the data collected in this study and data from the literature.

Key observations or findings from this study are listed below.

- Comparisons of study data with historical data showed no apparent impacts on groundwater at two of the three study locations.
- In the third study location, three study wells were identified as impacted. Comparison of study data with historical data revealed two wells were impacted based on differences in several parameters, most notably chloride and specific conductivity. There were also differences noted

in calcium, potassium, magnesium, sodium, bromide, iodide, and strontium. A more detailed investigation using site-specific background data indicated that a third well was also impacted.

- VOCs were detected in up to 6% of the study samples at concentrations below EPA drinking water standards. There were no detections of glycol ethers and no repeated detections in any sample of organic chemicals known to be associated with hydraulic fracturing. Consequently, the potential source(s) of the observed organic compounds could not be identified.
- Dissolved methane was detected in 64% of the study wells at concentrations ranging from 0.0007 to 0.0242 mg/L. Methane concentrations observed during the study were consistent with background methane concentrations in the Trinity aquifer south of Wise County (0.0144 to 0.0347 mg/L).
- Iron and manganese were detected at concentrations above the EPA's secondary maximum contamination level (SMCL). The iron, manganese, and arsenic levels detected in the study samples were consistent with naturally occurring sources and the historical ground water data.
- Chloride was detected in two study wells at concentrations that exceeded the chloride SMCL by a factor of 2.2 to 7.9 times.
- Based on the screening of potential sources of impacts, formation brines were the only source that was consistent with the observed impacts on two of the study wells. In the third impacted well, the screening indicated two potential sources exist for the impact observed, brines and landfill leachate. However, the evaluation of the potential source or sources of the impact was limited based on a lack of available site-specific data. Site-specific data were available only for formation brines, while literature data were used for other potential sources of impacts. This limited the capability of geochemical fingerprinting and determining a definitive source of the impacts.

1. Introduction

Recent advances in drilling technologies (horizontal drilling) and well stimulation (hydraulic fracturing) have resulted in large-scale development of vast, unconventional reserves of oil and gas across a wide range of geographic regions and geologic formations in the United States. These reserves are considered unconventional because they are bound up in low-permeability reservoirs such as shale, tight sands, limestone, and coal beds, and recovery of these reserves was previously uneconomical. While some of this new development is occurring in areas with mature oil and gas fields, vast areas with very little or no previous oil and gas development also are now being developed. As a result, there are rising concerns over potential impacts on human health and the environment, especially with regard to potential effects on drinking water sources. Environmental concerns include the potential for contamination of shallow ground water by stray gases (methane), formation waters (brines), and fracturing chemicals associated with unconventional gas development.

In December 2009, Congress urged EPA to study the relationship between hydraulic fracturing and drinking water. The study was to be conducted using a credible approach that relied on the best available science as well as independent sources of information, and through a transparent, peer-reviewed process that would ensure the validity and accuracy of the data. EPA also consulted with other federal agencies and appropriate state and interstate regulatory agencies in carrying out the study (US EPA, 2010a). In February 2011, EPA issued the *Draft Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources* (US EPA, 2011a). The final *Plan to Study the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources* was released in November 2011 (US EPA, 2011b).

In 2011, EPA began to research the potential impacts of hydraulic fracturing on drinking water resources, if any, and to identify the driving factors that could affect the severity and frequency of any such impacts. EPA scientists focused primarily on hydraulic fracturing of shale formations, with some study of other oil- and gas-producing formations, including coal beds. EPA designed the scope of the research around five stages of the hydraulic fracturing water cycle (US EPA, 2012).

Each stage of the cycle is associated with a primary research question:

- Water acquisition: What are the potential impacts of large-volume water withdrawals from ground water and surface waters on drinking water resources?
- Chemical mixing: What are the potential impacts of hydraulic fracturing fluid surface spills on or near well pads on drinking water resources?
- Well injection: What are the potential impacts of the injection and fracturing process on drinking water resources?
- Flowback and produced water: What are the potential impacts of flowback and produced water (collectively referred to as "hydraulic fracturing wastewater") surface spills on or near well pads on drinking water resources?
- Wastewater treatment and waste disposal: What are the potential impacts of inadequate treatment of hydraulic fracturing wastewater on drinking water resources?

Prior to the release of the study plan, EPA invited the public to nominate specific regions of the United States for inclusion as potential sites for case studies. The plan identified 41 potential retrospective case study sites. The retrospective case studies were to focus on investigating reported instances of drinking water resource contamination in areas where hydraulic fracturing has already occurred and were intended to inform several of the primary research questions related to chemical mixing, well injection, and flowback and produced water. Of the 41 sites nominated during the stakeholder process, EPA selected five sites across the United States at which to conduct retrospective case studies. The sites were deemed illustrative of the types of problems that were reported to EPA during stakeholder meetings held in 2010 and 2011. Additional information on site selection can be found in Study Plan (US EPA, 2011b). EPA's plan for the retrospective case studies was to make a determination on the presence and extent of drinking water resource contamination as well as whether hydraulic fracturing or related processes contributed to the contamination. Thus, the retrospective sites were expected to provide EPA with information regarding key factors that may be associated with drinking water contamination (US EPA, 2011b). In 2011 EPA also began conducting investigations at the five selected retrospective case study locations in Washington County, Pennsylvania (southwestern Pennsylvania); Bradford County, Pennsylvania (northeastern Pennsylvania); Wise County, Texas; Las Animas and Huerfano counties, Colorado (Raton Basin); and Dunn County, North Dakota (Killdeer). The Wise County, Texas retrospective case study examined three distinct locations within Wise County where hydraulic fracturing has already occurred and is ongoing (Figures 1 and 2). Wise County has historically produced a considerable amount of oil and gas from many plays, but currently the Barnett Shale is the formation receiving attention with new exploration. Reported drinking water concerns are clustered in three distinct locations within Wise County: (1) Location A, approximately 10 miles east of Decatur, (2) Location B, approximately 4 miles southwest of Decatur, and (3) Location C, approximately 6 miles northeast of Alvord (Figure 2). Homeowner complaints were centered on the recovery of natural gas from the Barnett Shale. Through the screening process, EPA determined that these three locations would be appropriate candidates for the study.

In Location A, homeowner complaints centered primarily on concerns about odors, leaks, and spills. It was later discovered that a fish kill had occurred in a small lake adjacent to a well pad. Three of the property owners have had their drinking water privately tested and some of the results may indicate a problem with their water; however the data quality was unknown. However, these data cannot be definitively linked to oil and gas production in the area or to other sources of contamination.

In Location B, two homeowner complaints included increased saltiness of drinking water. Other issues reported by these two homeowners were corroding appliances (e.g. dishwashers, washing machines, etc.) and water that sometimes had a rotten egg smell. There were no existing water quality data on any of the wells at this location (US EPA, 2012).

In Location C, homeowner complaints included reported changes in the smell of the drinking water in their homes and corroding appliances. One homeowner had preexisting data. One set of data had no QA information so its validity could not be substantiated, while the other data set had validated QA and did not indicate any problems with water quality. There were no existing water quality data for the other homeowner well at this location.

This report provides the Wise, County case study data and discussion of results. The following sections of this report present the purpose and scope of this case study; an overview of the case study site background; study methods; historical water quality data; analysis of the study sample data; analysis and discussion of site-specific focus areas; and a summary of the case study findings.

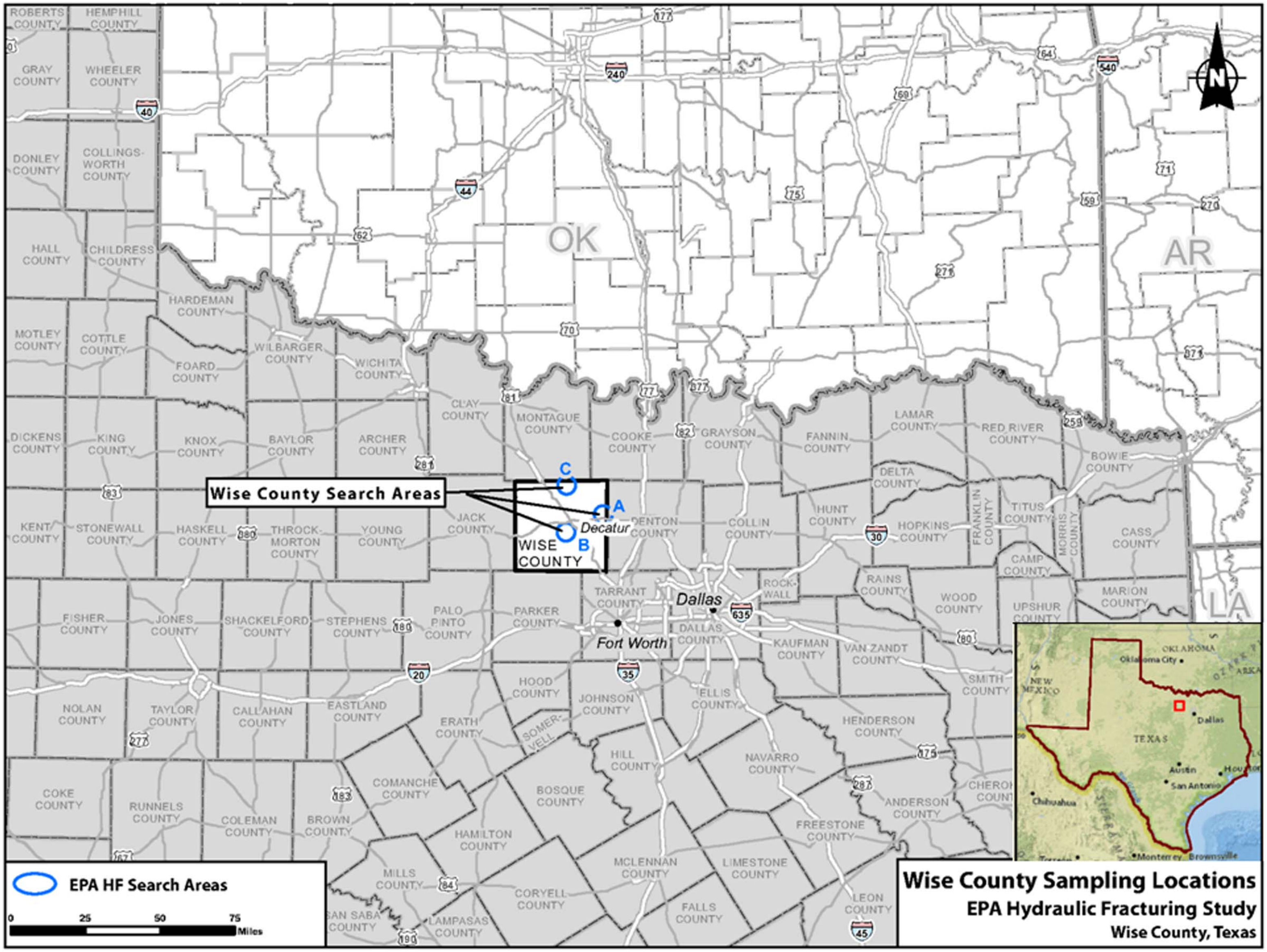
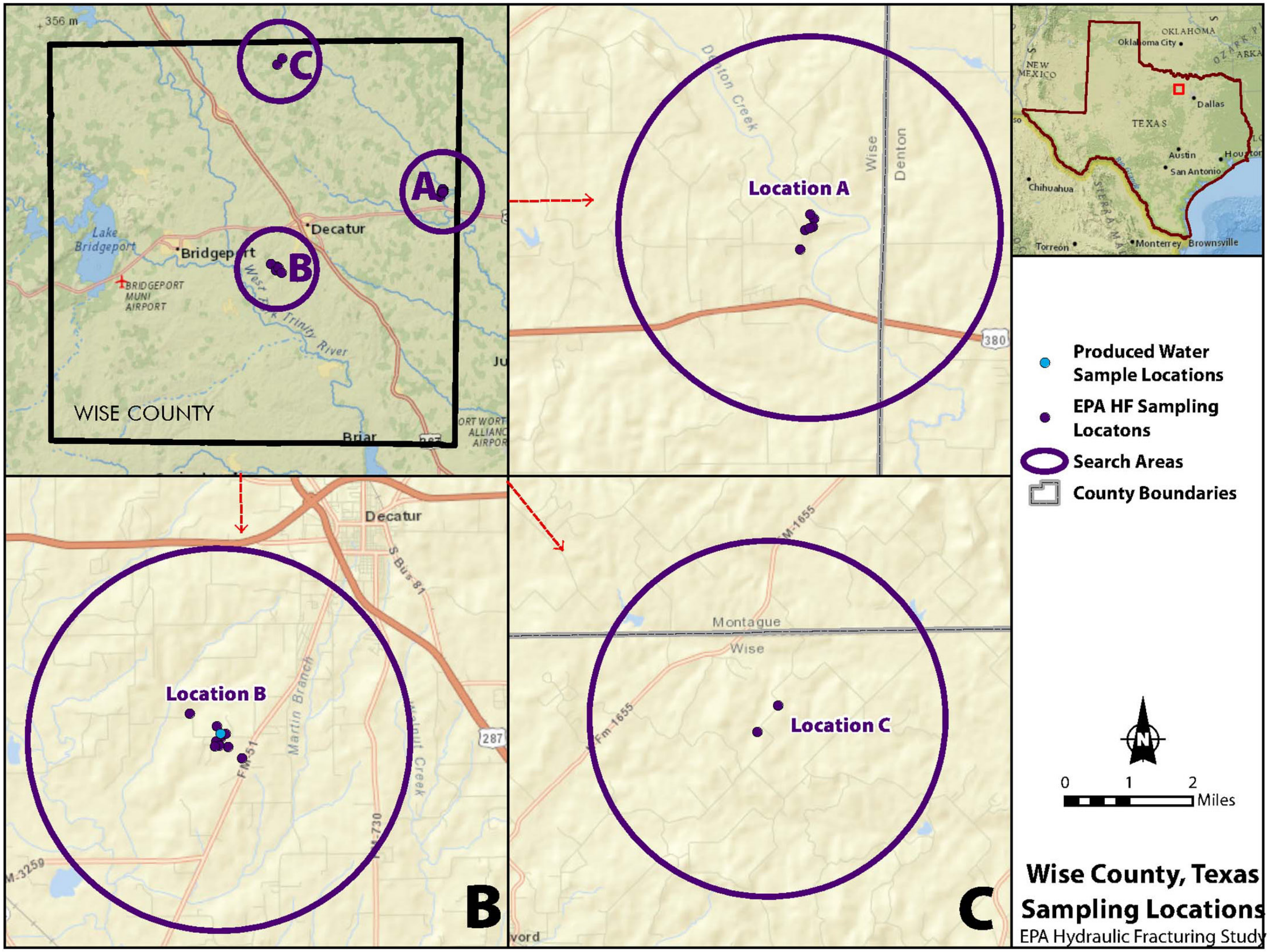


Figure 1. Overview of the Wise County Retrospective Case Study Location.



Source: *Basemap, ESRI; Sampling Locations, EPA ORD*

Figure 2. Detailed view of the Wise County sampling locations.

2. Purpose and Scope

As a component of EPA's National Study of the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources (US EPA, 2012), five retrospective case studies were conducted to investigate reported instances of drinking water resource contamination in areas of natural gas development and use of hydraulic fracturing technology. These studies were intended to inform primary research questions related to the hydraulic fracturing water cycle (US EPA, 2012).

This report provides the results of the retrospective case study conducted in the north central Texas and describes general water quality, geochemistry, and isotopic parameters of shallow ground water in Wise County, Texas. This area has been the focus of natural gas extraction from the Mississippian-age Barnett Shale. Water quality results were used to evaluate the potential impacts on drinking water resources, if any, from various land use activities not restricted to shale-gas drilling and production. The evaluation of potential impacts includes consideration of the chemicals used in hydraulic fracturing, and analyses of dissolved gases, deep brine geochemistry in relation to shallow ground water geochemistry, historical ground water quality in Wise County, and time-dependent geochemical trends. Potential causes of water quality impairment that were evaluated include: industrial/commercial land use; historical land use (e.g., farming and mining); current drilling processes/practices; historical drilling practices; and naturally occurring sources of contamination.

This report presents analytical data for water samples from three locations (Locations A, B, and C) representing domestic wells, production wells, and surface water bodies sampled at least twice during five rounds spanning 20 months (September 2011, March 2012, September 2012 (limited sampling), December 2012, and May 2013) in Wise County. The water samples were analyzed for up to 225 constituents, which included organic compounds, nutrients, major anions, major cations, trace elements, dissolved gases, and selected isotopes. Ground water quality data and summary statistics are presented for sampled constituents. In addition to chemical data collected specifically for this study, the report includes analysis of historical data from the U.S. Geological Survey (USGS) National Water Information System (NWIS) database, Texas Water Development Board (TXWDB) database, and USGS National Uranium Resource Evaluation (NURE) database for Wise County.

Each of the retrospective case study sites differs in geologic and hydrologic characteristics; however, generally similar research approaches were followed at the case study locations to assess potential drinking water impacts. As described in US EPA (2012), a tiered approach was followed to guide the progress of the retrospective case studies. The tiered scheme uses the results of successive steps or tiers to refine research activities in the subsequent steps. This report documents progress through the Tier 2 stage and includes the results of water sampling activities and evaluation of water quality impacts. The approach for Tier 2 efforts includes: a literature review of background geology and hydrology; choosing sampling locations and the development of a site-specific Quality Assurance Project Plan (QAPP); sampling and analysis of water wells and surface water; analysis of historical background data and evaluation of new results against background data; statistical and geochemical evaluation of water quality data; evaluation of potential drinking water contamination; and identification of potential sources of identified contamination. Further evaluation of any identified contaminant sources and contaminant transport and fate, including the collection of site-specific hydrogeologic information, is not part of the scope of this report.

3. Study Area Background

Wise County is located in north-central Texas (Figure 1). The center of the county is located approximately 60 miles northeast of downtown Dallas and 40 miles south of the Oklahoma border (England, 2013). According to the 2010 U.S. Census, Wise County has a population of about 60,000. This mostly rural county covers an area of approximately 922 square miles (England, 2013).

The annual precipitation in Wise County is approximately 29 inches, with May, June, and October typically being the wettest months (England, 2013). The mean average temperature ranges from 33 degrees Fahrenheit (°F) in January to 95°F in August (England, 2013). The Eastern Grand Prairie and the Western Cross Timbers regions of Texas divide Wise County from north to south. The average elevation in Wise County is 800 feet (ft) above sea level, and approximately two-thirds of the county is drained by the West Fork of the Trinity River (England, 2013). In addition to oil and gas, other natural resources in Wise County include stone and clay (England, 2013).

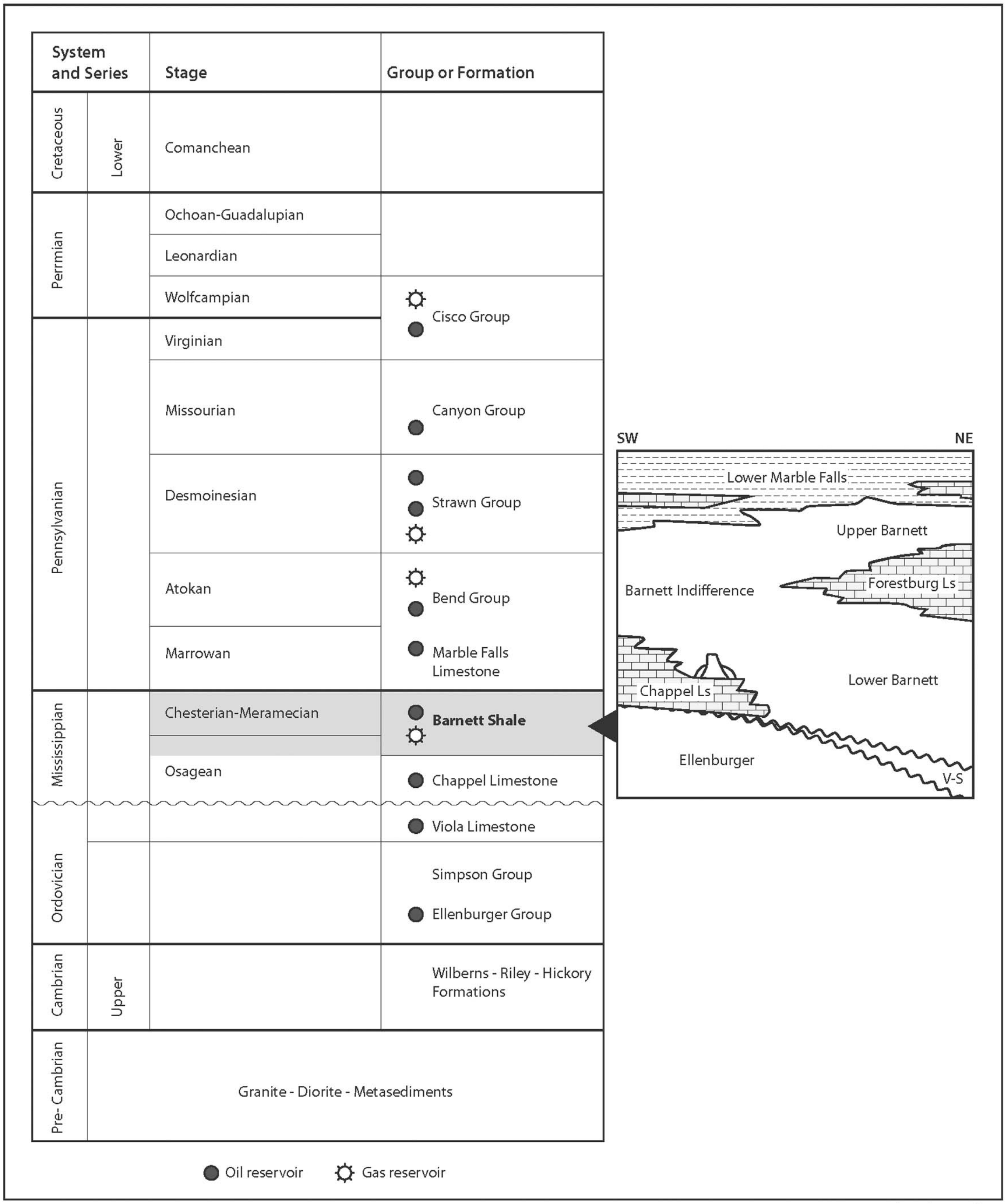
In Wise County, gas reserves are being developed in the Barnett Shale, which is an unconventional shale deposit in the Fort Worth basin adjoining the Bend Arch. Recently, development of the Barnett Shale has greatly increased.

3.1. Geology

Wise County is located in the Bend Arch-Fort Worth Basin. The stratigraphy (Figure 3) of the Bend Arch-Fort Worth Basin is characterized by sedimentary strata and includes limestones, sandstones, and shales. The Barnett shale is of Mississippian age (320 to 360 million years ago) and extends throughout the Bend Arch-Fort Worth Basin: south from the Muenster Arch, near the Oklahoma border, to the Llano Uplift in Burnet County, and west from the Ouachita Thrust Front near Dallas, to Taylor County (Figure 4) (Bruner and Smosna, 2011). In the northeastern portion of the Fort Worth Basin, the Barnett Shale is divided by the Forestburg Limestone, but this formation tapers out towards the southern edge of Wise County (Bruner and Smosna, 2011). The Barnett Shale is bounded by the Chappel Limestone below it and the Marble Falls Limestone above it (Bruner and Smosna, 2011).

Stratigraphic units that supply fresh-to-slightly saline water to wells in the study region range in age from Paleozoic to recent. The most important water-bearing formations in north-central Texas are of Cretaceous age (i.e., 66 to 144 million years ago). The Cretaceous-age Trinity Group is the principal water-bearing group of rocks in the study area. Based on information obtained from site visits, all but one of the domestic wells included in this case study are screened in the groundwater-bearing formations of the Trinity Group. According to the Texas Railroad Commission (TRRC), the base of the Cretaceous formations in Wise County range from 700 to 1,050 ft below ground surface (bgs); the Barnett Shale, occurring in the Pennsylvanian system, occurs between 7,000 to 8,000 ft bgs (NETL, 2013).

As shown on Figure 5A, Geological Map of Wise County, the Trinity Group crops out through most of the Wise County study area. The Trinity group dips eastward and southeastward and is underlain and confined by low-permeability rocks that range in age from Precambrian to Jurassic. Where it does not outcrop, is confined by the Walnut Formation (Renken, 1998). The aquifer dips to the south and southeast and exhibits a high degree of vertical anisotropy (Renken, 1998).



Source: American Association of Petroleum Geologists

Figure 3. A generalized stratigraphy column for the Fort Worth Basin (modified from Bruner and Smosna, 2011).

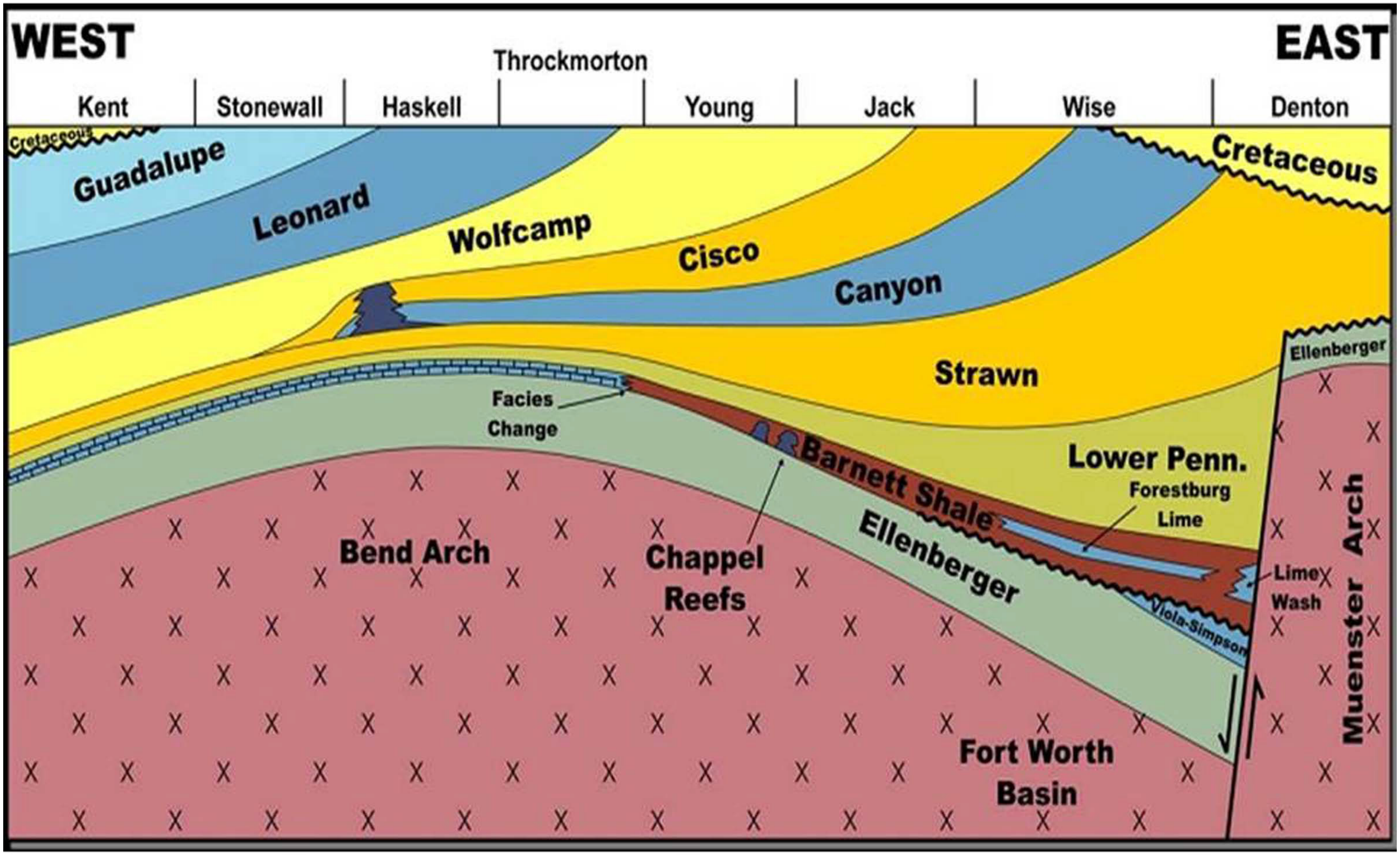
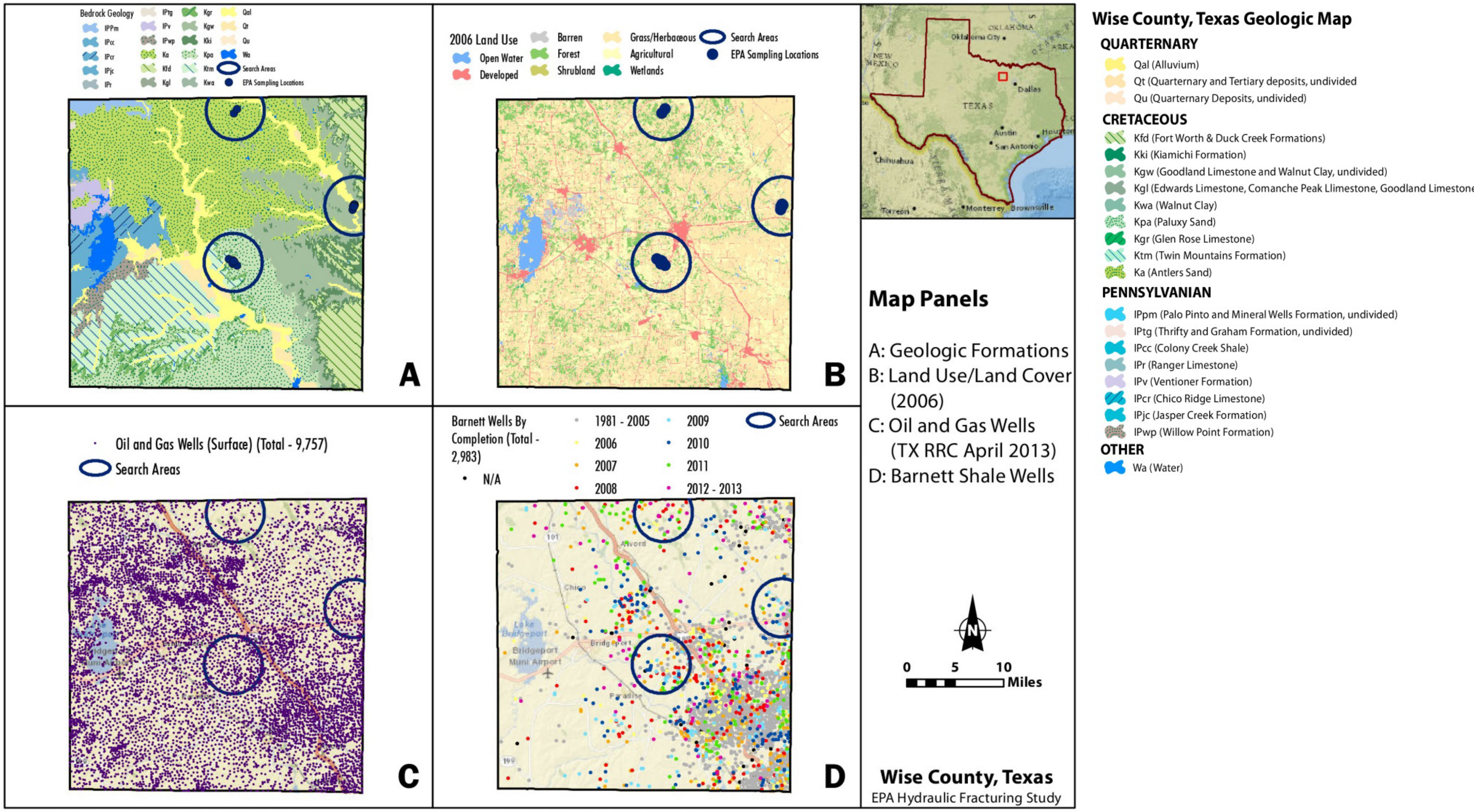


Figure 4. A generalized geologic cross section of the Bend Arch, Fort Worth Basin and Muenster Arch (modified from Bruner and Smosna, 2011).



Source: *Landuse: USGS; Geology, EPA ORD, USGS, Texas Water Development Board; Sampling Locations, EPA ORD; Well Locations: Texas Railroad Commission*

Figure 5. Maps of Wise County, Texas showing (A) Surface bedrock geology, (B) Land use and Land Cover, (C) Oil and Gas Wells, and (D) Barnett Shale Wells.

The Trinity Group is divided into the following formations (youngest to oldest): Paluxy, Glen Rose, Antlers, and Twin Mountains. In the southern part of the county, the Trinity Group is composed of the Paluxy, Glen Rose, and Twin Mountains formations (Nordstrom, 1982; Renken, 1998). In the northern portion of the county, the Glen Rose formation pinches out and the Paluxy and Twin Mountains formations coalesce to form one unit, the Antlers formation (Nordstrom, 1982; Renken, 1998).

The Paluxy formation is the upper member of the Trinity Group south of the Glen Rose pinch-out. It crops out in Hood, Parker, Tarrant, and Wise counties. The dip is easterly at an average rate of 30 feet per mile (ft/mile) (5.7 meters per kilometer [m/km]) near the outcrop, increasing to 80 ft/mile (15.2 m/km) near the downdip limit of fresh to slightly saline water. The Paluxy is composed predominantly of fine- to coarse-grained, friable, homogeneous, white quartz sand interbedded with sandy, silty, calcareous, or waxy clay and shale. In general, coarse-grained sand is in the lower part of the formation. The Paluxy grades upward into fine-grained sand with variable amounts of shale and clay. The sands are usually well-sorted, poorly cemented, and crossbedded. Pyrite and iron nodules are often associated with the sands and contribute to the high iron concentrations in the groundwater (Nordstrom, 1982).

The Glen Rose formation consists of hard limestone strata alternating with marl or marly limestone (Nordstrom, 1982). The Glen Rose formation in Wise County consists of only three or four thin ledges of limestone interstratified with clays, sandy clays, and sands, and the total thickness is never more than 25 ft, with a reported thickness ranging from 22 to 25 ft (Scott and Armstrong, 1932).

The Antlers formation crops out mainly in Cooke, Montague, and Wise counties. The formation dips to the southeast at an average rate of 20 ft/mile (3.8 m/km) near its outcrop to 70 ft/mile (13.3 m/km) near its southeastern limit. The Antlers consists of basal conglomerate and gravel overlain by a fine, white to gray, poorly consolidated sand in massive crossbedded layers interbedded with layers of red, purple, or gray clay in discontinuous lenses scattered throughout the formation, with a middle section containing considerably more clay beds than the upper or lower sections (Nordstrom, 1982). Fine, white to yellow pack sand with thin beds of multicolored clay resting on a basal layer of gravel characterize a section on the outcrop (Nordstrom, 1982).

The Twin Mountains formation crops out in the western part of the study region in Hood, Parker, and Wise counties. The formation overlies Paleozoic rocks throughout the study region and is the lower member of the Trinity Group; it underlies the Glen Rose formation where the Glen Rose is present. In Wise, Denton, Cooke, and Grayson counties, where the Glen Rose formation is absent, the Twin Mountains formation is equivalent to the lower unit of the Antlers formation. The Twin Mountains consists of a basal conglomerate of chert and quartz, grading upward to coarse- to fine-grained sand interspersed with varicolored shale. The sand strata are more thickly bedded in the lower part of the formation than in the upper and middle, and it is in this lower massive sand that the majority of wells are completed. The upper part of the Twin Mountains formation also contains a considerable percentage of sand and sandstone strata, but less than the lower part due to the increased interbedding of shale and clay. Few wells are developed in the upper part of the formation (Nordstrom, 1982).

The topography in the eastern portion of Wise County consists of gently rolling hills (England, 2013). The soils in the eastern portion of the county typically are sandy loam topsoils with brick clay subsoils. A combination of flat and undulating topography makes up the central portion of the county (England, 2013). The subsoils in the central part of the county are deep layers of red clay that are overlain by light colored surface soils. The topography of the western section of the county is primarily hilly, with alluvial loam and sandy topsoils that cover the clay and limestone subsoils or bedrock (England, 2013). A more detailed description of the geology is given in Appendix D.

3.2. Hydrogeology

Historical water quality data have been reported by Nordstrom (1982), Reutter and Dunn (2000), the Texas Water Development Board (TXWDB, 2013b), and the USGS (2013a, 2013b). In general, water quality data from both Nordstorm and Reutter and Dunn are consistent with each other. The historical data can be used as a reference point for water quality changes that may have taken place since 2000.

The Paluxy formation yields small to moderate amounts of fresh to slightly saline water (Nordstrom, 1982). Water in the outcrop area is under water table conditions, and water levels remain fairly constant, with only normal seasonal fluctuations. In downdip areas, water is under artesian conditions and is confined under hydrostatic pressure by overlying formations.

The Glen Rose formation yields small quantities of water to shallow wells in localized areas, and is of poor quality (Nordstrom, 1982).

The primary source of ground water in the Antlers formation is precipitation on the outcrop; streams on the outcrop are a source of recharge. Water in the outcrop area is unconfined and therefore under water table conditions. Downdip from the outcrop, the water is confined under hydrostatic pressure and is under artesian conditions (Baker et al., 1990).

The Twin Mountains formation, which is the most important source of ground water for a large part of the northern Texas (Baker et al., 1990), yields moderate to large quantities of fresh to slightly saline water to municipal and industrial wells. The primary source of recharge to the Twin Mountains formation is precipitation falling on the outcrop and other minor sources such as surface water seepage from ponds, lakes, and streams cutting the outcrop. Ground water in this formation usually occurs under water table conditions in or near the outcrop; downdip of the outcrop, it can be under artesian conditions (Nordstrom, 1982).

The average rate of movement of ground water in the Antlers, Twin Mountains, and Paluxy formations of the Trinity Group is about 1 to 2 feet per year (ft/yr) (Nordstrom, 1982), generally in an east-southeast direction. However, as reported by the TXWDB in 1990, extensive cones of depression have developed in the piezometric surface of each of the region's principal aquifers, coinciding with areas of large ground water withdrawals. For example, from 1976 to 1989, water level declines of 25 ft (1.9 ft/yr) were common in the aquifers throughout the TXWBD's northern Texas aquifer study area. Declines have been especially severe over extensive areas in the Antlers and Twin Mountains aquifers. Water-level declines in the Paluxy were reported in some locations (Baker et al., 1990). A more detailed description of the hydrogeology is presented in Appendix D.

3.3. Oil and Gas Production

Since the 1950s, Wise County has been a focus of extensive oil and gas production as a result of being located in the north-central portion of the Bend Arch-Fort Worth Basin (Figure 6). The comprehensive National Assessment of Oil and Gas Project completed by the USGS in 1995 (Ball and Perry, 1996) assessed the potential for undiscovered oil and natural gas resources of the onshore United States. The project identified the Bend Arch-Fort Worth Basin as a major petroleum-producing geological system, and the basin was officially designated by the USGS as Province 045 and classified as the Barnett-Paleozoic total petroleum system (TPS). Oil and gas production in the TPS comes from carbonate and clastic rock reservoirs ranging in age from Ordovician to Permian (Figure 3). The first indications of hydrocarbons in the province were shows of oil and gas in wells drilled for water during the mid-nineteenth century. Sporadic exploration for petroleum began at the conclusion of the Civil War, and the first commercial oil accumulations were found in the early 1900s. The province reached a mature stage of exploration and development in the 1960s (Ball and Perry, 1996). In 2003, the USGS conducted a new assessment of the TPS and estimated a mean of 26.7 trillion cubic feet (tcf) of undiscovered natural gas, a mean of 98.5 million barrels (bbl) of undiscovered oil, and a mean of 1.1 billion bbls of undiscovered natural gas liquids, with more than 98%, or 26.2 tcf, of the undiscovered natural gas resource in the Mississippian-age Barnett Shale (USGS, 2004).

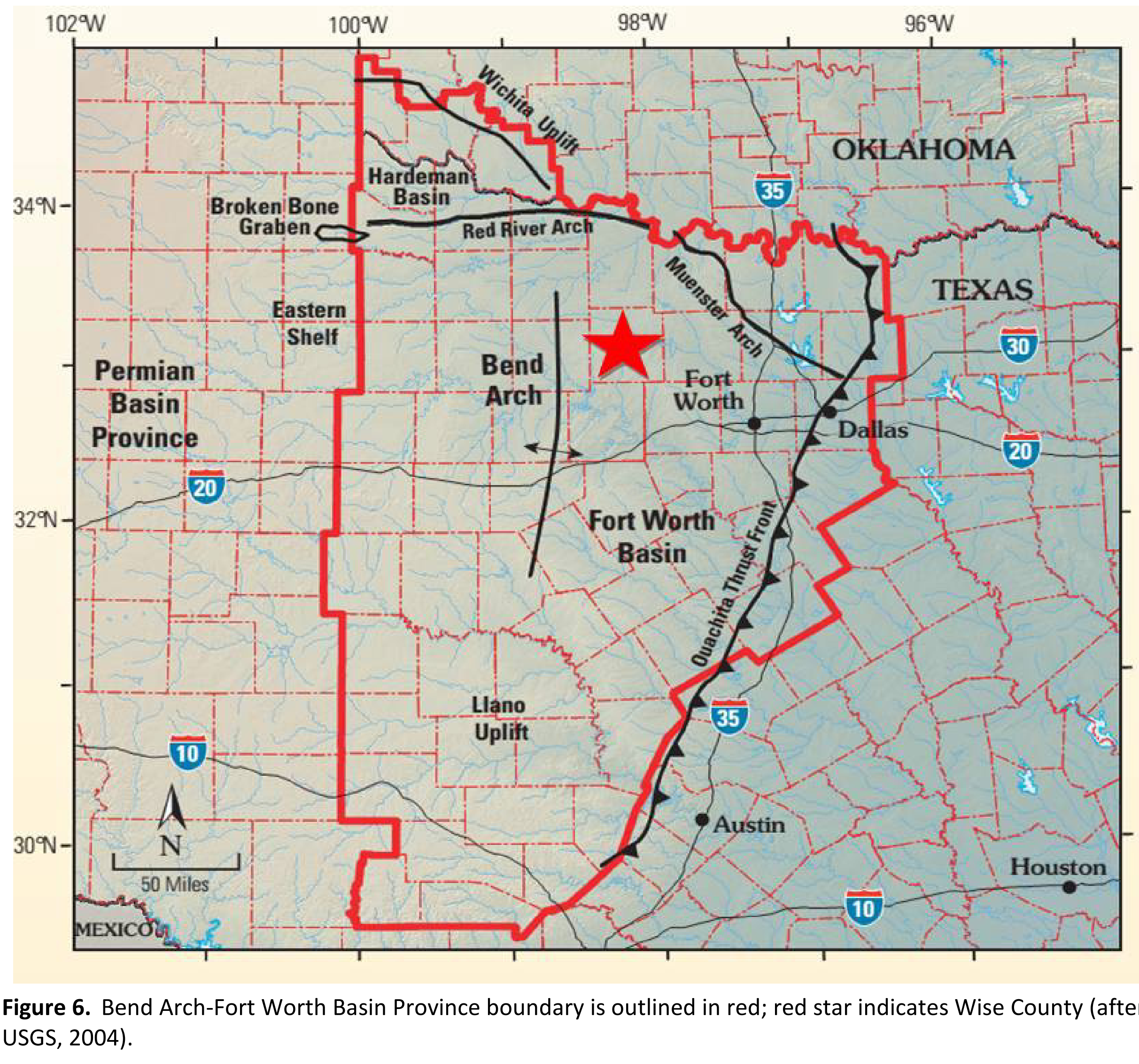


Figure 6. Bend Arch-Fort Worth Basin Province boundary is outlined in red; red star indicates Wise County (after USGS, 2004).

According to the USGS, extensive stratigraphic accumulations of natural gas occur in the numerous lenticular sandstone and conglomerate bodies of Early Pennsylvanian age in Jack, Parker, and Wise counties, Texas. These sandstone and conglomerate lenses, locally known as "Bend Conglomerates," were deposited during the Atoka Stage of the Middle Pennsylvanian period and are characterized by extreme variability in lateral extent. The Boonsville Bend Conglomerate gas field and the Toto (lower Bend Conglomerate) gas field cover an area of approximately 450 square miles in Jack, Parker, and Wise counties. At one point in the 1950s, this gas field was the largest gas-producing area of North Texas. Reported depths for these Bend Conglomerates range from 5,000 to 7,000 ft bgs.

The East Newark Field (i.e., the Barnett Shale) first became a TRRC-recognized field in early 1981, when Mitchell Energy Corp. made the first economic completion in the formation with its C.W. Slay No. 1, located 4 miles east of Newark, Texas. This could not be considered a true "discovery" since the Barnett Shale was known to exist in the TPS for some time, as many wells had been drilled for years in the area to the shallower Boonsville Field or deeper to the Viola Limestone intervals, while penetrating the Barnett Shale. According to TRRC records, as of January 2012, there were 16,530 gas wells in the Barnett Shale and 2,457 permitted locations.

According to the TRRC, the number of permits issued in the Barnett Shale peaked in 2008, with more than 4,000 permits being issued (Figure 7). In contrast, in 2012, approximately 1,182 permits were issued. Similarly, the number of drilling permits issued in Wise County peaked between 2001 to 2002, with more than 390 permits being issued, while in 2013, fewer than 70 permits were issued by the TRRC. From January through November 2012, production in the Barnett shale accounted for 31% of Texas gas well production. As of February 2013, the TRRC reported a total of 4,362 regular gas-producing wells in Wise County.

In 1919 the TRRC was given authority by the Texas legislature to regulate well plugging and enact general requirements designed to prevent the loss of oil and gas to other strata. The TRRC continued to update plugging regulations by issuing specific cementing instructions in 1934 and then requiring the plugging of fresh water strata in 1957. In 1966, the TRRC promulgated Rule 14, which required setting cement plugs to protect fresh water sands to protect drinkable quality water from pollution and to isolate each productive horizon. On February 12, 2012, the TRRC implemented the Hydraulic Fracturing Disclosure Rule, requiring oil and gas operators to disclose chemical ingredients and water volumes used in all hydraulic fracturing wells in Texas completed after February 1, 2012. These regulations require the operator to disclose this information on the well completion report, and complete the Chemical Disclosure Registry form and upload it to the FracFocus database. In May 2013, the TRRC also issued new regulations on the construction of oil and gas wells. The rule, known as the "well-integrity rule," took effect in January 2014 and updates the Commission's requirements for drilling a well, installing pipe down the well, and cementing the pipe in place.

3.4. Land Use

Much of Wise County has historically been devoted to agriculture (grazing, crop farming, and forestry). In addition, coal mines operated in the county in the early twentieth century and oil and gas production have been major industries in the county for many decades (England, 2013). The economy of Wise County is integrated with that of the nearby Fort Worth-Arlington metropolitan area and many county residents commute to work in that area. About a quarter of all workers in the county commute to nearby Tarrant County, in which Fort Worth and Arlington are located (U.S. Census Bureau, 2013).

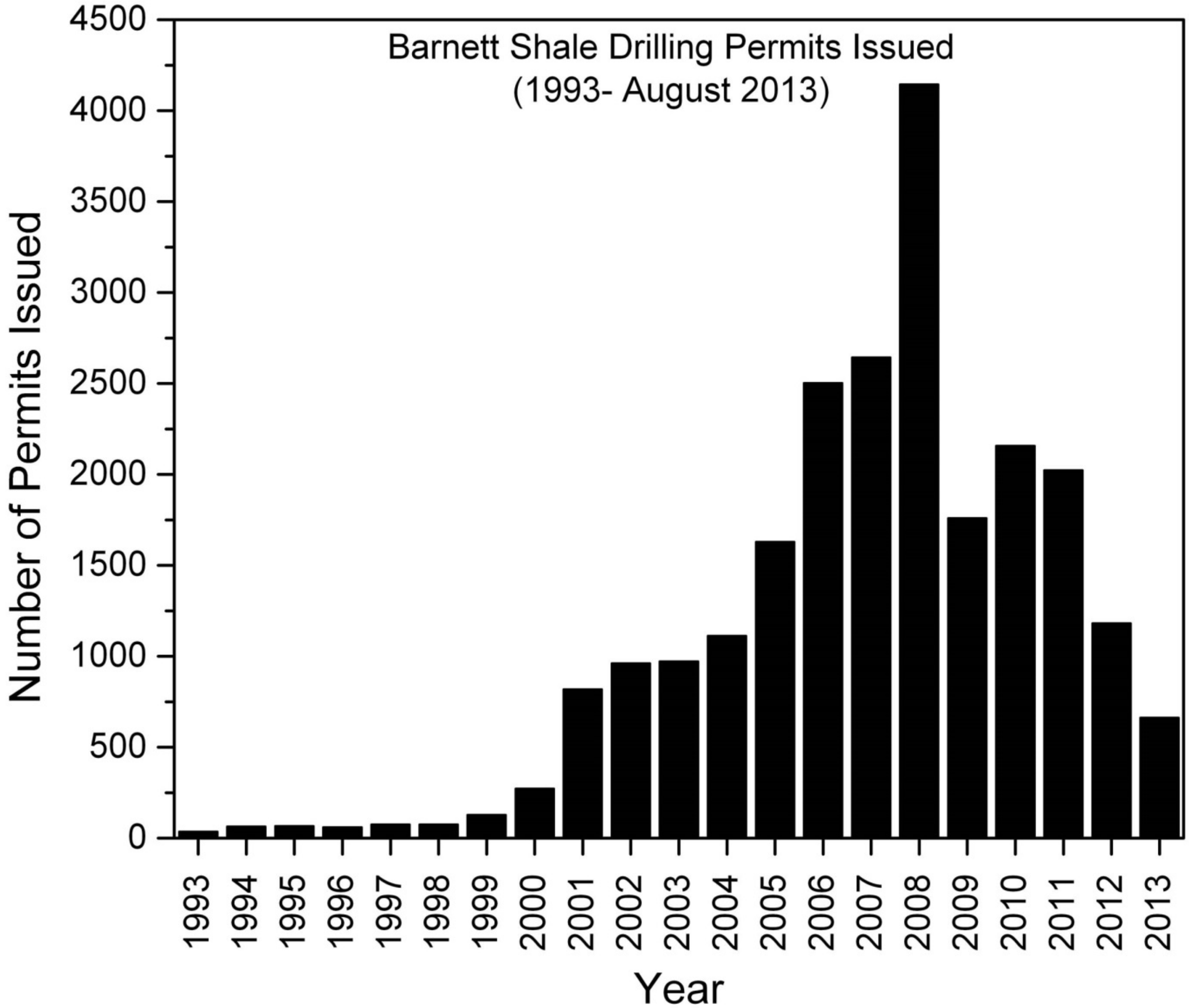


Figure 7. Drilling permits for the Barnett Shale from 1993 to August 2013 (TRRC, 2013).

Figure 8 shows land use maps created using the National Land Cover Database (NLCD) for Wise County in 1992 and 2006. Table 1, based on the same source, contains data on land use in the county in 1992 and 2006. NLCD is based upon 30-meter resolution data from the Landsat satellite (USGS, 2012a). The 2006 dataset was the most recent land use information available.

Because of methodological differences, quantitative comparisons of land use are not recommended; however, qualitative comparisons suggest very little difference in the predominant land use patterns between 1992 and 2006 (Multi-Resolution Land Characteristics Consortium, 2013). The NLCD data indicate that in both years grassland/herbaceous and pasture/hay (i.e., land suitable for grazing or animal forage production) were the largest land use categories in the county, followed by forestland, and that between them these accounted for the majority of the land use in the county. The data also indicate that, between 1992 and 2006, land use patterns did not significantly change, although in 2006 there was much more developed land (to some extent, this may have been a function of the input data and methodology changes noted above). Additional land use analysis, with particular focus in the areas adjacent to the sampling points of this study, is presented in Appendix C.

Table 1. Land use in Wise County in 1992 and 2006.

Land Use	1992		2006	
	Square Miles	% of Total	Square Miles	% of Total
Grassland/Herbaceous	329.0	35.8	541.7	58.8
Pasture/Hay	267.5	29.0	94.4	10.2
Deciduous Forest	124.0	13.5	136.0	14.8
Row/Cultivated Crops	68.7	7.5	40.9	4.4
Shrub/Scrub	54.3	5.9	1.0	0.1
Open Water	29.2	3.2	20.3	2.2
Evergreen Forest	18.1	2.0	0.7	0.1
Developed	11.4	1.2	79.1	8.6
Mixed Forest	10.2	1.1	---	---
Quarries/Strip Mines/Gravel Pits	4.8	0.5	---	---
Emergent Herbaceous Wetlands	1.3	0.1	0.4	0.1
Urban/Recreational Grass	1.1	0.1	---	---
Barren	0.6	0.1	6.8	0.7
Total	920.2	100.0	921.3	100.0

Source: USGS, 2012a

3.5. Other Potential Contaminant Sources

A detailed background assessment is needed to evaluate potential source of contamination. A list of candidate causes, i.e., hypothesized causes of environmental impairment sufficiently credible to be analyzed (US EPA, 2000a), was developed for three distinct areas of this retrospective case study site (Locations A, B, and C). Each environmental stressor was evaluated by examining potential causes and effects. Candidate causes included potential sources that could stress the environment and thus contribute to detected levels of surface and/or ground water contamination. Candidate causes were categorized as follows: industrial/commercial land use; historical land use (e.g., farming and mining); current drilling processes/practices; historical drilling practices; and naturally occurring sources.

In order to determine whether there are potential sources of contamination unrelated to drilling and hydraulic fracturing processes, a background assessment was conducted for each location of interest in Wise County.

The detailed background assessments reviewed the following databases:

- **Environmental Records Search:** Environmental record searches were performed by obtaining environmental record reports from Environmental Data Resources, Inc. (EDR). EDR searches publicly available databases and also provides data from their own proprietary databases.

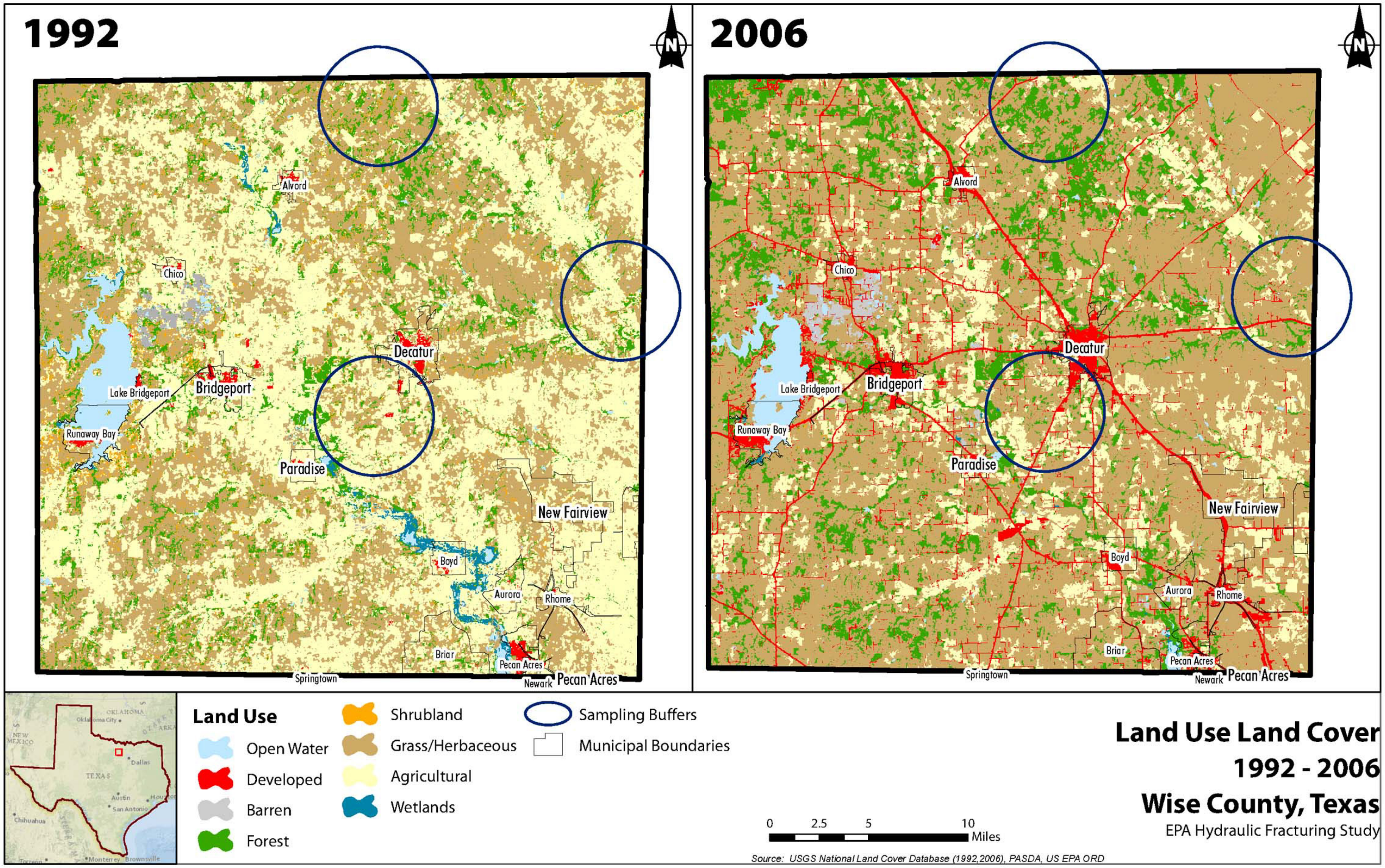


Figure 8. Land Use in Wise County, Texas from 1992-2006 (source National Land Cover Database).

- **Well Inventory:** Existing oil and gas wells from the TRRC's oil and gas well database.
- **State Record Summary:** The TRRC provided up-to-date well records for wells for the study areas. The TRRC database provides information on inspection and pollution prevention, including a listing of all inspections that have occurred at each well on record, whether violations were noted, and any enforcement that may have resulted. The system provides multiple options to search for records.

Appendix C provides the results of these detailed background assessments for each case study location.

The issues concerning ground water and surface water in Location A (approximately 10 miles east of Decatur) include complaints about changes in water quality (odor and taste) believed to be associated with recent gas drilling. Although numerous gas wells have been recently drilled and continue to be drilled in these areas, no specific gas well was considered a potential candidate cause at the initiation of the study. Changes in water quality could also be due to historical land use, historical drilling practices, and/or naturally occurring sources.

The issues concerning ground water and surface water in Location B (approximately 4 miles southwest of Decatur) include complaints regarding increased saltiness of drinking water. After the area was evaluated for impact, the potential candidate causes of the increased saltiness of drinking water in Location B include brine migrating from underlying formations along current and historical well bores due to well integrity; brine migrating from underlying formations along natural fractures; leaks from the reserve pits and/or impoundments; and brine migrating from a nearby brine injection well located 0.6 miles northwest of WISETXGW01.

The issues concerning ground water and surface water in Location C (approximately 6 miles northeast of Alvord) include complaints about changes in the smell of the drinking water believed to be associated with recent gas drilling. Changes in water quality could also be due to historical land use, historical drilling practices, and naturally occurring sources.

A report produced by Battelle (2013) addressed other potential sources of contamination that could impact surface water and ground water on a broad scale (i.e. in Wise and Denton Counties). Battelle (2013) stated that the most significant causes of impacts on water quality in Wise County were from agriculture, livestock production, oil and gas activities, construction industries, and historical coal mining. Over 442,753 acres of Wise County are dedicated to agriculture in the form of livestock production and cropland. Agricultural impacts from croplands include runoff of pesticides, fertilizers, metals, total dissolved solids (TDS), and bromide. Impacts from livestock production can include nutrients, pathogens, and methane. Battelle (2013) also identified mining activities as potential sources of impacts on water quality. These mining activities included the production of sand and gravel, which are used in the construction industry in Wise County, as well as coal mining. Water quality impacts associated with these mining activities include changes in sulfate, turbidity, pH, nitrate, nitrite, and iron levels. In addition, historical conventional and unconventional oil and gas development has in the past contributed to declines in water quality in Wise County (Battelle, 2013). Impacts can result from abandoned wells, pits, and historical discharge to surface waters. For example, Battelle (2013) reported that 211 documented ground water contamination issues have occurred because of oilfield activities in Texas. Thirty-five percent of these were the result of waste management and disposal activities; 26.5% occurred during the production-phase activities; and the remaining impacts were not categorized in the

Battelle report. Similarly, another report for the Ground Water Protection Council (GWPC; Kell, 2011), reported that between 1993 and 2008 there were also 211 incidents of ground water contamination in Texas related to oil and gas activities. Of the 211 incidents of ground water contamination 35.5 % were the result of waste management or disposal activities; 27% were legacy incidents from water disposal pits, and 26.5 % were from storage tank or flow line leaks; and the other 11 % of the reported incidents were not specified. Battelle (2013) concluded that determining a relationship between hydraulic fracturing and drinking water impairment is challenging given the lack of adequate data to characterize background water quality conditions and because of natural variability, land use patterns, and other factors that affect observed water quality patterns. Although the Battelle report provides context for a broad assessment of potential contaminant sources in Wise County, it does not provide the necessary level of detail for each study location as was done in Appendix C.

4. Study Methods

This section describes the methods used in this study for the collection of water samples, sample analysis, quality assurance/quality control (QA/QC), data reduction, and data analysis. The sampling history, parameters measured, and analytical methods used are summarized in Table 2. A more detailed description of the sampling methods, analytical methods, and QA/QC QC is presented in the Quality Assurance Project Plan (QAPP), *Hydraulic Fracturing Retrospective Case Study, Wise Co., TX, rev. 5* (Beak, 2013), at http://www2.epa.gov/sites/production/files/documents/barnett-qapp.pdf.

Table 2. Sampling history, parameters measured and analytical methods used for the Wise County, Texas, retrospective case study.

Sampling Round	Parameters Measured	Analytical Lab/Analytical Methods
September 2011	Temperature (Temp)	Field/ EPA Method 170.1
	Specific Conductance (SpC)	Field/ EPA Method 120.1
	Dissolved Oxygen (DO)	Field/ EPA Method 360.1
	pH	Field/ EPA Method 150.2
	Oxidation-Reduction Potential (ORP)	Field/ No EPA Method
	Turbidity (Turb)	Field/ USEPA Method 180.1
	Alkalinity (Alk)	Field/ USEPA Method 310.1; HACH Method 8203
	Dissolved Ferrous Iron (Fe^{2+})	Field/ Standard Method 3500-FeB for Wastewater, HACH Method 8146
	Dissolved Sulfide	Field/ Standard Method 4500-S^{2-}D for Wastewater, HACH Method 8131
	Dissolved Organic Carbon (DOC)	ORD/NRMRL (Ada)/ EPA Method 9060A (RSKSOP-330v0)
	Dissolved Inorganic Carbon (DIC)	ORD/NRMRL (Ada)/ EPA Method 9060A (RSKSOP-330v0)
	Nutrients (Nitrate + Nitrite, Ammonia)	ORD/NRMRL (Ada)/ EPA Method 353.1 and 350.1 (RSKSOP-214v5)
	Anions (Bromide, Chloride, Sulfate, Fluoride)	ORD/NRMRL (Ada)/ EPA Method 6500 (RSKSOP-276v3) Br in high Cl matrix: No EPA Method (RSKSOP-214v5)
	Dissolved Metals	Shaw Environmental/ EPA Methods 200.7 (RSKSOP-213v4)
	Total Metals	Shaw Environmental/ Analysis- EPA Methods 200.7 (RSKSOP-213v4); and Digestion- EPA Method 3015A (RSKSOP-179v3)
	Volatile Organic Compounds (VOC)	Shaw Environmental/ EPA Method 5021A + 8260C (RSKSOP-299v1)
	Low Molecular Weight Acids	Shaw Environmental/ No EPA Method (RSKSOP-112v6)
	Dissolved Gases (Methane, Ethane, Propane, Butane)	Shaw Environmental/ No EPA Method (RSKSOP-194v4 &-175v5)
	Glycols (2-butoxyethanol, diethylene glycol, triethylene glycol, tetraethylene glycol)	EPA Region 3/ No EPA Method (Method in Development; Schumacher and Zintek, 2014)

Table 2. Sampling history, parameters measured and analytical methods used for the Wise County, Texas, retrospective case study.

Sampling Round	Parameters Measured	Analytical Lab/Analytical Methods
	Semi-Volatile Organic Compounds (sVOC)	EPA Region 8/ EPA Method 8270D (ORGM-515 r1.1)
	Diesel Range Organic Compounds (DRO)	EPA Region 8/ EPA Method 8015D (ORGM-508 r1.0)
	Gasoline Range Organic Compounds (GRO)	EPA Region 8/ EPA Method 8015D (ORGM-506 r1.0)
March 2012	Temperature (Temp)	Field/ EPA Method 170.1
	Specific Conductance (SpC)	Field/ EPA Method 120.1
	Dissolved Oxygen (DO)	Field/ EPA Method 360.1
	pH	Field/ EPA Method 150.2
	Oxidation-Reduction Potential (ORP)	Field/ No EPA Method
	Turbidity (Turb)	Field/ USEPA Method 180.1
	Alkalinity (Alk)	Field/ USEPA Method 310.1; HACH Method 8203
	Dissolved Ferrous Iron (Fe^{2+})	Field/ Standard Method 3500-FeB for Wastewater, HACH Method 8146
	Dissolved Sulfide	Field/ Standard Method 4500-S^{2-}D for Wastewater, HACH Method 8131
	Dissolved Organic Carbon (DOC)	ORD/NRMRL (Ada)/ EPA Method 9060A (RSKSOP-330v0)
	Dissolved Inorganic Carbon (DIC)	ORD/NRMRL (Ada)/ EPA Method 9060A (RSKSOP-330v0)
	Nutrients (Nitrate + Nitrite, Ammonia)	ORD/NRMRL (Ada)/ EPA Method 350.1 and 353.1 (RSKSOP-214v5)
	Anions (Bromide, Chloride, Sulfate, Fluoride)	ORD/NRMRL (Ada)/ EPA Method 6500 (RSKSOP-276v3) Br in high Cl matrix: EPA Method 6500 (RSKSOP-288v3)
	Dissolved Metals	CLP/ EPA CLP Inorganic Statement of Work (SOW) ISM01.3, Exhibit D – Part B
	Total Metals	CLP/ EPA CLP Inorganic Statement of Work (SOW) ISM01.3, Exhibit D – Part B
	Volatile Organic Compounds (VOC)	Shaw Environmental/ EPA Method 5021A + 8260C (RSKSOP-299v1)
	Low Molecular Weight Acids	Shaw Environmental/ No EPA Method (RSKSOP-112v6)
	Dissolved Gases (Methane, Ethane, Propane, Butane)	Shaw Environmental/ No EPA Method (RSKSOP-194v4 &-175v5)
	Glycols (2-butoxyethanol, diethylene glycol, triethylene glycol, tetraethylene glycol)	EPA Region 3/ No EPA Method (Method in Development)
	Semi-Volatile Organic Compounds (sVOC)	EPA Region 8/ EPA Method 8270D (ORGM-515 r1.1)
	Diesel Range Organic Compounds (DRO)	EPA Region 8/ EPA Method 8015D (ORGM-508 r1.0)

Table 2. Sampling history, parameters measured and analytical methods used for the Wise County, Texas, retrospective case study.

Sampling Round	Parameters Measured	Analytical Lab/Analytical Methods
	Gasoline Range Organic Compounds (GRO)	EPA Region 8/ EPA Method 8015D (ORGM-506 r1.0)
	$^{87}Sr/^{86}Sr$ Isotopes	USGS/ No EPA Method (Thermal ionization mass spectrometry)
	O, H stable isotopes of water	Shaw Environmental: No EPA Method (RSKSOP-334v0)
September 2012	Temperature (Temp)	Field/ EPA Method 170.1
	Specific Conductance (SpC)	Field/ EPA Method 120.1
	Dissolved Oxygen (DO)	Field/ EPA Method 360.1
	pH	Field/ EPA Method 150.2
	Oxidation-Reduction Potential (ORP)	Field/ No EPA Method
	Turbidity (Turb)	Field/ USEPA Method 180.1
	Alkalinity (Alk)	Field/ USEPA Method 310.1; HACH Method 8203
	Dissolved Ferrous Iron (Fe^{2+})	Field/ Standard Method 3500-FeB for Wastewater, HACH Method 8146
	Dissolved Sulfide	Field/ Standard Method 4500-S^{2-}D for Wastewater, HACH Method 8131
	Dissolved Organic Carbon (DOC)	ORD/NRMRL (Ada)/ EPA Method 9060A (RSKSOP-330v0)
	Dissolved Inorganic Carbon (DIC)	ORD/NRMRL (Ada)/ EPA Method 9060A (RSKSOP-330v0)
	Nutrients (Nitrate + Nitrite, Ammonia)	ORD/NRMRL (Ada)/ EPA Method 350.1 and 353.2 (RSKSOP-214v5)
	Iodide	ORD/NRMRL (Ada)/ No EPA Method RSKSOP-223v2
	Anions (Bromide, Chloride, Sulfate, Fluoride)	ORD/NRMRL (Ada)/ EPA Method 6500 (RSKSOP-276v3) Br in high Cl matrix: EPA Method 6500 (RSKSOP-288v3)
	Dissolved Metals	EPA Region 7 RASP Contract Southwest Research Institute: EPA Methods 200.7 & 6020A
	Total Metals	EPA Region 7 RASP Contract Southwest Research Institute: EPA Methods 200.7 & 6020A
	Dissolved Hg (Filtered)	EPA Region 7 RASP Contract Southwest Research Institute: EPA Method 7470A
	Total Hg (Unfiltered)	EPA Region 7 RASP Contract Southwest Research Institute: EPA Method 7470A
	$^{87}Sr/^{86}Sr$ Isotopes	USGS/ No EPA Method (Thermal ionization mass spectrometry)
	O, H stable isotopes of water	Shaw Environmental: No EPA Method (RSKSOP-334v0)

Table 2. Sampling history, parameters measured and analytical methods used for the Wise County, Texas, retrospective case study.

Sampling Round	Parameters Measured	Analytical Lab/Analytical Methods
December 2012	Temperature (Temp)	Field/ EPA Method 170.1
	Specific Conductance (SpC)	Field/ EPA Method 120.1
	Dissolved Oxygen (DO)	Field/ EPA Method 360.1
	pH	Field/ EPA Method 150.2
	Oxidation-Reduction Potential (ORP)	Field/ No EPA Method
	Turbidity (Turb)	Field/ USEPA Method 180.1
	Alkalinity (Alk)	Field/ USEPA Method 310.1; HACH Method 8203
	Dissolved Ferrous Iron (Fe^{2+})	Field/ Standard Method 3500-FeB for Wastewater, HACH Method 8146
	Dissolved Sulfide	Field/ Standard Method 4500-S^{2-}D for Wastewater, HACH Method 8131
	Dissolved Organic Carbon (DOC)	ORD/NRMRL (Ada)/ EPA Method 9060A (RSKSOP-330v0)
	Dissolved Inorganic Carbon (DIC)	ORD/NRMRL (Ada)/ EPA Method 9060A (RSKSOP-330v0)
	Nutrients (Nitrate + Nitrite, Ammonia)	ORD/NRMRL (Ada)/ EPA Method 350.1 and 353.1 (RSKSOP-214v5)
	Iodide	ORD/NRMRL (Ada)/ No EPA Method RSKSOP-223v2
	Anions (Bromide, Chloride, Sulfate, Fluoride)	ORD/NRMRL (Ada)/ EPA Method 6500 (RSKSOP-276v3) Br in high Cl matrix: EPA Method 6500 (RSKSOP-288v3)
	Dissolved Metals	EPA Region 7 RASP Contract Southwest Research Institute: EPA Methods 200.7 & 6020A
	Total Metals	EPA Region 7 RASP Contract Southwest Research Institute: EPA Methods 200.7 & 6020A
	Dissolved Hg (Filtered)	EPA Region 7 RASP Contract Southwest Research Institute: EPA Method 7470A
	Total Hg (Unfiltered)	EPA Region 7 RASP Contract Southwest Research Institute: EPA Method 7470A
	Volatile Organic Compounds (VOC)	EPA Region 7 RASP Contract Southwest Research Institute: EPA Method 8260B
	Low Molecular Weight Acids	Shaw Environmental/ No EPA Method (RSKSOP-112v6)
	Dissolved Gases (Methane, Ethane, Propane, Butane)	Shaw Environmental/ No EPA Method (RSKSOP-194v4 &-175v5)
	Glycols (2-butoxyethanol, diethylene glycol, triethylene glycol, tetraethylene glycol)	EPA Region 3/ No EPA Method (Method in Development)
	Semi-Volatile Organic Compounds (sVOC)	EPA Region 8/ EPA Method 8270D (ORGM-515 r1.1)

Table 2. Sampling history, parameters measured and analytical methods used for the Wise County, Texas, retrospective case study.

Sampling Round	Parameters Measured	Analytical Lab/Analytical Methods
	Diesel Range Organic Compounds (DRO)	EPA Region 8/ EPA Method 8015D (ORGM-508 r1.0)
	Gasoline Range Organic Compounds (GRO)	EPA Region 8/ EPA Method 8015D (ORGM-506 r1.0)
	$^{87}Sr/^{86}Sr$ Isotopes	USGS/ No EPA Method (Thermal ionization mass spectrometry)
	O, H stable isotopes of water	Shaw Environmental: No EPA Method (RSKSOP-334v0)
May 2013	Temperature (Temp)	Field/ EPA Method 170.1
	Specific Conductance (SpC)	Field/ EPA Method 120.1
	Dissolved Oxygen (DO)	Field/ EPA Method 360.1
	pH	Field/ EPA Method 150.2
	Oxidation-Reduction Potential (ORP)	Field/ No EPA Method
	Turbidity (Turb)	Field/ USEPA Method 180.1
	Alkalinity (Alk)	Field/ USEPA Method 310.1; HACH Method 8203
	Dissolved Ferrous Iron (Fe^{2+})	Field/ Standard Method 3500-FeB for Wastewater, HACH Method 8146
	Dissolved Sulfide	Field/ Standard Method 4500-S^{2-}D for Wastewater, HACH Method 8131
	Dissolved Organic Carbon (DOC)	ORD/NRMRL (Ada)/ EPA Method 9060A (RSKSOP-330v0)
	Dissolved Inorganic Carbon (DIC)	ORD/NRMRL (Ada)/ EPA Method 9060A (RSKSOP-330v0)
	Nutrients (Nitrate + Nitrite, Ammonia)	ORD/NRMRL (Ada)/ EPA Method 350.1 and 353.1 (RSKSOP-214v5)
	Iodide	ORD/NRMRL (Ada)/ No EPA Method RSKSOP-223v2
	Anions (Bromide, Chloride, Sulfate, Fluoride)	ORD/NRMRL (Ada)/ EPA Method 6500 (RSKSOP-276v3) Br in high Cl matrix: EPA Method 6500 (RSKSOP-288v3)
	Dissolved Metals	EPA Region 7 RASP Contract Southwest Research Institute: EPA Methods 200.7 & 6020A
	Total Metals	EPA Region 7 RASP Contract Southwest Research Institute: EPA Methods 200.7 & 6020A
	Dissolved Hg (Filtered)	EPA Region 7 RASP Contract Southwest Research Institute: EPA Method 7470A
	Total Hg (Unfiltered)	EPA Region 7 RASP Contract Southwest Research Institute: EPA Method 7470A
	$^{87}Sr/^{86}Sr$ Isotopes	USGS/ No EPA Method (Thermal ionization mass spectrometry)
	O, H stable isotopes of water	Shaw Environmental: No EPA Method (RSKSOP-334v0)

4.1. Sampling Locations

Water-quality samples were collected from 16 domestic wells, three production wells (active gas wells), and four surface water locations in total (Table 3). The samples were collected during five sampling rounds occurring in September 2011, March 2012, September 2012, December 2012, and May 2013, with the last three sampling rounds occurring only at Location B. Samples were analyzed for up to 225 constituents, including field parameters, major ions, nutrients, trace metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), diesel-range organics (DRO), gasoline-range organics (GRO), glycol ethers (diethylene, triethylene, and tetraethylene glycol), low-molecular-weight acids (lactate, formate, acetate, propionate, isobutyrate, and butyrate), dissolved gases (methane, ethane, propane, and butane), and selected stable isotopes ($\delta^{18}O_{H2O}$, $\delta^{2}H_{H2O}$, and $^{87}Sr/^{86}Sr$; see Appendix B).

Table 3. Locations of samples taken as part of the Wise County, Texas, retrospective case study.

Sample ID	Latitude	Longitude	Study Location	Sampling Rounds
WISETXGW01	33.18620°N	97.62572°W	B	1, 2, 3, 4, 5
WISETXGW02	33.18481°N	97.62632°W	B	1, 2, 4, 5
WISETXGW03	33.18541°N	97.62691°W	B	1, 2, 4
WISETXGW04	33.18884°N	97.62665°W	B	1, 2, 4, 5
WISETXGW05	33.19186°N	97.63403°W	B	1, 2
WISETXGW06	33.40958°N	97.62195°W	C	1, 2
WISETXGW07	33.41591°N	97.61593°W	C	1, 2
WISETXGW08	33.18418°N	97.62372°W	B	1, 2, 3, 4, 5
WISETXGW09	33.26966°N	97.40840°W	A	1, 2
WISETXGW10	33.26277°N	97.41238°W	A	1, 2
WISETXGW11	33.27067°N	97.40943°W	A	1, 2
WISETXGW12	33.26712°N	97.41085°W	A	1
WISETXGW13	33.18448°N	97.62603°W	B	1, 2, 3, 4, 5
WISETXGW14	33.18440°N	97.62730°W	B	2, 4, 5
WISETXGW15	33.18712°N	97.62430°W	B	2, 4, 5
WISETXGW16	33.18157°N	97.61992°W	B	2, 4, 5
WISETXSW01	33.26778°N	97.40884°W	A	1, 2
WISETXSW02	33.26787°N	97.40890°W	A	1, 2
WISETXSW03	33.26748°N	97.40967°W	A	1, 2
WISETXSW04	33.18788°N	97.62532°W	B	4, 5
WISETXPW01	33.18719°N	97.62577°W	B	3
WISETXPW02	33.17955°N	97.62493°W	B	5
WISETXPW03	33.18448°N	97.63172°W	B	5

Water was sampled from ground water from domestic wells, produced water from production wells, and surface water from ponds in this study. A matrix of the sample types and number of sampling points for each sample type in each of the three locations in this study is shown in Table 4.

Table 4. Sample types and number of sampling points for each location in the Wise County, Texas, retrospective case study.

Location	Sample Type	Number
A	Ground Water	4
	Surface Water	3
	Produced Water	0
B	Ground Water	10
	Surface Water	1
	Produced Water	3
C	Ground Water	2
	Surface Water	0
	Produced Water	0

At Location A (Figure 9), there were four domestic wells (WISETXGW09, WISETXGW10, WISETXGW11, and WISETXGW12) in which the homeowners suspected there had been changes in water quality. In addition, surface water from a small lake was sampled at three locations (WISETXSW01, WISETXSW02, and WISETXSW03) because of a fish kill that occurred in the lake. At Location A, ground water and surface water, with the exception of WISETXGW12, were sampled in rounds 1 and 2. WISETXGW12 was sampled only during the first round of sampling, after which access was denied by the property owner.

At Location B (Figure 10), complaints about water quality changes focused on two wells, WISETXGW01 and WISETXGW08. All other wells at this location were chosen to help ascertain background conditions, focusing on wells where homeowners did not observe changes in water quality. Background wells at Location B were established prior to sampling by selecting wells in which the homeowners had not observed any changes in water quality. Initially, WISTXGW04 was chosen as an upgradient background well based on the published regional groundwater flow direction (Baker et al., 1990). WISETXGW02 and WISETXGW03 were also chosen to serve as background wells for this study and are located near one of the impacted wells. WISETXGW03 was not sampled during the final round of sampling because the homeowner would not grant access to this well for future samplings.

WISETXGW05 was chosen to serve as a potential background well for the salt water injection well, since it is also upgradient based on the published regional groundwater direction. WISETXGW05 was only sampled during the initial two rounds of sampling (September 2011 and March 2012), for the remaining rounds of sampling access to WISETXGW05 was not granted by the property owners and therefore, not sampled.

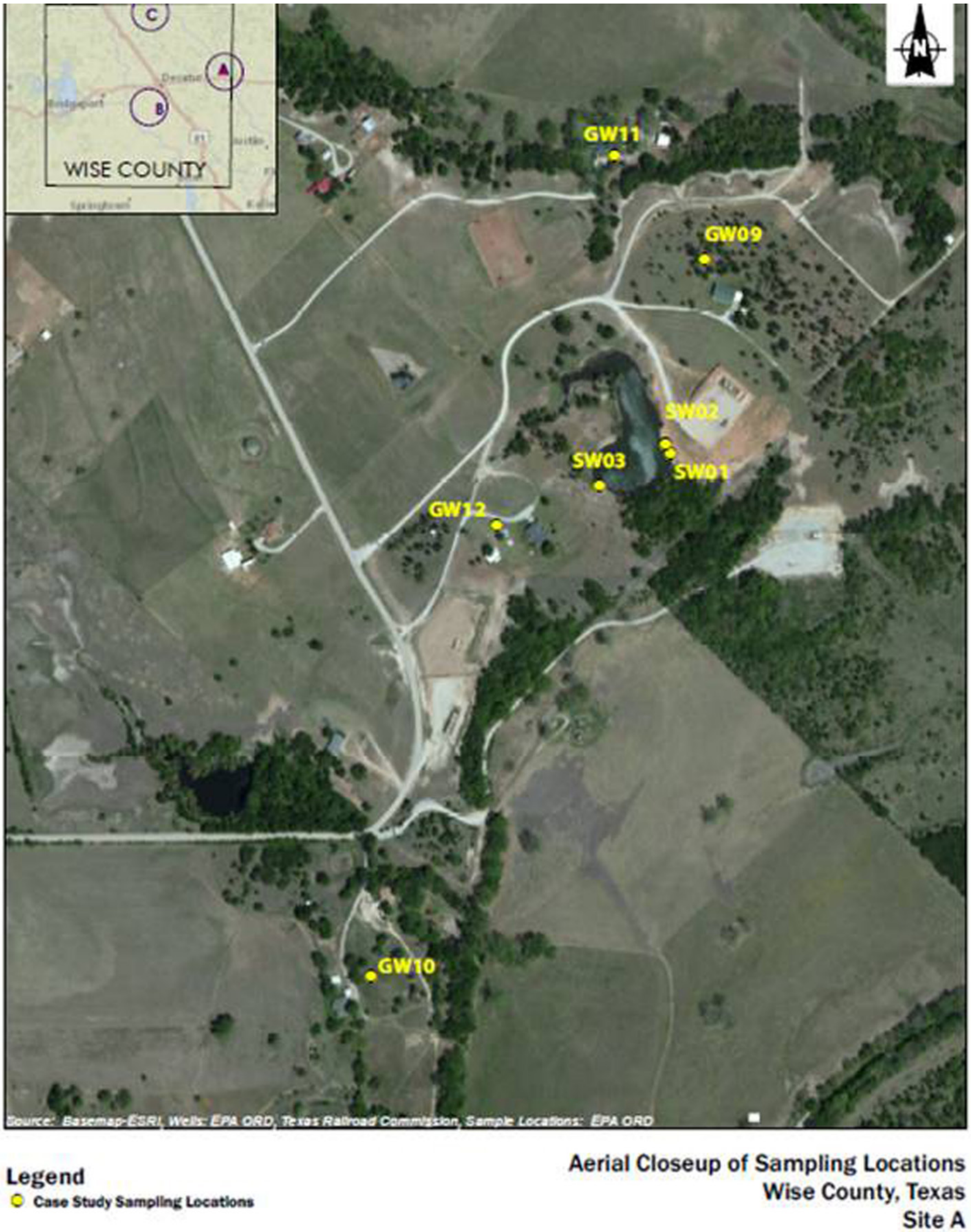


Figure 9. Aerial view of Location A showing sampling locations for domestic wells and surface water sampling locations. The prefix WISETX has been omitted for both domestic wells (GW) and surface water (SW) on this map for clarity.

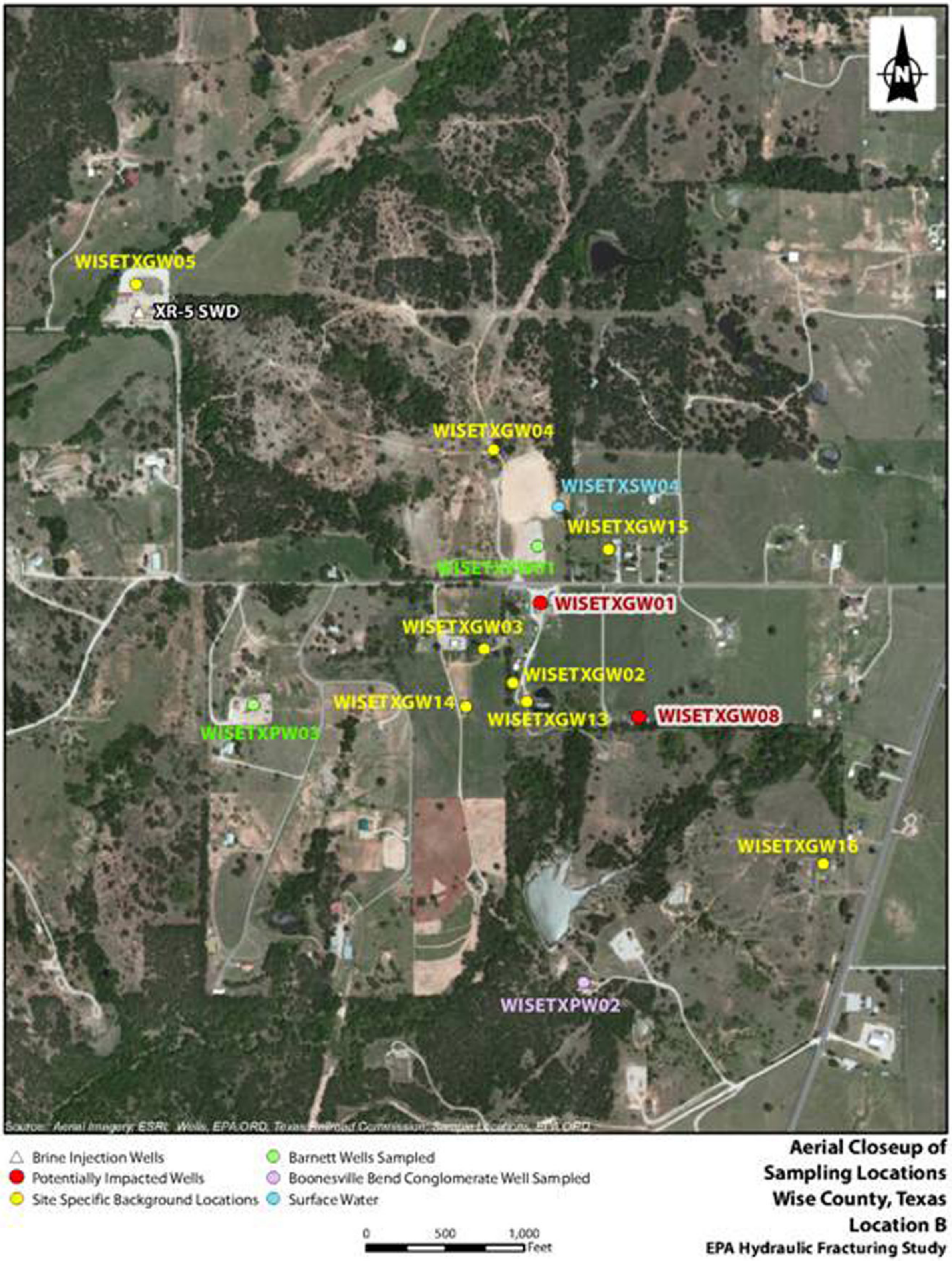


Figure 10. Aerial view of Location B showing sampling locations for domestic wells, production wells, brine injection wells and surface water sampling locations.

After the initial sampling round in September 2011, EPA was granted access to additional domestic wells that were initially selected to serve as background wells for the study. WISETXGW15 was an additional upgradient background well. WISETXGW13 and WISETXGW14 were added as background wells downgradient of WISETXGW01. One of the wells chosen (WISETXGW16) was approximately one-half mile southeast of the impacted wells and, based on the presumed regional gradient, well outside of the potentially impacted area, providing confidence in evaluating background concentrations. The additional background wells were also added to better understand the variations in background conditions at Location B. An additional sampling for WISETXGW01 and WISETXGW08 occurred in September 2012 when a special, limited sampling was conducted that coincided with the sampling of a Barnett Production well, WISETXPW01. Table 3 lists the sampling history for the ground water wells at this location. Surface water was collected from a pond downhill from the well pad in rounds 4 and 5.

At Location C (Figure 11), homeowner complaints involved two wells, WISETXGW06 and WISETXGW07. There were no complaints about surface water at this location. WISETXGW06 and WISETXGW07 were sampled in rounds 1 and 2.

4.2. Water Collection

Sample bottles for each location were uniquely labeled prior to each sampling round, and all labels were color-coded by analytical parameter. See Table A1 (Appendix A) for pre-cleaned bottle types and number of sample bottles needed for each laboratory analysis.

Both field-filtered and unfiltered samples were collected: unfiltered samples were collected first. Unfiltered samples that could contain volatile components were collected before samples with less volatile components. The unfiltered samples were analyzed for the following parameters: dissolved gases, VOCs, SVOCs, DROs GROs, glycols, low-molecular-weight acids, and total metals. Filtered samples were collected by placing a 0.45 µm disposable capsule filter at the end of the polyethylene tubing and passing the water stream through the filter into the sample container. Approximately 100 milliliters (mL) of ground water was passed through the filter, to waste, before filling sample bottles. Filtered parameters included dissolved metals, anions, nutrients (ammonia, nitrate + nitrite), dissolved inorganic carbon (DIC), dissolved organic carbon (DOC), $\delta^{18}O/\delta^{2}H$ of water, and Sr isotope. Not all parameters mentioned above were analyzed for each sampling round. Table 2 identifies the types of samples collected during each sampling round. Sampling methods, sample preservation, and handling are discussed in detail in the QAPP (Beak, 2013) and are described in Appendix A and Table A1.

4.3. Purging and Sampling at Domestic Wells

Domestic well samples were collected as close to the well head as possible and where possible before the pressure tank, prior to any water treatment. Methods used were designed to yield samples that were representative of formation water and to minimize sample contamination using the installed pump present in the well. A well volume approach, combined with the monitoring of stabilization parameters, was used for purging domestic wells (Yeskis and Zavala, 2002). Initially the well was allowed to purge at a flow rate greater than 8 liters per minute (L/min). Depending on the flow rate the initial purge lasted from 30 to 60 minutes (min).

Figure 11. Aerial view of Location C showing sampling locations for domestic wells. The prefix WISETX has been omitted for both domestic wells (GW) on this map for clarity.

Once the initial purge was completed, the flow rate was lowered to < 2 L/min (with the exception of two wells), and one end of a clean piece of polyethylene tubing was connected to the sampling port and the other end was connected to a flow cell equipped with a YSI 5600 multi-parameter probe. The well was then allowed to purge at the lower flow rate until geochemical parameters (i.e., specific conductivity (SpC), pH, dissolved oxygen (DO), and oxidation-reduction potential (ORP)) were stabilized. Once geochemical parameters were stabilized, the samples were collected. All samples were immediately preserved upon collection, and the samples were stored on ice prior to leaving the sample location (Appendix A, Table A1).

Two domestic wells (WISETXGW01 and WISETXGW13) that were no longer in use also were sampled. Because most of the plumbing to these two wells had been removed and the remaining plumbing could not be modified, the flow rate could not be adjusted downward. For these two wells, a clean 4-L graduated cylinder was placed in the water stream and, once filled, the water in the 4-L graduated cylinder was used to fill the sample containers. These samples were also preserved immediately upon collection and stored on ice before leaving the site.

Beginning with the September 2012 sampling round, one domestic well (WISETXGW08) was sampled by lowering a Grundfos Ready Flow 2 pump down the well. This was needed because the pump in the well had malfunctioned and was removed by the homeowner and not replaced. The Grundfos pump was lowered approximately 300 ft down the well (where the top of the screen was believed to be) and then turned on. The flow rate was approximately 1 to 2 L/min. During the September 2012 and the December 2012 sampling rounds, the well was purged for 60 min and the geochemical parameters were measured until stabilization occurred. However, upon reviewing the pumped water volume data, it was determined that a longer purge time was needed. Therefore, during the May 2013 sampling round this well was purged for 3.5 hours and then was purged until geochemical parameters were stable (one additional hour). The samples were then collected, preserved, and stored as previously described.

4.4. Sampling at Surface Water Locations

Surface water samples for this case study were collected from Locations A and B. In Location A, the surface water was collected from a small lake; in Location B, the surface water was collected from a small pond. In both locations, the surface water bodies were adjacent to and downhill from the well pad. Gullies at these locations indicated that runoff from the pad flowed into these ponds. In Location A, because of the size of the lake, three sampling points were needed. Two of the sampling points were located at a mouth of the gully on the side of the lake that received the runoff from the pad. The third sampling point was located on the opposite side of the lake and served as a reference point. The pond at Location B was sampled at only one point. Because of the lack of access to the opposite side of the pond, a sample could not be obtained. As was the case in Location A, the pond was sampled at the mouth of a large gully running from the pad to the pond.

The ponds were sampled using a clean piece of polyethylene tubing attached to a pole that was positioned just above the sediment layer. Sampling was performed in a manner that minimized the disturbance of the sediment. The other end of the polyethylene tubing was connected to a peristaltic pump, and the water was purged for a few minutes to avoid collecting any disturbed sediment in the sample containers. After the purge samples were collected, geochemical parameters were collected by attaching the YSI probe to a pole and positioning it in the same location where the water sample was collected. Once probe stabilization occurred, the parameters were recorded in the field notes. All samples were immediately preserved upon collection, and the samples were stored on ice prior to leaving the sampling location (Appendix A, Table A1).

4.5. Sampling at Production Wells

Production wells were sampled in cooperation with contractors of the TRRC at the gas-liquid separator. Company representatives or the TRRC contractors operated all equipment around the production wells. Production wells were sampled by attaching a clean piece of polyethylene tubing to a connection port at the base of the gas-liquid separator, and the other end of the tube was connected to a polyethylene carboy. The port on the gas-liquid separator was opened and the sample was allowed to pass into the carboy. Once filled, the carboy was disconnected from the polyethylene tubing and moved away from the gas-liquid separator. A new clean piece of polyethylene tubing was placed in the carboy, and the sample containers were filled using a peristaltic pump (Geotech, Geopump Series II). Additionally, a sub-sample was collected for measurement of the geochemical parameters (temperature, pH, ORP, SpC, and DO) and turbidity, alkalinity, ferrous iron, and dissolved sulfide. Once field parameter measurements stabilized, the geochemical parameters were recorded in the field note book. The samples were immediately preserved, and all samples were stored on ice prior to leaving the sampling location.

4.6. Sample Shipping/Handling

At the conclusion of each day, samples were organized by analytical parameter, placed together in sealed Ziploc plastic bags, and transferred to coolers filled with ice. Glass bottles were packed with bubble wrap to prevent breakage. A temperature blank and chain-of-custody form were placed in each cooler. Coolers were sealed and affixed with a custody seal and sent to the appropriate lab, via express delivery, within 24 hours of collection.

4.7. Water Analysis

4.7.1. Field Parameters

Temperature (EPA Method 170.1), SpC (EPA Method 120.1), pH (EPA Method 150.2), ORP, and DO (EPA Method 360.1) were continuously monitored and logged during well purging using an YSI 556 multi-parameter probe. YSI electrodes were calibrated every morning prior to use. Performance checks were conducted after in initial calibration, at mid-day, and at the end of each day. National Institute of Standards and Technology (NIST)-traceable 1413 microsiemens per centimeter (µS/cm) SpC standard was used for calibration. NIST-traceable buffer solutions (4.00, 7.00, and 10.01) were used for pH calibration. An ORP standard (Zobell Solution) was used for calibration of the ORP sensor. Electrode performance was checked using the YSI 5580 Confidence Solution. Dissolved oxygen sensors were calibrated with air. Prior to deployment to the field, all calibration and performance standards were checked to ensure that they had not expired nor would they expire during the sampling round. Duplicate field measurements are not applicable to measurements performed in flow-through cell (RSKSOP-211v3).

Once stabilization of the geochemical parameters occurred, a 1 L sub-sample was collected for field determinations of alkalinity, turbidity, ferrous iron, and dissolved sulfide. Alkalinity measurements were determined by titrating ground water with 1.6N sulfuric acid (H_2SO_4) to the bromcresol green-methyl red endpoint using a Hach titrator (EPA Method 310.1). Turbidity measurements (EPA Method 180.1) were determined with a Hach 2100Q portable meter. Ferrous iron measurements were collected using the 1,10-phenanthroline colorimetric method (HACH DR/890 colorimeter, Standard Method 3500-FeB for Wastewater). Dissolved sulfide measurements were collected using the methylene blue colorimetric method (HASH DR/890 spectrophotometer, Standard Method 4500-S^{2-}D for Wastewater).

Hach spectrophotometers (ferrous iron and sulfide) and turbidimeters (turbidity) were inspected before going into the field, and their function was verified using performance calibration check solutions. The ferrous iron accuracy was checked by making duplicate measurements of a 1 mg Fe/L standard solution (HACH Iron Standard solution, using Ferrover pillows); the results were between 0.90 - 1.10 mg Fe/L. For sulfide, accuracy and precision were checked using a standard solution of sodium sulfide prepared in the laboratory that had been titrated with sodium thiosulfate to determine its concentration. Accuracy should be within ± 10% of the expected concentration, and the coefficient of variation should be <20%. Turbidity was checked against turbidity standards supplied by Hach (StablCal® Calibration Set for the HACH 2011Q), which consist of four standards: 20 nephelometric turbidity unit [NTU], 100 NTU, 800 NTU and with a 10 NTU performance check standard. Titrators used for alkalinity measurements were checked using a 250 mg/L standard made from sodium bicarbonate ($NaHCO_3$ blanks made with deionized water) and performance calibration check solutions (where applicable).

4.7.2. Analytical Methods for Ground Water and Surface Water

Water samples were collected and analyzed using the methods identified in Table A1, Appendix A. The samples were collected and delivered to seven laboratories for analysis: EPA ORD/NRMRL/GWERD, Ada, Oklahoma; Shaw Environmental (later known as CB & I), Ada, Oklahoma; EPA Region 8, Golden, Colorado; EPA Region 3, Fort Meade, Maryland; USGS, Denver, Colorado; Southwest Research Institute (SwRI), San Antonio, Texas; and a Contract Laboratory Program laboratory (A4 Scientific, Inc., Woodlands, Texas). The laboratories that performed the analyses, in each sampling round, are summarized in Appendix A, Table A1.

Anions, nutrients, DIC, and DOC were analyzed in- house (GWERD General Parameters Laboratory, Ada, Oklahoma). Quantitative analyses of the major anions bromide, chloride, fluoride, and sulfate were determined by capillary electrophoresis (EPA Method 6500, RSKSOP-276v4) using a Waters Quanta 4000 capillary Ion analyzer for all sampling rounds. Bromide samples containing high chloride were also analyzed using capillary electrophoresis using a method to provide better resolution of the bromide in a high chloride matrix (EPA Method 6500, RSKSOP-288v3) for rounds 2, 3, 4, and 5 or, alternatively, using flow injection analysis (Lachat QuickChem 8000 Series flow injection analyzer, RSKSOP-214v5) for rounds 1 and 3. The alternative bromide analysis was conducted when the bromide was not completely resolved from chloride using EPA Method 6500, RSKSOP-276v4. Nutrients (nitrate + nitrite, and ammonia) were measured by flow injection analysis (EPA Method 350.1 and 353.1, RSKSOP-214v5) for all sampling rounds. Iodide measurements were performed using flow injection analysis (RSKSOP-223v2) only for sampling rounds 3, 4, and 5. The carbon concentration of DIC and DOC in aqueous samples was determined via combustion and infrared detection (EPA Method 9060A, RSKSOP-330v0) on a Shimadzu TOC-VCPH analyzer for all sampling rounds.

Dissolved gases (methane, ethane, propane, and butane), low-molecular-weight acids (lactate, formate, acetate, propionate, isobutyrate, and butyrate), and the stable isotopes of water (δ^2H, $\delta^{18}O$) were analyzed by Shaw Environmental/CB&I (Ada, Oklahoma). Dissolved gases were measured using gas chromatography (Agilent Micro 3000 gas chromatograph, RSKSOP-194v4 & -175v5) for sampling rounds 1, 2, and 4. The concentrations of low-molecular-weight acids were determined using high performance liquid chromatography (HPLC) (Dionex ICS-3000, RSKSOP-112v6) for sampling rounds 1, 2, and 4. Hydrogen (δD) and oxygen ($\delta^{18}O$) isotope ratios for aqueous samples collected were determined by cavity ring-down spectrometry (Picarro L2120i CRDS, RSKSOP-334v0) for all sampling rounds except sampling round 1.

The analyses of DROs, GROs, and SVOCs in water samples were completed by EPA Region 8 laboratory (Golden, Colorado) for samples collected during sampling rounds 1, 2, and 4. DROs and GROs were determined by gas chromatography, using a gas chromatograph equipped with a flame ionization detector (EPA Method 8015B; Agilent 6890N GC). The concentrations of SVOCs were determined by gas chromatography (GC)/mass spectrometry (GC/MS), (EPA Method 8270D; HP 6890 GC and HP 5975 MS).

VOCs were measured by Shaw Environmental (Ada, Oklahoma) for samples collected during sampling rounds 1 and 2. The samples were analyzed using automated headspace GC/MS (EPA Methods 5021A & 8260C; Agilent 6890/5973 Quadrupole GC/MS). VOC samples were analyzed by Southwest Research Institute (SwRI, San Antonio, Texas) by purge-and-trap GC/MS (EPA Method 8260 B; Agilent 6890N GC/MS) following sampling rounds 4 and 5.

Both dissolved (filtered) and total (unfiltered) metal samples were analyzed by Shaw Environmental for round 1 metal samples. For all dissolved and total metals, analysis was performed using inductively coupled plasma–optical emission spectroscopy (ICP-OES): EPA Methods 200.7 (RSKSOP-213v4; Optima 3300 DV ICP-OES). Unfiltered samples were prepared prior to analysis by microwave digestion (EPA Method 3015A). Total and dissolved metals were analyzed through EPA's contract laboratory program (CLP) following round 2. The samples were prepared and analyzed following CLP methodology for ICP-OES and ICP-MS (CLP Inorganic Statement of Work (SOW) ISM01.3, Exhibit D – Part B). Total and dissolved metal analyses for samples collected during sampling rounds 3, 4, and 5 were conducted by Southwest Research Institute (San Antonio, Texas), in accordance with EPA Methods 6020A (ICP–MS) and 200.7 (ICP–OES). Filtered samples were digested prior to analysis (EPA Method 200.7). Mercury concentrations were determined by cold-vapor atomic absorption (EPA Method 7470A; PerkinElmer FIMS 400A).

Glycols (2-butoxyethanol, di-, tri-, and tetraethylene glycol) were measured by EPA Region 3 Laboratory for samples collected during sampling rounds 1, 2, and 4. Samples were analyzed using high performance liquid chromatography (HPLC) coupled with positive electrospray ionization (ESI+) tandem mass spectrometry (MS/MS; Waters HPLC/MS/MS with a Waters Atlantis dC18 3µm, 2.1 x 150 mm column). Over the course of this case study, the glycol method was in development. A verification study of the method used for glycol analysis was completed using volunteer federal, state, municipal, and commercial analytical laboratories. The study indicated that the HPLC/MS/MS method was robust, provided good accuracy and precision, and exhibited no matrix effects for the several water types that were tested (Schumacher and Zintek, 2014).

Strontium isotopes ($^{87}Sr/^{86}Sr$), and rubidium (Rb) and strontium (Sr) concentrations were measured by the USGS (Denver, Colorado; no EPA method) for samples collected during sampling rounds 2 through 5 using methods described in Peterman et al. (2012). High-precision ($2\sigma = +0.00002$) strontium isotope ratio results were obtained using thermal ionization mass spectrometry (TIMS); Finnigan MAT 262 and Thermo Elemental Triton).

Detection and reporting limits for all analytes, per sample type, are provided in Tables B1 – B7 in Appendix B.

4.8. QA/QC

Detailed information concerning QA/QC is presented in Appendix A of this report. QC samples included blanks, field duplicates, matrix spikes, and matrix spike duplicates**.** All of these QC sample types were collected, preserved, and analyzed using methods identical to those used for the water samples collected in the field (Table 2). Sample preservation and holding time criteria are listed in Table A1 in Appendix A. Field QC samples for ground water and surface water sampling, which included several types of blanks and duplicate samples, are summarized in Table A2 in Appendix A. These included several types of blanks and duplicate samples. Adequate sample volumes were collected to allow for laboratory matrix spike samples to be prepared, where applicable. Data were checked using computer program AqQA for the quality of solute concentrations. First, the SpC values measured in the field were compared with a calculated value that is based on anion- and cation-specific resistivity constants and the measured concentrations of anions and cations in specific ground water samples. This agreement between the measured and calculated values should be within 15%. The second method was to calculate the charge balance for each solution. This was done by summing and comparing the net positive and negative charge from the measured concentrations of anions and cations. The agreement should be within 10%. Poor agreement would suggest that some major solute(s) were not accounted for in the analytical measurements or could otherwise point to an analytical error. Per the QAPP, discrepancies in this manner were either flagged or the identities of other sample components and/or reason(s) for poor agreement were investigated. A more detailed description of the QA/QC procedures and implementation is presented in the QAPP (Beak, 2013).

Appendix A describes general QA and the results of QC sample analyses, including discussion of chain of custody, holding times, blank results, field duplicate results, laboratory QA/QC results, data usability, QAPP additions and deviations, field QA/QC, application of data qualifiers, tentatively identified compounds (TICs), audits of data quality (ADQ), the field technical system audit (TSA), and laboratory TSAs. All reported data met project requirements unless otherwise indicated by application of data qualifiers. In rare cases, data were rejected as unusable and not reported.

4.9. Data Handling and Analysis

For each sampling location from this study, geochemical parameters and the water quality data for major ions and other selected inorganic ions collected over the multiple sampling rounds were averaged. This approach ensures that more frequently sampled locations are given equivalent weight in the data analysis (Battelle, 2013); however, a shortcoming of this method is that potential temporal variability in concentration data at a single location is not captured. Intra-site variability of the data collected in this study was examined by evaluating time-dependent concentration trends at specific locations. Summary statistics were calculated for selected parameters after averaging across sampling rounds for each location (e.g., mean, median, standard deviation, minimum and maximum values). Parameters with non-detect values were set at half the method detection limit; summary statistics determined for parameters that showed mixed results, both greater than the quantitation limit (>QL) and less than the quantitation limit (<QL), were generally determined only when greater than 50% of the concentration data were above the censoring level (US EPA, 2000b). In rare cases data were not used (e.g., for iron and manganese), and these are noted in the tabulated data.

Concentration data for organic compounds were not averaged across the multiple sampling rounds, because relatively few detections above the QL were found and because detections were generally not consistent through time at specific sampling locations. Stable isotope and strontium isotope data, used to identify fluid sources and biogeochemical processes, were not averaged so that the full range of data variability could be evaluated. Furthermore, historical sources of isotope data for the study were not available, so that weighting was not a significant data analysis issue.

Historical ground water data for Wise County were collected from the NWIS (USGS, 2013a), the TXWDB (2013a), and the NURE (USGS, 2013b) databases. Secondary data from these sources were considered based upon various evaluation criteria, such as: (1) did the organization that collected the data have a quality system in place; (2) were the secondary data collected under an approved Quality Assurance Project Plan or other similar planning document; (3) were the analytical methods used comparable to those used for the primary data; (4) did the analytical laboratories have demonstrated competency (such as through accreditation) for the analysis they performed; (5) were the data accuracy and precision control limits similar to the primary data; (6) are the secondary data source MDLs and QLs comparable to those associated with the primary data or at least adequate to allow for comparisons; and (7) were sampling methods comparable to those used for the primary water quality data collected for this study. In general, the necessary accompanying metadata are unavailable for the secondary water quality data sources to fully assess these evaluation criteria; thus, the secondary data are used with the understanding that they are of an indeterminable quality relative to the requirements specified for this study (see QAPP; Beak, 2013).

The software package AqQA (version 1.1.1) was used to evaluate internal consistency of water compositions by calculating cation/anion balances and by comparing measured and calculated electrical conductivity values (see Appendix A, Table A26). Major-ion charge balance was calculated by comparing the summed milliequivalents of major cations (calcium, magnesium, sodium, and potassium) with major anions (chloride, sulfate, and bicarbonate) in filtered samples using the eqn. 1.

$$\text{Charge Balance (\%)} = \left|\frac{(\sum \text{cations} - \sum \text{anions})}{(\sum \text{cations} + \sum \text{anions})}\right| \text{x } 100\% \qquad (1)$$

Where Charge Balance is the cation/anion balance, ∑cations is the sum of the major cations (calcium, magnesium, sodium, and potassium) and ∑anions is the sum of the major anions (bicarbonate, sulfate, and chloride). The calculated charge balance error over the five sampling rounds ranged between 0.1 and 8.7% for surface and ground water; 88% of the surface and ground water samples collected for this study had a charge balance error less than 5% (see Appendix A).

Once the databases were sorted and filtered, the data from each database were compared to identify duplicate samples between databases. This comparison was based on the metadata provided in each database. Based on the metadata provided in each database, sampling locations within databases were duplicated.

For the historical datasets, samples with a charge balance error ≤15% were used for water-type analysis and for constructing geochemical plots such as Piper or Schoeller diagrams. In most cases, charge balance errors exceeding the 15% criterion were due to missing concentrations of major cations or anions in the historical datasets. Again, the historical data from locations with multiple sampling rounds were averaged and summary statistics were determined. Charge balance criteria were not used to screen data for use in summary statistic calculations and for plotting box and whisker diagrams. Summary statistics for historical data were determined on a countywide basis for comparison with the data collected in this study and also on a reduced-area basis (3-mile radius) in order to more directly evaluate data from samples collected in nearby locations. Various issues relating to data quality and applicability of historical data have been previously discussed (Battelle, 2013; US EPA, 2012; Beak, 2013), such as comparability of analytical methods, comparability of analytes, unknown sample collection methods, and unavailable laboratory QC data and data quality-related qualifiers. While recognizing these limitations, historical data are used as the best points of reference available to compare with the water quality data collected in this study.

Statistical evaluations were carried out using the ProUCL (US EPA, 2010b) and Statistica (version 12) software packages. Hypothesis testing for the water quality data was performed using parametric (ANOVA) and nonparametric (Kruskal-Wallis) methods. An assumption underlying parametric statistical procedures is that datasets are normally distributed or can be transformed to a normally distributed form; data transformations in some cases included logarithmic functions. For the analysis of the major-ion trends, average values were used in the statistical tests and were combined with single observations. As noted, previously this approach was used to avoid the undue weighting of locations sampled multiple times, either in the new data collected for this study or in the historical water quality data. Post-hoc tests were performed to determine significant differences among water quality datasets for particular analytes, including the Scheffe and Kruskal-Wallis multiple comparison tests. A p-value of less than 0.05 was interpreted as a significant difference between compared datasets. Because a large number of comparisons were made between the data from this study and the historical water quality data, which encompassed numerous sampling investigations, multiple locations, and extended periods of time, the problem of multiple comparisons is suggested, that is, the increased likelihood of rejecting the null hypothesis and flagging significant differences among datasets. Given the exploratory nature of this study, p-value adjustments were not incorporated (e.g., Bonferroni or Šidák correction factors), and the traditional significance threshold of 0.05 was applied for these data comparisons.

5. Historic Water Quality

5.1. National Water Information Systems (NWIS) Database

The NWIS is a large, publically available database of water quality data for the United States (USGS, 2011, 2012b). Both surface water and ground water data are available from the NWIS database.

Data for surface water and ground water were downloaded for Wise County, Texas (USGS, 2013a). Because of the proximity of Locations A and C to the Wise County border, additional data were downloaded for Denton and Montague Counties. The downloaded data included the water quality data as well as all the metadata (e.g., longitude, latitude, QA/QC, and the aquifer/formation the water was obtained from, etc.). The data from Denton and Montague Counties were then mapped and only wells or surface water locations within a 3-mile radius of Locations A and C were retained.

Initially, the data were sorted based on whether the water was surface water or ground water. The ground water data were then sorted according to the source aquifer (Antlers, Paluxy, Glenn Rose, Twin Mountains, or combination of these that make up the Trinity aquifer), because the study wells (with the exception of one domestic well in Location A) were all within the Trinity aquifer. Data for other aquifers or formations not part of the Trinity aquifer or alluvial aquifers were eliminated from consideration. Surface water did not need any additional sorting.

Calculations of charge balances revealed that the charge balances ranged from 0.2 to 99.9%. There were 27 total data points but only 11 data points were useable. Of the other 16 data points, 14 did not have any data for most of the major anions and cations and only limited data for other parameters. The other two data points had a charge balance greater than 15% (26.3% and 72.7%).

The data points also were plotted on a map to see if other samples should be filtered out because of proximity to urban locations or industrial complexes. No additional filtering was needed.

No data points were within a 3-mile radius of Location A in the NWIS database. For Locations B and C, only one data point was within the 3-mile radius of these locations.

5.2. Texas Water Development Board (TXWDB) Database

The TXWDB maintains a publically available database of water quality data for the state of Texas. The purpose of the TXWDB ground water quality sampling program is to monitor changes in ground water quality over time and to establish the naturally occurring baseline ground water (TXWDB, 2013a).

The data from the TXWDB were downloaded (TXWDB, 2013b) and processed in the same way as the NWIS data, with the exception that this database did not contain any surface water data and, therefore, did not require sorting based on this criterion. A total of 191 data points in this database and charge balances ranged from 0.1 to 61.8%. Of the total of 191 data points, eight data points were excluded because of poor charge balance, and an additional 17 data points were filtered out because they were adjacent to industrial complexes (within 0.5 mile radius) or were located within urban areas (inside city boundaries based on aerial photography) that could potentially bias the background data.

No data points in the TXWDB database were within 3 miles of Location A, seven sampling points were within 3 miles of Location B, and two data points were within 3 miles of Location C.

5.3. National Uranium Resource Evaluation (NURE) Database

The NURE program's primary goal is to identify uranium resources in the United States (USGS, 2012b; 2013b). This database is accessible to the public through the USGS. Unlike the NWIS and TXWDB databases, this database is not intended to provide water quality data and, as such, only data for selected ground water quality parameters are available for Wise County. Using the NURE database can be problematic because, most of the samples do not contain all the major anions and cations, and anion-cation balances cannot be made. Additionally, the aquifer codes used in the NURE database are not standardized (USGS, 2013b), but are based on local code definitions. No aquifer codes were found during the study; therefore, the aquifer or formation the water was obtained from is unknown. However, even with these limitations, the data have some usefulness with respect to understanding background conditions for trace elements. The NURE data were downloaded from the USGS (2012b) website.

Seventy-nine data points in the NURE database were used in this study. Three sampling points were within 3 miles of Location A, and two sampling points were within 3 miles of both Location B and Location C.

5.4. Produced Water Database

The National Produced Waters Database is a large, publically available database that contains concentrations for major anions and cations, pH, and total dissolved solids (TDS) for produced water in the United States (USGS, 2002). The produced water database is maintained by the USGS. The USGS compiled the data in the database from the original Department of Energy Fossil Energy Research Center and removed redundancies, verified consistency of the data, and added metadata (USGS, 2002). The database, in addition to the parameters reported, also reports the charge balances for all individual samples contained in the database. The metadata also allows the user to sort the data based on the formation or formations it was produced from. This was important since data that indicated it was potentially produced from multiple formations was not included in the data analysis.

5.5. Limitations to the Determination of Background Using Historical Data

The use of historical data to determine background water quality has several limitations (Battelle, 2013; Reiman et al., 2008; Matschullat et al., 2000). As was discussed earlier, Battelle (2013) highlighted the QA issues and sample collection methods in regards to the use of secondary data. Battelle (2013) also discussed the intended purpose of the database being considered. For example, EPA STORET database was excluded because it likely contains samples that were used for regulatory purposes and thus may not be a good candidate for representing background data since the purpose of those samples is regulatory in nature and likely to represent impaired waters. Likewise, the NURE database's intended purpose was to identify potential uranium resources, not water quality. It is unknown how or if the NWIS and TXWDB databases screen sampling locations for potential contamination. Therefore, it is possible that these databases also contain data that are not background. Other potential limitations are the databases may not have the appropriate spatial distribution of sampling points or temporal sampling needed; lack of trace organic compounds included in the database; and lack of geochemical or isotopic indicators (Bowen et al., 2015). Bowen et al. (2015) also indicated that many of the watersheds where current hydrocarbon exploration is occurring had severely degraded water prior to 1972 and, since 1972, have experienced improvements in water quality. This causes the comparisons to historical data more difficult and not straightforward.

Another limitation is that, in Wise County, the Trinity aquifer characteristics change from roughly northeast to southwest. In the northern portion of Wise County, the aquifer comprises two formations that are collectively termed the Antlers formation, and in the southern portion of the county the aquifer comprises three formations. This change is evident, as can be seen on a map showing the historical water types in Wise County (Figure 12). This figure suggests that the comparisons of water quality data using a countywide scale may not be appropriate.

A conservative approach for comparing the data collected during this study was used initially as a screening method for determining whether there were potential impacts on water quality. As previously described, the process will use limited filtering of the historical data, and all the historical data will be compared with the study data. If suspected contamination has occurred, it is discussed further in the site-specific focus area section of this report.

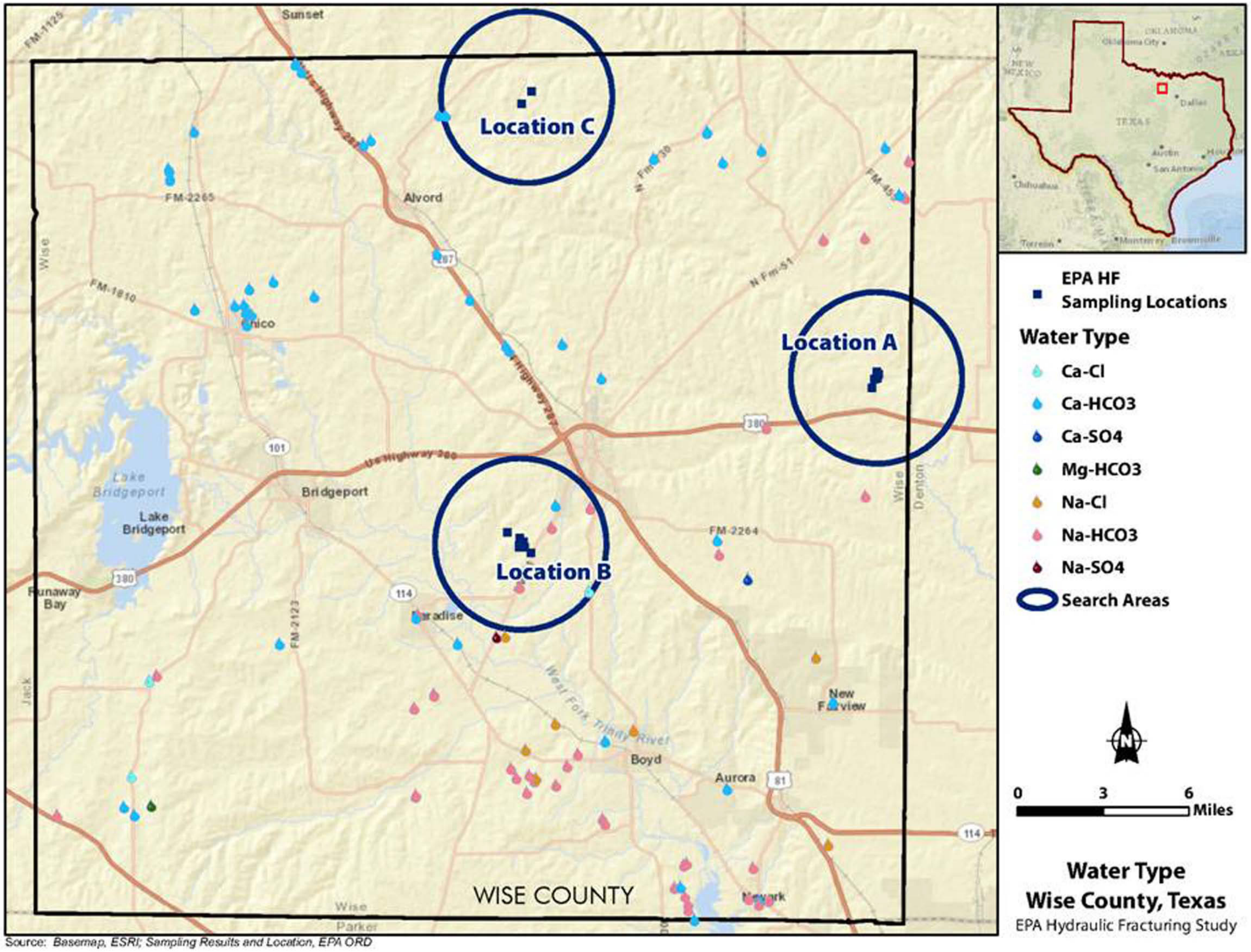


Figure 12. Map of the different water types and water type distributions for Wise County based on historical databases. (Data Sources: NWIS (USGS, 2013a) and TXWDB (2013b)).

6. Water Quality Results from This Study

The following sections describe results and interpretations of the water-quality testing conducted for this case study. The indicators of water quality (e.g., geochemical parameters, major anions, major cations) and indicators of naturally occurring sources (e.g., trace elements, and isotopes) were selected, because they can be related to anthropogenic sources of contamination such as agriculture, industrial activities, and, potentially, hydraulic fracturing. The parameters discussed include major cation, major anions, TDS, SpC, boron, barium, bromide, iodide and strontium; geochemical parameters, nutrients/DOC/other anions, trace elements, dissolved gases, organic parameters, and isotopes. Analytical data obtained during the five sampling rounds are provided in tabular form in Appendix B.

6.1. Surface Water

Surface water collected as part of this study was obtained from ponds in Locations A and B for which the only sources of recharge were precipitation and runoff. The only historical surface water that was found, a large stream-fed reservoir, was identified in the NWIS database. Using water quality from this reservoir as a comparison to the water quality in the ponds is not appropriate; therefore, no historical comparisons were made with the study surface water data collected. A summary of the surface water parameters is presented in Table 5, and all surface water data collected are presented in Appendix B.

The pond sampled at Location A was the location of a reported fish kill, which occurred in March of 2010. The data that were collected from this pond as part of the study did not indicate a cause that could be linked to the fish kill reported. However, the first study sampling did not occur until September of 2011 (approximately 1.5 years after the incident). Because of this time gap between the fish kill and the study sampling, there may be no detectable residual signature of the cause of the fish kill in the water column.

6.2. Boonesville Bend Conglomerate Sample Collected

A sample was collected from the Boonesville Bend Conglomerate production well as part of this study was dramatically different for most parameters than what has been reported previously for water from this formation (Table 6). The USGS (2002) has published data for major anions and cations, as well as pH and TDS in its database. The only parameters that were similar to the previously published data were pH and bicarbonate (Table 6). The measured SpC versus calculated SpC were well outside the acceptable range based QA requirements (Beak, 2013). Therefore, the sample collected as part of this study was unusable and was not used for data analysis in this report. Instead, where appropriate, data from the USGS produced water database were used.

6.3. Ground Water

6.3.1. Geochemical Parameters

The pH of ground water samples collected for this study ranged from 6.85 to 9.04, with a median pH of 8.20, which indicates the water is circumneutral to basic (Table 7). The pH data collected as part of this study are discussed below with respect to historical data for the Trinity aquifer.

Table 5. Surface water data summaries and statistics for all study surface water data collected in Locations A and B.

Data Source	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
Brine Components											
NWIS	SpC		µS/cm	443	346	205	305	678	3	3	
Location A	SpC		µS/cm	244	244	3	242	248	3	3	0
Location B	SpC		µS/cm	333	333	----	333	333	1	1	0
NWIS	Bicarbonate	Dissolved	mg/L	166	138	65	119	240	3	3	
Location A	Bicarbonate	Dissolved	mg/L	100	101	2	97	102	3	3	0
Location B	Bicarbonate	Dissolved	mg/L	104	104	----	104	104	1	1	0
NWIS	Chloride	Dissolved	mg/L	40	29	24	24	68	3	3	
Location A	Chloride	Dissolved	mg/L	9.15	9.17	0.07	9.08	9.22	3	3	0
Location B	Chloride	Dissolved	mg/L	9.00	9.00	----	9.00	9.00	1	1	0
NWIS	Sulfate	Dissolved	mg/L	31	17	24	17	59	3	3	
Location A	Sulfate	Dissolved	mg/L	12.9	12.9	0.2	12.7	13.1	3	3	0
Location B	Sulfate	Dissolved	mg/L	5.4	5.4	----	5.4	5.4	1	1	0
NWIS	Calcium	Dissolved	mg/L	48	40	18	35	68	3	3	
Location A	Calcium	Dissolved	mg/L	34.9	34.9	0.1	34.8	35.1	3	3	0
Location B	Calcium	Dissolved	mg/L	44.5	44.5	----	44.5	44.5	1	1	0
NWIS	Potassium	Dissolved	mg/L	5.4	5.1	0.5	5.1	6.0	3	3	
Location A	Potassium	Dissolved	mg/L	5.74	5.75	0.05	5.69	5.78	3	3	0
Location B	Potassium	Dissolved	mg/L	21.3	21.3	----	21.3	21.3	1	1	0
NWIS	Magnesium	Dissolved	mg/L	10.3	6.5	7.2	5.9	18.6	3	3	
Location A	Magnesium	Dissolved	mg/L	3.30	3.30	0.02	3.29	3.33	3	3	0
Location B	Magnesium	Dissolved	mg/L	5.00	5.00	----	5.00	5.00	1	1	0

Table 5. Surface water data summaries and statistics for all study surface water data collected in Locations A and B.

Data Source	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
NWIS	Sodium	Dissolved	mg/L	28	19	16	18	46	3	3	
Location A	Sodium	Dissolved	mg/L	8.68	8.71	0.05	8.63	8.72	3	3	0
Location B	Sodium	Dissolved	mg/L	4.20	4.20	----	4.20	4.20	1	1	0
Geochemical Parameters											
NWIS	DO		mg/L	6.5	6.5	----	5.0	8.0	3	2	
Location A	DO		mg/L	9.17	9.93	1.49	7.46	10.1	3	3	0
Location B	DO		mg/L	5.35	5.35	----	5.35	5.35	1	1	0
NWIS	pH			7.6	7.7	0.2	7.4	7.7	3	3	
Location A	pH			8.56	8.58	0.09	8.46	8.64	3	3	0
Location B	pH			7.66	7.66	----	7.66	7.66	1	1	0
NWIS	Alkalinity		mg $CaCO_3$/L	139	139	----	73	205	3	2	
Location A	Alkalinity		mg $CaCO_3$/L	89	89	2	88	31	3	3	0
Location B	Alkalinity		mg $CaCO_3$/L	141	141	----	141	141	1	1	0
Nutrients/DOC/Other Anions											
NWIS	DOC		mg/L	7.1	7.1	----	6.6	7.5	3	2	
Location A	DOC		mg/L	6.63	6.62	0.05	6.59	6.59	3	3	0
Location B	DOC		mg/L	20.1	20.1	----	20.1	20.1	1	1	0
NWIS	Fluoride	Dissolved	mg/L	0.2	0.2	0.1	0.1	0.3	3	3	
Location A	Fluoride	Dissolved	mg/L	0.12	0.12	0.01	0.11	0.13	3	3	0
Location B	Fluoride	Dissolved	mg/L	0.11	0.11	----	0.11	0.11	1	1	0

Table 5. Surface water data summaries and statistics for all study surface water data collected in Locations A and B.

Data Source	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
Trace Elements											
NWIS	Iron	Dissolved	µg/L	96	96	----	32	160	3	2	
Location B	Iron	Dissolved	µg/L	1509	1509	----	1509	1509	1	1	0
NWIS	Manganese	Dissolved	µg/L	121	121	----	8	233	3	2	
Location A	Manganese	Dissolved	µg/L	6	7	1	6	7	3	3	0
Location B	Manganese	Dissolved	µg/L	330	330	----	330	330	1	1	0

[1] Percentage of left censored data.

Table 6. Boonesville Bend Conglomerate data obtained from the USGS produced water database (USGS, 2002) compared to study sample from the Boonesville Bend Conglomerate.

Source	Parameter	Units	Mean	Median	Standard Deviation	Min	Max	Count	N	Z[1]
Study	Bicarbonate	mg/L	84	84	---	84	84	1	1	0
USGS	Bicarbonate	mg/L	118	86	102	9	427	17	17	0
Study	Calcium	mg/L	1.70	1.70	---	1.70	1.70	1	1	0
USGS	Calcium	mg/L	10252	9207	6066	2605	18958	17	17	0
Study	Chloride	mg/L	3.14	3.14	---	3.14	3.14	1	1	0
USGS	Chloride	mg/L	84899	91765	41514	25230	148862	17	17	0
Study	Magnesium	mg/L	0.12	0.12	---	0.12	0.12	1	1	0
USGS	Magnesium	mg/L	1982	1429	1684	300	7084	17	17	0
Study	pH		5.90	5.90	---	5.90	5.90	1	1	0
USGS	pH		6.1	5.96	0.5	5.1	7.1	17	17	0
Study	Potassium	mg/L	---	---	---	---	---	1	0	0
USGS	Potassium	mg/L	843	843	222	686	1000	17	2	88
Study	Sodium	mg/L	1.15	1.15	---	1.15	1.15	1	1	0
USGS	Sodium	mg/L	40114	45103	19733	11157	74285	17	16	6
Study	Sulfate	mg/L	0.18	0.18	---	0.18	0.18	1	1	0
USGS	Sulfate	mg/L	294	228	391	8	1319	17	16	6
Study	TDS	mg/L	187	187	---	187	187	1	1	0
USGS	TDS	mg/L	137646	149480	66709	41707	242027	17	17	0

[1] Percentage of left censored data.

Table 7. Data summaries and statistics for select components for ground, surface, and produced water collected during the study countywide. Data for any sampling point were averaged for all rounds of sampling.

Sample Type	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
Barnett Produced Water	Boron	Dissolved	µg/L	26450	26450	---	25800	27100	2	2	0
Ground Water	Boron	Dissolved	µg/L	179	175	111	64	481	16	16	7
Surface Water	Boron	Dissolved	µg/L	32	35	6	24	35	4	4	80
Barnett Produced Water	Barium	Dissolved	µg/L	10405	10405	---	8510	12300	2	2	0
Ground Water	Barium	Dissolved	µg/L	45	23	38	13	138	16	16	17
Surface Water	Barium	Dissolved	µg/L	131	45	177	39	397	4	4	0
Barnett Produced Water	Bromide	Dissolved	mg/L	903	903	---	903	903	2	1	0
Ground Water	Bromide	Dissolved	mg/L	0.94	0.18	2.14	0.03	7.57	16	16	43
Surface Water	Bromide	Dissolved	mg/L	---	---	---	---	---	4	0	100
Barnett Produced Water	Calcium	Dissolved	mg/L	18700	18700	---	16200	21200	2	2	0
Ground Water	Calcium	Dissolved	mg/L	31.2	9.51	40.8	1.13	144	16	16	0
Surface Water	Calcium	Dissolved	mg/L	37.3	35.0	4.80	34.8	44.5	4	4	0
Barnett Produced Water	Chloride	Dissolved	mg/L	126750	126750	---	110100	143400	2	2	0
Ground Water	Chloride	Dissolved	mg/L	189	42.6	420	4.59	1434	16	16	0
Surface Water	Chloride	Dissolved	mg/L	9.12	9.12	0.09	9.02	9.22	4	4	0
Barnett Produced Water	DIC	Dissolved	mg/L	30.2	30.2	---	27.2	33.1	2	2	0
Ground Water	DIC	Dissolved	mg/L	66.5	63.2	14.9	38.7	108.0	16	16	0
Surface Water	DIC	Dissolved	mg/L	23.8	20.5	7.13	19.7	34.5	4	4	0
Barnett Produced Water	Bicarbonate	Dissolved	mg/L	31	31	---	14	48	2	2	0
Ground Water	Bicarbonate	Dissolved	mg/L	314	312	51	189	427	16	16	0
Surface Water	Bicarbonate	Dissolved	mg/L	101	102	3	97	104	4	4	0

Table 7. Data summaries and statistics for select components for ground, surface, and produced water collected during the study countywide. Data for any sampling point were averaged for all rounds of sampling.

Sample Type	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
Barnett Produced Water	Iodide	Dissolved	µg/L	91900	91900	---	57800	126000	2	2	0
Ground Water	Iodide	Dissolved	µg/L	59.6	19.8	87.3	16.4	269	9	9	0
Surface Water	Iodide	Dissolved	µg/L	26.7	26.7	---	26.7	26.7	1	1	0
Barnett Produced Water	Potassium	Dissolved	mg/L	1354	1354	---	928	1780	2	2	0
Ground Water	Potassium	Dissolved	mg/L	2.19	1.79	1.49	0.50	6.63	16	16	0
Surface Water	Potassium	Dissolved	mg/L	9.62	5.77	7.76	5.69	21.3	4	4	0
Barnett Produced Water	Magnesium	Dissolved	mg/L	2135	2135	---	1860	2410	2	2	0
Ground Water	Magnesium	Dissolved	mg/L	13.2	4.06	18.1	0.41	62.7	16	16	0
Surface Water	Magnesium	Dissolved	mg/L	3.73	3.31	0.85	3.29	5.00	4	4	0
Barnett Produced Water	Sodium	Dissolved	mg/L	78250	78250	---	60100	96400	2	2	0
Ground Water	Sodium	Dissolved	mg/L	224	161	251	25.8	889	16	16	0
Surface Water	Sodium	Dissolved	mg/L	7.57	8.67	2.23	4.22	8.72	4	4	0
Barnett Produced Water	Sulfate	Dissolved	mg/L	322	322	---	285	358	2	2	0
Ground Water	Sulfate	Dissolved	mg/L	75.1	65.4	57.1	24.5	219	16	16	0
Surface Water	Sulfate	Dissolved	mg/L	11.0	12.8	3.72	5.44	13.1	4	4	0
Barnett Produced Water	SpC	Dissolved	µS/cm	233050	233050	---	184200	281900	2	2	0
Ground Water	SpC	Dissolved	µS/cm	1278	781	1349	555	5077	16	16	0
Surface Water	SpC	Dissolved	µS/cm	266	246	44	242	333	4	4	0
Barnett Produced Water	Strontium	Dissolved	µg/L	668000	668000	---	584000	752000	2	2	0
Ground Water	Strontium	Dissolved	µg/L	2026	605	2728	51	9454	16	16	0
Surface Water	Strontium	Dissolved	µg/L	336	374	78	219	377	4	4	0

Table 7. Data summaries and statistics for select components for ground, surface, and produced water collected during the study countywide. Data for any sampling point were averaged for all rounds of sampling.

Sample Type	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
Barnett Produced Water	TDS	Dissolved	mg/L	131015	131015	---	119730	142300	2	2	0
Ground Water	TDS	Dissolved	mg/L	831	506	877	361	3301	16	16	0
Surface Water	TDS	Dissolved	mg/L	173	160	29	157	216	4	4	0

[1] Percentage of left censored data.

A comparison of the study's current ground water pH data to historical pH data on a countywide scale is shown in Table 8. On this scale, the ranges of the historical pH data were similar to that of the study's pH range. However, the median pH of the study samples was slightly higher than the median pH of the historical samples, and this was statistically significant, using both parametric and non-parametric statistics (p-values = 0.00019 and 0.000006, respectively).

The ORP of ground water samples collected in this study ranged from -103 to 227 millivolts (mV), with a median ORP of 165 mV, which indicates the ground water is mildly reducing. The ORP data collected for the Barnett Shale ranged from -0.7 to 75 mV, with a median ORP of 37.2 mV. The produced water was considered reducing.

Specific conductivity in ground water ranged from 555 to 5,077 µS/cm, with a median SpC of 781 µS/cm. The wide range found in the ground water was skewed because the SpC of samples from two wells (WISETXGW01 and WISETXGW08) was much higher than in other wells. The SpC of Barnett Shale-produced water ranged from 184,200 to 281,900 µS/cm, with a median SpC of 233,050 µS/cm.

Comparisons of the SpC data collected in this study to the historical data on a countywide scale are shown in Table 8 and in Figure 13; Figure 14 is a map of the distribution. Although these ranges appear to have significant overlap, the study data have two samples (WISETXGW01 and WISETXGW08) with higher SPCs than the NWIS and NURE databases (Figure 13). Only the TXWDB reports values with SpC data in the range of the two study data points (Figure 13). From Figure 13, it can also be seen that the greatest SpC was in the study data and the third highest SpC was also in the study data. The remainder of the study's SpC data were much lower than the data from these two wells. However, both ANOVA and Kruskal-Wallis statistical analysis indicates that there were no significant differences between the study data as a whole and the historical data.

For Location A, the SpC (Table 9), the median SpC, and the SpC range were lower than the historical data for Location A in the NURE database.

The NWIS, TXWDB, and NURE databases contained data for locations within a 3-mile radius of Location B (Table 10). The median SpC for study samples collected in Location B was similar to that of the historical data in the TXWDB and NURE databases for locations within the 3-mile radius. The range for the samples collected for the study was wider, as can be seen in a visual inspection of the statistical plots in Figure 15, because two wells, WISETXGW01 and WISETXGW08, consistently had high SpC values and are higher than any data in the historical databases.

The NWIS, TXWDB, and NURE databases also contained historical data for locations within a 3-mile radius of Location C (Table 11). As shown in Table 11, the SpC values for samples from the study wells were similar to the historical data, although the range suggests that Location C may have had slightly lower SpC values than the historical databases indicate.

Although there were differences in pH and SpC at study locations A and C when compared with the historical data, these differences were not significant. For Location B there were significant differences in the pH of the study data compared with the historical data. Likewise, for Location B the SpC found in two wells, WISTXGW01 and WISTXGW08 were found to be greater than the historical data. This could indicate that there were impacts to WISTXGW01 and WISTXGW08.

Table 8. Countywide-scale ground water data summaries and statistics for the historical databases (NWIS, TXWDB, and NURE) along with all study data collected.

Data Source	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
Brine Components											
NWIS	SpC		µS/cm	1150	1120	506	617	2380	11	11	0
TXWDB	SpC		µS/cm	1211	994	738	482	4572	94	92	0
NURE	SpC		µS/cm	1292	1140	732	450	3870	79	79	0
This Study	SpC		µS/cm	1278	781	1349	555	5077	16	16	0
TXWDB	TDS		mg/L	652	535	356	303	2186	94	94	0
This Study	TDS		mg/L	831	506	877	361	3301	16	16	0
NWIS	Bicarbonate	Dissolved	mg/L	422	432	82.0	272	517	11	11	0
TXWDB	Bicarbonate	Dissolved	mg/L	374	352	97.0	188	537	94	94	0
This Study	Bicarbonate	Dissolved	mg/L	314	312	51.0	189	427	16	16	0
NWIS	Chloride	Dissolved	mg/L	118	68	141	16	500	11	11	0
TXWDB	Chloride	Dissolved	mg/L	128	68	183	9	1170	94	94	1
This Study	Chloride	Dissolved	mg/L	189	42.6	420	4.59	1434	16	16	0
NWIS	Sulfate	Dissolved	mg/L	78	53	59	20	200	11	11	0
TXWDB	Sulfate	Dissolved	mg/L	80	48	78	29	421	94	93	1
NURE	Sulfate	Dissolved	mg/L	69	42	87	3	550	79	79	0
This Study	Sulfate	Dissolved	mg/L	75.1	65.4	57.1	24.5	219	16	16	0
NWIS	Bromide	Dissolved	mg/L	0.71	0.45	0.83	0.12	3.00	11	11	0
TXWDB	Bromide	Dissolved	mg/L	0.62	0.45	0.72	0.05	3.00	94	27	15
This Study	Bromide	Dissolved	mg/L	0.94	0.18	2.14	0.03	7.57	16	16	43

Table 8. Countywide-scale ground water data summaries and statistics for the historical databases (NWIS, TXWDB, and NURE) along with all study data collected.

Data Source	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
NWIS	Calcium	Dissolved	mg/L	81	71	56	4	200	11	11	0
TXWDB	Calcium	Dissolved	mg/L	71	71	56	4	250	94	94	0
NURE	Calcium	Dissolved	mg/L	69.7	63.9	56.8	0.8	260	79	79	0
This Study	Calcium	Dissolved	mg/L	31.2	9.51	40.8	1.13	144	16	16	0
NWIS	Potassium	Dissolved	mg/L	2.6	2.7	1.1	1	4.3	11	11	0
TXWDB	Potassium	Dissolved	mg/L	2.85	2.93	1.29	1.7	5.73	94	46	0
NURE	Potassium	Dissolved	mg/L	2.9	2.5	2.6	0.1	18	79	79	0
This Study	Potassium	Dissolved	mg/L	2.19	1.79	1.49	0.5	6.63	16	16	0
NWIS	Magnesium	Dissolved	mg/L	28	16	27	2	86	11	11	0
TXWDB	Magnesium	Dissolved	mg/L	20.8	10.9	24.2	2.0	134	94	94	1
NURE	Magnesium	Dissolved	mg/L	19.4	13.3	19.4	0.1	89.9	79	79	0
This Study	Magnesium	Dissolved	mg/L	13.2	4.06	18.1	0.41	62.7	16	16	0
NWIS	Sodium	Dissolved	mg/L	121	79	100	30	310	11	11	0
TXWDB	Sodium	Dissolved	mg/L	143	88	154	30	819	94	94	0
NURE	Sodium	Dissolved	mg/L	98.9	75.6	79.9	7.2	360	79	79	0
This Study	Sodium	Dissolved	mg/L	224	161	251	25.8	889	16	16	0
TXWDB	Boron	Dissolved	µg/L	167	105	162	25	700	94	22	24
NURE	Boron	Dissolved	µg/L	158	73	266	2	1824	79	79	0
This Study	Boron	Dissolved	µg/L	179	175	111	64	481	16	16	7
TXWDB	Barium	Dissolved	µg/L	103	81	80	23	314	94	31	2
NURE	Barium	Dissolved	µg/L	78	63	67	2	367	79	79	0
This Study	Barium	Dissolved	µg/L	45	23	38	13	138	16	16	17

Table 8. Countywide-scale ground water data summaries and statistics for the historical databases (NWIS, TXWDB, and NURE) along with all study data collected.

Data Source	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
TXWDB	Strontium	Dissolved	µg/L	2046	1290	2044	750	8360	94	21	0
NURE	Strontium	Dissolved	µg/L	1765	1053	1833	20	7913	79	79	0
This Study	Strontium	Dissolved	µg/L	2026	605	2728	51	9454	16	16	0
Geochemical Parameters											
NWIS	pH			7.4	7.3	0.7	6.8	9.0	11	11	0
TXWDB	pH			7.7	7.7	0.5	7.2	9.0	94	94	0
NURE	pH			8	7.2	0.7	6.3	10	79	79	0
This Study	pH			8.05	8.20	0.67	6.85	9.04	16	16	0
Trace Elements											
NWIS	Manganese	Dissolved	µg/L	18	2	38	0.5	130	11	11	36
TXWDB	Manganese	Dissolved	µg/L	14	7	22	1	117	94	32	32
This Study	Manganese	Dissolved	µg/L	21	12	23	2	71	16	16	13
TXWDB	Lithium	Dissolved	µg/L	23	20	16	19	53	94	21	3
NURE	Lithium	Dissolved	µg/L	22	17	17	1	82	79	79	0
This Study	Lithium	Dissolved	µg/L	55	45	29	29	120	16	9	0
Organic Parameters											
NWIS	Benzene	Dissolved	µg/L	0.4	0.4	---	0.4	0.4	11	1	---[2]
TXWDB	Benzene	Dissolved	µg/L	0.4	0.4	---	0.4	0.4	11	1	---[2]
This Study	Benzene	Dissolved	µg/L	0.1	0.1	---	0.1	0.1	16	1	---[2]

[1] Percentage of left censored data.
[2]Percentage of left censored data was not calculated because only one location had detectable concentrations.

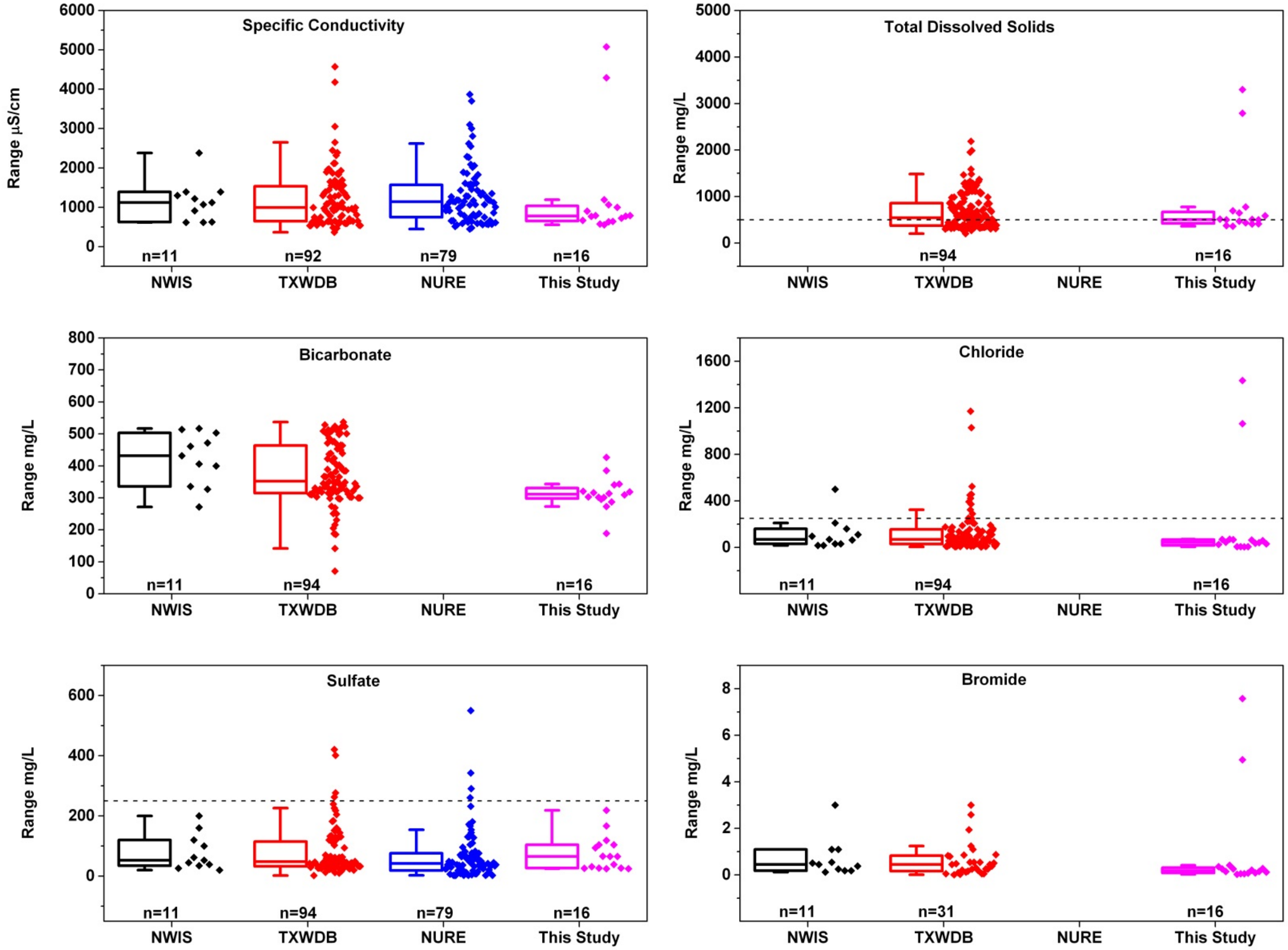


Figure 13. Ground water box and whisker plots comparing historical databases (NWIS, [USGS, 2013a], TXWDB [2013b], and NURE [USGS, 2013b]) with all the study data on a county wide scale. The black dashed lines indicate, for constituents that have secondary MCLs, the concentrations of the secondary MCLs.

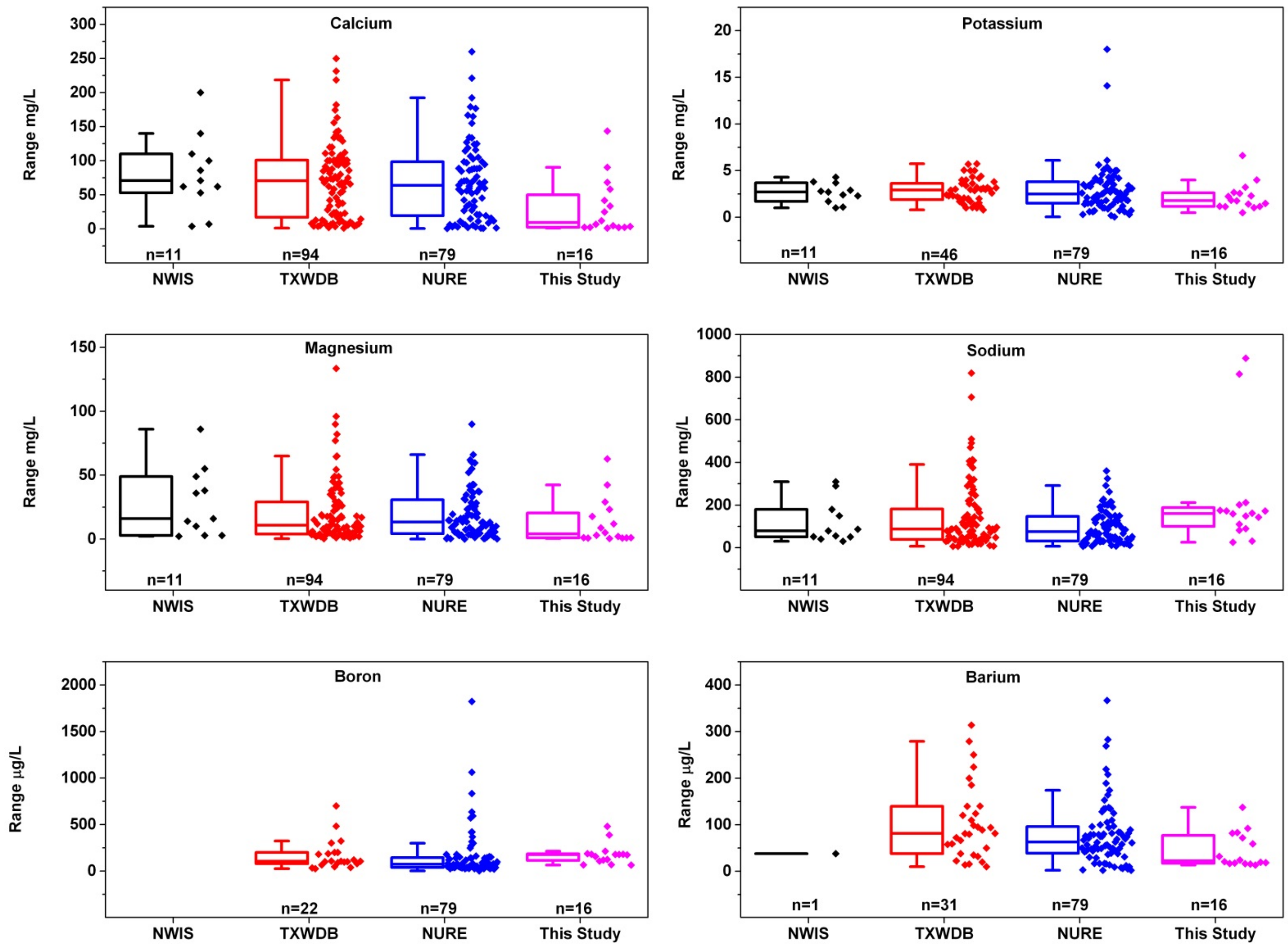


Figure 13 continued. Ground water box and whisker plots comparing historical databases (NWIS, [USGS, 2013a], TXWDB [2013b], and NURE [USGS, 2013b]) with all the study data on a county wide scale. The black dashed lines indicate, for constituents that have secondary MCLs, the concentrations of the secondary MCLs.

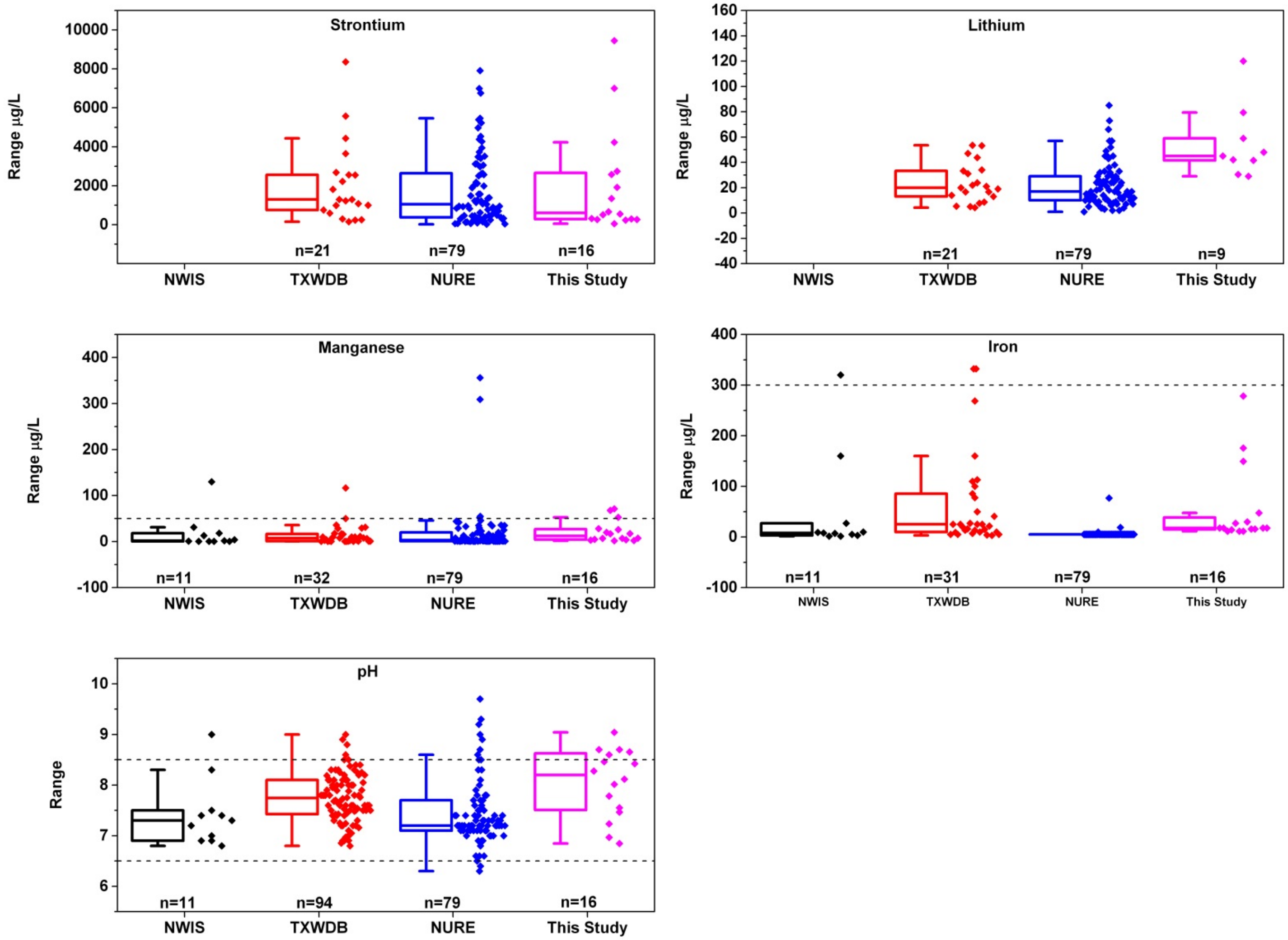
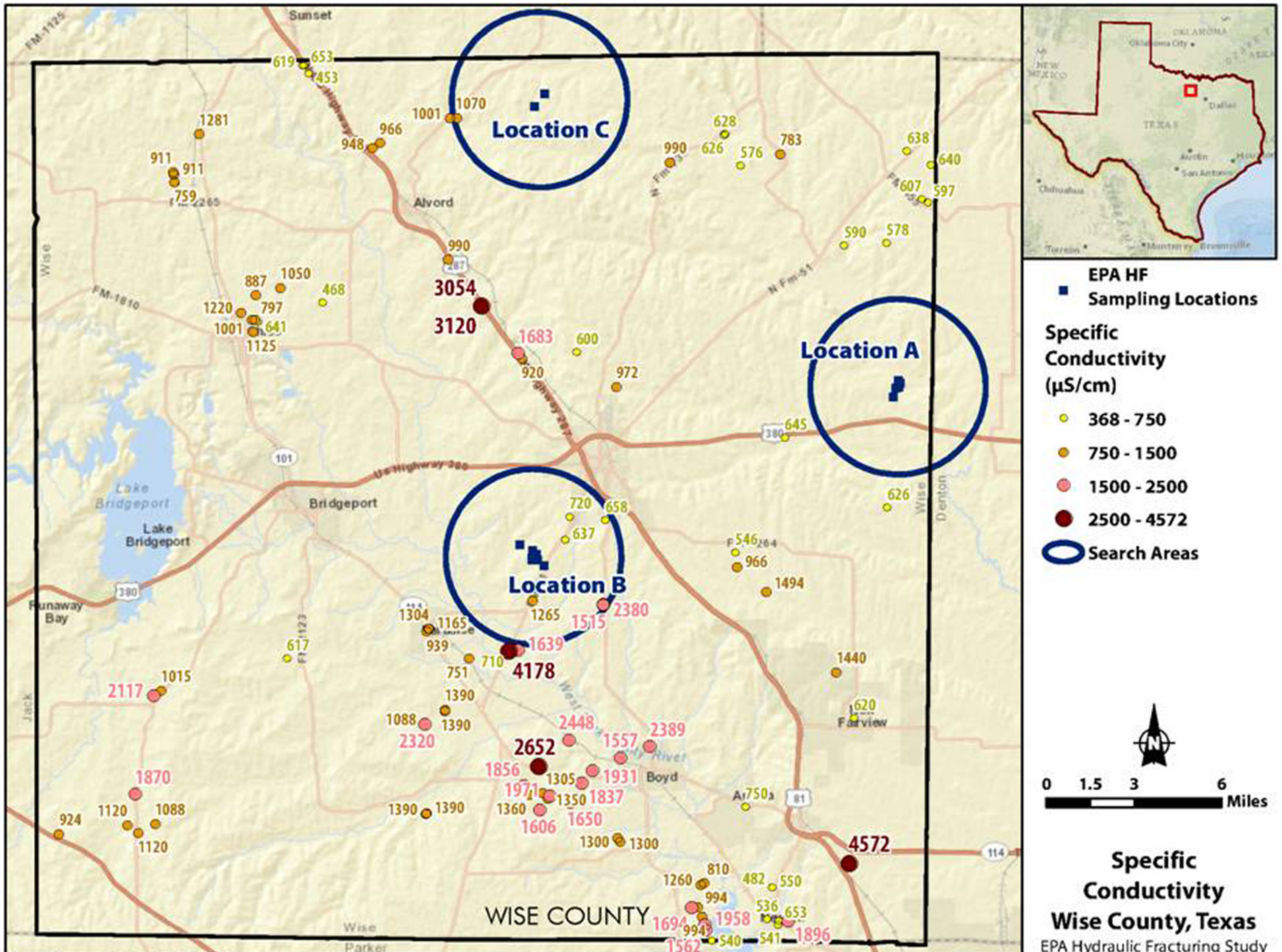


Figure 13 continued. Ground water box and whisker plots comparing historical databases (NWIS, [USGS, 2013a], TXWDB [2013b], and NURE [USGS, 2013b]) with all the study data on a county wide scale. The black dashed lines indicate, for constituents that have secondary MCLs, the concentrations of the secondary MCLs.



Source: Basemap, ESRI; Sampling Results and Location, EPA ORD

Figure 14. Map of specific conductivity values and distributions for Wise County based on historical databases**.** (Data Sources: USGS (2013a, 2013b) and TXWDB (2013b)).

Table 9. Location A 3-mile-radius-scale data summaries and statistics for the historical databases (NURE) along with all study data collected in Location A.

Data Source	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
Brine Components											
NURE	SpC		µS/cm	727	655	165	610	915	3	3	0
Location A	SpC		mS/cm	601	605	41	555	641	4	4	0
NURE	Sulfate	Dissolved	mg/L	44	45	6	38	50	3	3	0
Location A	Sulfate	Dissolved	mg/L	30.2	28.7	6.5	24.5	39.0	4	4	0
NURE	Calcium	Dissolved	mg/L	2.7	1.6	2.6	0.8	5.6	3	3	0
Location A	Calcium	Dissolved	mg/L	18.0	18.6	14.3	1.13	33.5	4	4	0
NURE	Potassium	Dissolved	mg/L	0.4	0.3	0.2	0.3	0.7	3	3	0
Location A	Potassium	Dissolved	mg/L	2.01	2.16	1.17	0.50	3.23	4	4	0
NURE	Magnesium	Dissolved	mg/L	0.3	0.3	0.1	0.2	0.3	3	3	0
Location A	Magnesium	Dissolved	mg/L	6.57	6.96	4.97	0.41	12.0	4	4	0
NURE	Sodium	Dissolved	mg/L	169	150	40	141	215	3	3	0
Location A	Sodium	Dissolved	mg/L	108	100	29.7	81.8	149	4	4	0
NURE	Boron	Dissolved	µg/L	99	98	79	21	179	3	3	0
Location A	Boron	Dissolved	µg/L	104	113	25	68	124	4	4	14
NURE	Barium	Dissolved	µg/L	3	3	2	2	5	3	3	0
Location A	Barium	Dissolved	µg/L	77	78	50	16	138	4	4	14
NURE	Strontium	Dissolved	µg/L	48	48	9	40	57	3	3	0
Location A	Strontium	Dissolved	µg/L	992	999	812	51	1920	4	4	0
Geochemical Parameters											
NURE	pH			8.4	8.9	1.6	6.6	9.7	3	3	0
Location A	pH			8.02	7.78	0.72	7.47	9.04	4	4	0

[1] Percentage of left censored data.

Table 10. Location B 3-mile-radius-scale data summaries and statistics for the historical databases (NWIS, TXWDB, and NURE) along with all study data collected in Location B.

Data Source	Parameter	Dissolved/Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
Brine Components											
NWIS	SpC		µS/cm	2380	2380	---	2380	2380	1	1	0
TXWDB	SpC		µS/cm	882	689	423	637	1515	4	4	0
NURE	SpC		µS/cm	955	955	---	840	1070	2	2	0
Location B	SpC		µS/cm	1619	846	1630	726	5077	10	10	0
TXWDB	TDS		mg/L	510	398	232	386	859	4	4	0
Location B	TDS		mg/L	1052	549	1060	472	3301	10	10	0
NWIS	Bicarbonate	Dissolved	mg/L	517	517	---	517	517	1	1	0
TXWDB	Bicarbonate	Dissolved	mg/L	351	323	69	303	453	4	4	0
Location B	Bicarbonate	Dissolved	mg/L	302	306	51	189	385	10	10	0
NWIS	Chloride	Dissolved	mg/L	500	500	---	500	500	1	1	0
TXWDB	Chloride	Dissolved	mg/L	93	44	105	34	250	4	4	14
Location B	Chloride	Dissolved	mg/L	294	64.7	211	34.9	1434	10	10	0
NWIS	Sulfate	Dissolved	mg/L	100	100	---	100	100	1	1	0
TXWDB	Sulfate	Dissolved	mg/L	36	30	17	24	62	4	4	0
NURE	Sulfate	Dissolved	mg/L	143	143	---	131	154	2	2	0
Location B	Sulfate	Dissolved	mg/L	83.7	79.8	43.1	25.8	167	10	10	0
NWIS	Bromide	Dissolved	mg/L	3	3	---	3	3.00	1	1	0
TXWDB	Bromide	Dissolved	mg/L	1.24	0.48	1.53	0.25	3.00	4	3	0
Location B	Bromide	Dissolved	mg/L	1.43	0.26	2.62	0.09	7.57	10	10	37
NWIS	Calcium	Dissolved	mg/L	200	200	---	200	200	1	1	0
TXWDB	Calcium	Dissolved	mg/L	53	52	50	7	100	4	4	0

Table 10. Location B 3-mile-radius-scale data summaries and statistics for the historical databases (NWIS, TXWDB, and NURE) along with all study data collected in Location B.

Data Source	Parameter	Dissolved/Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
NURE	Calcium	Dissolved	mg/L	16.9	16.9	---	1.1	32.7	2	2	0
Location B	Calcium	Dissolved	mg/L	21.5	4.11	31.2	2.12	90.3	10	10	0
NWIS	Potassium	Dissolved	mg/L	2.8	2.8	---	2.8	2.8	1	1	0
TXWDB	Potassium	Dissolved	mg/L	2.2	2.3	0.5	1.6	2.6	4	3	0
NURE	Potassium	Dissolved	mg/L	2.55	2.55	---	0.6	4.5	2	2	0
Location B	Potassium	Dissolved	mg/L	2.08	1.44	1.69	1.03	6.63	10	10	0
NWIS	Magnesium	Dissolved	mg/L	86	86	---	86	86	1	1	0
TXWDB	Magnesium	Dissolved	mg/L	15.4	8.1	18.7	2.3	43.2	4	4	0
NURE	Magnesium	Dissolved	mg/L	10.3	10.3	---	0.4	20.1	2	2	0
Location B	Magnesium	Dissolved	mg/L	9.29	1.58	14.1	0.71	42.4	10	10	0
NWIS	Sodium	Dissolved	mg/L	150	150	---	150	150	1	1	0
TXWDB	Sodium	Dissolved	mg/L	118	137	51	43	154	4	4	0
NURE	Sodium	Dissolved	mg/L	143	143	---	93.7	192	2	2	0
Location B	Sodium	Dissolved	mg/L	310	174	287	144	889	10	10	0
NURE	Boron	Dissolved	mg/L	163	163	---	149	177	2	2	0
Location B	Boron	Dissolved	mg/L	231	180	110	157	481	10	10	0
TXWDB	Barium	Dissolved	µg/L	68	50	65	14	140	4	4	0
NURE	Barium	Dissolved	µg/L	58	58	---	6	110	2	2	0
Location B	Barium	Dissolved	µg/L	31	19	29	13	92	10	10	33
TXWDB	Strontium	Dissolved	µg/L	590	590	---	590	590	4	1	0
NURE	Strontium	Dissolved	µg/L	2197	2197	---	126	4268	2	2	0
Location B	Strontium	Dissolved	µg/L	1887	414	2983	237	9454	10	10	0

Table 10. Location B 3-mile-radius-scale data summaries and statistics for the historical databases (NWIS, TXWDB, and NURE) along with all study data collected in Location B.

Data Source	Parameter	Dissolved/Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
Geochemical Parameters											
NWIS	pH			6.8	6.8	---	6.8	6.8	1	1	0
TXWDB	pH			7.6	7.6	0.1	7.5	7.7	4	4	0
NURE	pH			8.4	8.4	---	7.4	9.3	2	2	0
Location B	pH			8.29	8.44	0.47	7.24	8.7	10	10	0
Trace Elements											
TXWDB	Manganese	Dissolved	µg/L	7.2	10.0	5.9	0.5	11.2	4	3	77
NURE	Manganese	Dissolved	µg/L	18	18	---	1	34	2	2	50
Location B	Manganese	Dissolved	µg/L	15	7	21	2	71	10	10	11
TXWDB	Lithium	Dissolved	µg/L	21	21	---	21	21	4	1	0
NURE	Lithium	Dissolved	µg/L	45	45	---	38	52	2	2	0
Location B	Lithium	Dissolved	µg/L	55	45	29	29	120	9	9	0

[1] Percentage of left censored data.

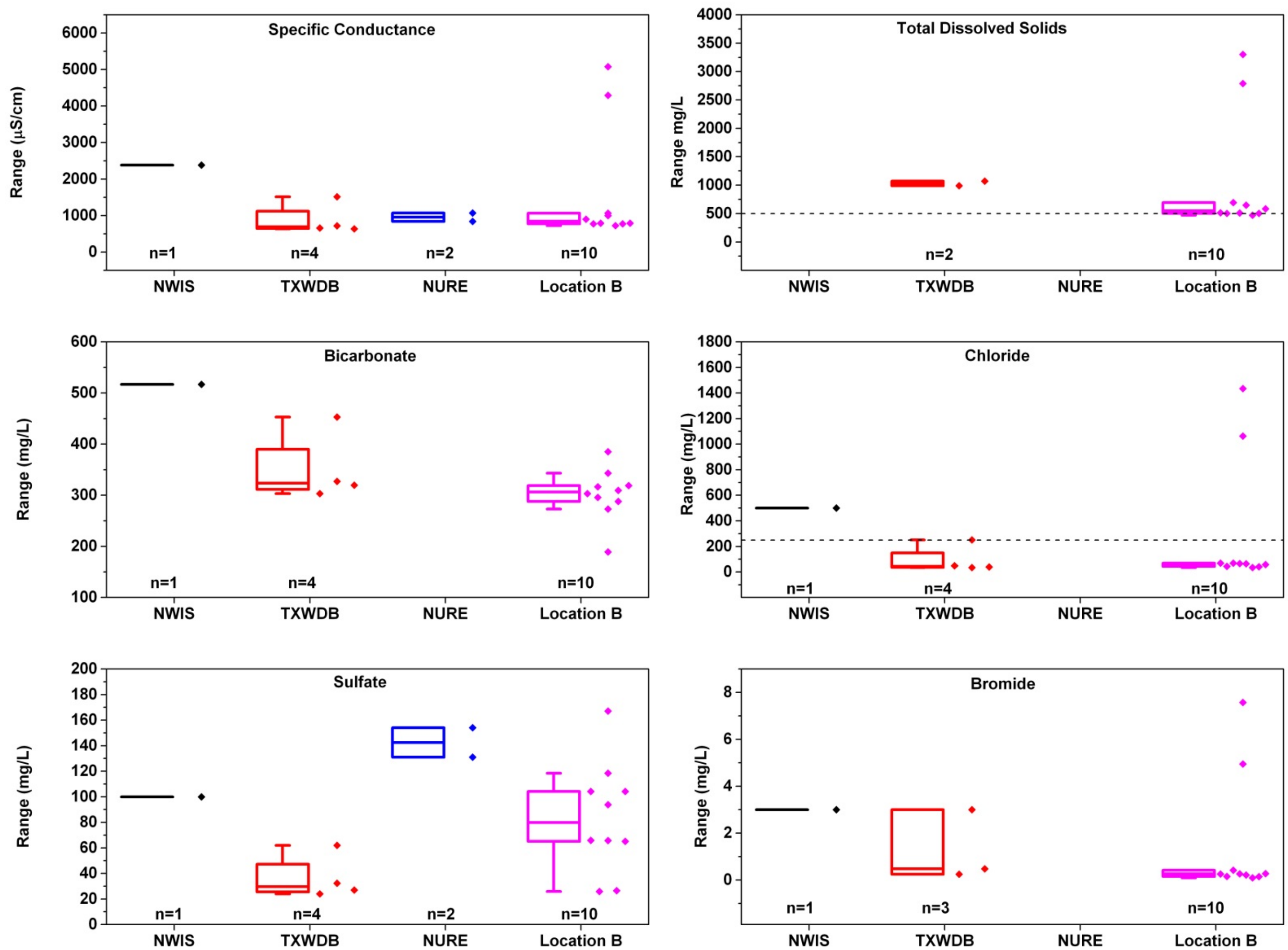


Figure 15. Ground water box and whisker plots comparing historical databases (NWIS [USGS, 2013a], TXWDB [2013b], and NURE [USGS, 2013b]) with all the study data at Location B using a 3-mile radius. The black dashed lines indicate, for constituents that have secondary MCLs, the concentrations of the secondary MCLs.

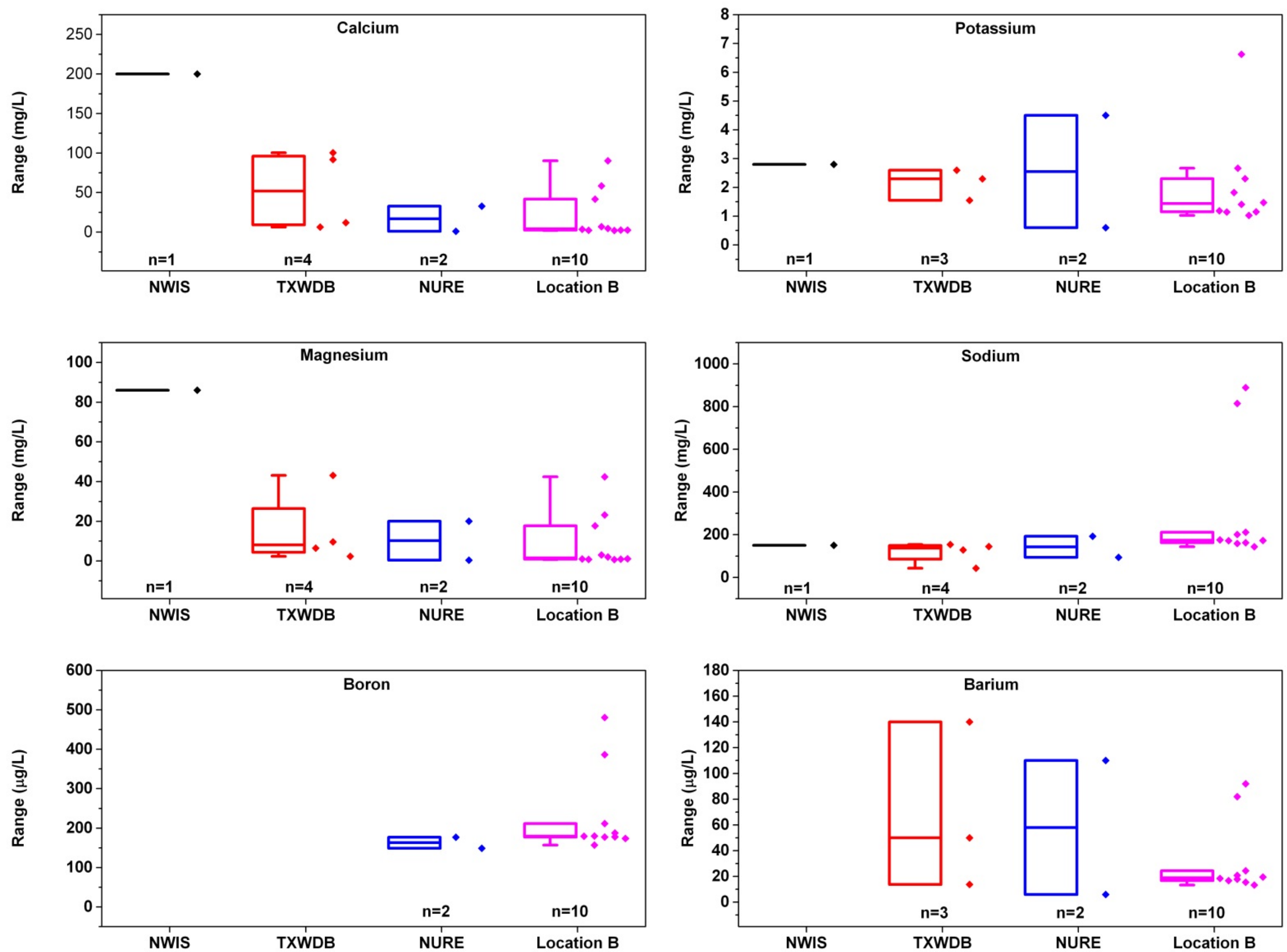


Figure 15 continued. Ground water box and whisker plots comparing historical databases **(NWIS [USGS, 2013a], TXWDB [2013b],** and NURE [USGS, 2013b]) with all the study data at Location B using a 3-mile radius. The black dashed lines indicate, for constituents that have secondary MCLs, the concentrations of the secondary MCLs.

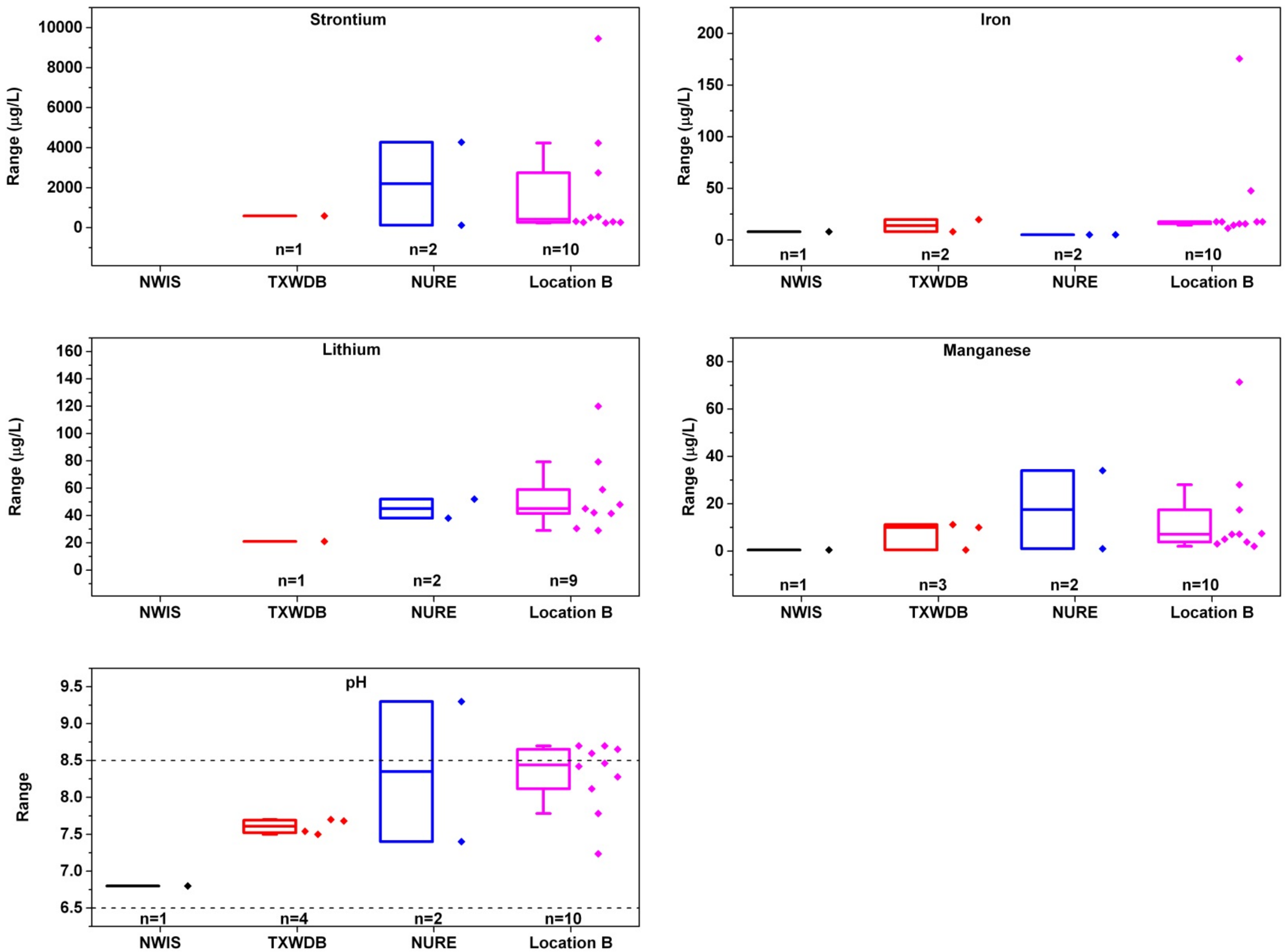


Figure 15 continued. Ground water box and whisker plots comparing historical databases (NWIS [USGS, 2013a], TXWDB [2013b], and NURE [USGS, 2013b]) with all the study data at Location B using a 3-mile radius. The black dashed lines indicate, for constituents that have secondary MCLs, the concentrations of the secondary MCLs.

Table 11. Location C 3-mile-radius-scale data summaries and statistics for the historical databases (NWIS, TXWDB, and NURE) along with all study data collected in Location C.

Data Source	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
Brine Components											
NWIS	SpC		µS/cm	1070	1070	---	1070	1070	1	1	0
TXWDB	SpC		µS/cm	1030	1030	---	1030	1030	1	1	0
NURE	SpC		µS/cm	2590	2590	---	1310	3870	2	2	0
Location C	SpC		µS/cm	932	932	---	668	1195	2	2	0
TXWDB	TDS		mg/L	651	651	---	651	651	1	1	0
Location C	TDS		mg/L	606	606	---	434	777	2	2	0
NWIS	Bicarbonate	Dissolved	mg/L	432	432	---	432	432	1	1	0
TXWDB	Bicarbonate	Dissolved	mg/L	425	425	---	425	425	1	1	0
Location C	Bicarbonate	Dissolved	mg/L	374	374	---	320	427	2	2	0
NWIS	Chloride	Dissolved	mg/L	30	30	---	30	30	1	1	0
TXWDB	Chloride	Dissolved	mg/L	30	30	---	30	30	1	1	0
Location C	Chloride	Dissolved	mg/L	27.8	27.8	---	25.8	29.8	2	2	0
NWIS	Sulfate	Dissolved	mg/L	200	200	---	200	200	1	1	0
TXWDB	Sulfate	Dissolved	mg/L	194	194	---	194	194	1	1	0
NURE	Sulfate	Dissolved	mg/L	447	447	---	343	550	2	2	0
Location C	Sulfate	Dissolved	mg/L	122	122	---	24.8	219	2	2	0
NWIS	Bromide	Dissolved	mg/L	0.18	0.18	---	0.18	0.18	1	1	0
TXWDB	Bromide	Dissolved	mg/L	0.17	0.17	---	0.17	0.17	1	1	0
Location C	Bromide	Dissolved	mg/L	0.24	0.24	---	0.13	0.36	2	2	50

Table 11. Location C 3-mile-radius-scale data summaries and statistics for the historical databases (NWIS, TXWDB, and NURE) along with all study data collected in Location C.

Data Source	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
NWIS	Calcium	Dissolved	mg/L	110	110	---	110	110	1	1	0
TXWDB	Calcium	Dissolved	mg/L	107	107	---	107	107	1	1	0
NURE	Calcium	Dissolved	mg/L	197	197	---	134	260	2	2	0
Location C	Calcium	Dissolved	mg/L	106	106	---	68.4	144	2	2	0
NWIS	Potassium	Dissolved	mg/L	3.7	3.7	---	3.7	3.7	1	1	0
TXWDB	Potassium	Dissolved	mg/L	3.6	3.6	---	3.6	3.6	1	1	0
NURE	Potassium	Dissolved	mg/L	4	4	---	4	4.0	2	2	0
Location C	Potassium	Dissolved	mg/L	3.12	3.12	---	2.24	4.00	2	2	0
NWIS	Magnesium	Dissolved	mg/L	55	55	---	55	55	1	1	0
TXWDB	Magnesium	Dissolved	mg/L	56.2	56.2	---	56.2	56.2	1	1	0
NURE	Magnesium	Dissolved	mg/L	78	78.0	---	66	89.9	2	2	0
Location C	Magnesium	Dissolved	mg/L	45.9	45.9	---	29.1	62.7	2	2	0
NWIS	Sodium	Dissolved	mg/L	30	30	---	30	30	1	1	0
TXWDB	Sodium	Dissolved	mg/L	30	30	---	30	30	1	1	0
NURE	Sodium	Dissolved	mg/L	121	121	---	39.6	203	2	2	0
Location C	Sodium	Dissolved	mg/L	28.7	28.7	---	25.8	31.7	2	2	0
TXWDB	Boron	Dissolved	µg/L	104	104	---	104	104	1	1	0
NURE	Boron	Dissolved	µg/L	84	84	---	77	90	2	2	0
Location C	Boron	Dissolved	µg/L	65	65	---	64	67	2	2	50
TXWDB	Barium	Dissolved	µg/L	110	110	---	110	110	1	1	0
NURE	Barium	Dissolved	µg/L	30	30	---	17	43	2	2	0
Location C	Barium	Dissolved	µg/L	45	45	---	32	59	2	2	50

Table 11. Location C 3-mile-radius-scale data summaries and statistics for the historical databases (NWIS, TXWDB, and NURE) along with all study data collected in Location C.

Data Source	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
TXWDB	Strontium	Dissolved	µg/L	4430	4430	---	4430	4430	1	1	0
NURE	Strontium	Dissolved	µg/L	2966	2966	---	1991	3940	2	2	0
Location C	Strontium	Dissolved	µg/L	4790	4790	---	2580	7000	2	2	0
Geochemical Parameters											
NWIS	pH			7.0	7.0	---	7.0	7.0	1	1	0
TXWDB	pH			7.1	7.1	---	7.1	7.1	1	1	0
NURE	pH			7.0	7.0	---	6.9	7.0	2	2	0
Location C	pH			6.91	6.91	---	6.85	6.97	2	2	0
Trace Elements											
NWIS	Iron	Dissolved	µg/L	320	320	---	320	320	1	1	0
TXWDB	Iron	Dissolved	µg/L	332	332	---	332	332	1	1	0
NURE	Iron	Dissolved	µg/L	8	8	---	5	10	2	2	50
Location C	Iron	Dissolved	µg/L	214	214	---	150	279	2	2	0
NWIS	Manganese	Dissolved	µg/L	130	130	---	130	130	1	1	0
TXWDB	Manganese	Dissolved	µg/L	117	117	---	117	117	1	1	0
NURE	Manganese	Dissolved	µg/L	157	157	---	4	309	2	2	0
Location C	Manganese	Dissolved	µg/L	60	60	---	53	68	2	2	0

[1] Percentage of left censored data.

6.3.2. Major Ions

Bicarbonate concentrations collected in the study can be compared with historical bicarbonate concentrations contained in the NWIS and TXWDB databases (Table 8 and Figure 13) on a county wide scale. The ranges and median concentrations of the historical bicarbonate data and the study bicarbonate data are similar.

The historical bicarbonate data were compared with the study data from Locations B and C on a 3-mile radius scale. The Location B study bicarbonate data had a slightly lower range and median bicarbonate concentration than the historical data (Table 10 and Figure 15). The study data were significantly lower than the NWIS and TXWDB values in the Kruskal-Wallis tests (p-value = 0.00236). In the Scheffe tests, both original and log-transformed values from this study were significantly lower than the values in the NWIS database, but the values from this study only approached a significant difference from the TXWDB. The 3-mile radius historical data from the NWIS for Location C had a slightly lower median bicarbonate concentration (Table 11).

Chloride occurs naturally in water (Hounslow, 1995; Eby, 2004), and there are also many anthropogenic sources of chloride (Eby, 2004). Anthropogenic sources of chloride are extensive, since chloride is one of the most widely used elements in modern chemistry (Eby, 2004). Chloride concentrations in ground water study samples ranged from 4.59 to 1,434 mg/L (Table 7). Chloride concentrations in the Barnett Shale-produced water ranged from 110,100 to 143,400 mg/L.

As is the case with other parameters collected for the study, chloride in ground water was compared on a countywide scale with historical data contained in the NWIS and TXWDB databases (Table 8 and Figure 13). Chloride distributions are shown on Figure 16. Statistical analysis on this scale of all the study data indicated that there were no significant differences between the historical data and the study data. Although this indicates the chloride concentrations are similar, this scale may not provide an accurate assessment of the chloride concentrations at a particular study location when taking geographical locations and geologic information into account, and does not account for potential differences at different study locations.

Ground water chloride concentrations at Locations B and C were compared with the historical data in the NWIS and TXWDB databases using a 3-mile radius. The differences seen between the historical data and the Location B study data (Table 10 and Figure 15) were due to the high chloride concentration found in two of the study wells, WISETXGW01 and WISETXGW08. No historical wells had concentrations in the same range as WISETXGW01 and WISETXGW08; therefore, at this scale, these wells appear to be outliers. The historical chloride concentrations and the study chloride concentrations at Location C were similar (Table 11).

Calcium (Table 7) also occurs naturally in water (Hounslow, 1995). Anthropogenic sources of calcium are agriculture and industrial and construction uses. In study samples, calcium concentrations in ground water ranged from 1.13 to 144 mg/L, with a median concentration of 9.51 mg/L. The Barnett Shale-produced water collected as part of the study had calcium concentrations that ranged from 16,200 to 21,200 mg/L, with a median concentration of 18,700 mg/L.

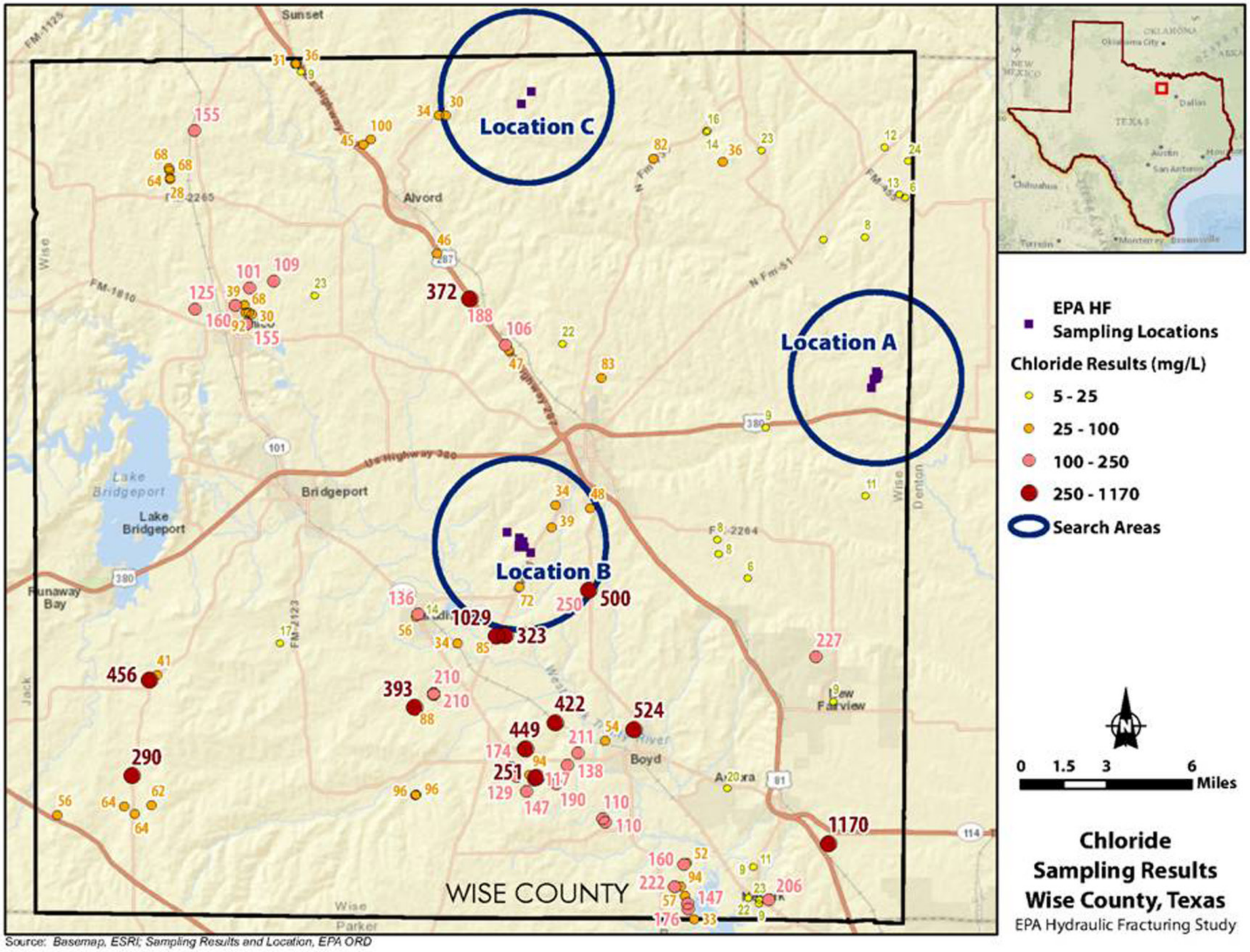


Figure 16. Map of chloride concentrations and chloride distributions within Wise County based on historical databases**.** (Data Sources: USGS (2013a) and TXWDB (2013b)).

The median concentration for calcium in this study was much lower than the historical calcium concentrations on a countywide scale (Table 8 and Figure 13). For calcium, the Kruskal-Wallis tests indicated that the study data were significantly lower than historical data (p-value = 0.0115). ANOVA tests using untransformed and log-transformed data had p-values = 0.0472 and 0.00292, respectively. This indicates that calcium concentrations for samples collected during the study were significantly lower than the historical data for Wise County.

For study Location A, the NURE was the only historical database available for comparison of calcium concentrations on a 3-mile radius basis. For Location A, the median calcium concentrations in samples from the study were higher than the historical concentrations in the NURE database (Table 9).

For Location B, all three historical databases could be used for comparison with the study data (Table 10 and Figure 15). Comparison of the historical calcium concentrations with the Location B concentrations showed that the median calcium concentration at Location B was lower than the historical concentration. Unfortunately, the historical data could not be compared statistically with the study data because of the lack of data in the individual historical databases. Data from the pooled historical databases can be compared with the study Location B data, but this should be done with caution because of the differences in sampling methods and analysis. The ANOVA test results were almost significant, with p-value = 0.0499. The Kruskal-Wallis test was nearly significant at the α=0.05 level of significance, with a p-value = 0.0641.

For Location C, data from the NWIS, TXWDB, and NURE historical databases could be compared with the Location C study data. The study data for dissolved calcium were similar to with the calcium concentrations reported in the historical databases (Table 11).

Another naturally occurring major cation analyzed for in this study was potassium (Table 7) (Hounslow, 1995). Potassium sources also include anthropogenic sources such as fertilizers and industrial processes. The potassium concentration in study ground water ranged from 0.50 to 6.63 mg/L, with a median concentration of 1.79 mg/L. The Barnett Shale-produced water samples had potassium concentrations that ranged from 928 to 1,780 mg/L, with a median concentration of 1,354 mg/L.

The potassium concentrations in samples collected as part of this study were compared with historical potassium concentrations on a countywide basis using all three historical databases (Table 8 and Figure 13). The comparison showed that the median potassium concentration in the study samples was slightly lower than the historical potassium concentrations.

The potassium results for all three study locations were compared with the historical potassium concentrations within a 3-mile radius. For Location A, the NURE database provided the historical data for comparison (Table 9). For location A, the potassium concentrations and ranges from the study were higher than the concentrations in the historical data. For Location B, all three historical databases provided the historical data for comparison with potassium concentrations from the study (Table 10 and Figure 15). As was the case in the countywide comparisons, the median potassium concentration in the Location B data was lower than the concentration in the historical data, and the Location B study data had a higher maximum potassium concentration because of WISETXGW01 and WISETXGW08. For Location C, all three historical databases provided the historical data for comparison with potassium concentrations from the study (Table 11). The potassium concentrations from Location C were similar to with the historical potassium concentrations.

Magnesium (Table 7) is a naturally occurring major cation in ground water and surface water (Hounslow, 1995) and can be derived from anthropogenic sources such as agriculture, mining, and industry. Magnesium concentrations in study sample ground water ranged from 0.41 to 62.7 mg/L, with a median concentration of 4.06 mg/L. The Barnett Shale-produced water had magnesium concentrations that ranged from 1,860 to 2,410 mg/L, with a median concentration of 2,135 mg/L.

The magnesium data collected for the study was compared with the historical magnesium data on a countywide basis (Table 8 and Figure 13). The range of magnesium concentrations collected as part of this study was somewhat smaller than that in the historical data, but there was considerable overlap. The median concentration in the study was less than the median concentrations in the historical databases.

The magnesium data for the individual study locations were compared with the historical magnesium concentrations within a 3-mile radius. For Location A, the historical magnesium concentrations from the NURE database ranged from 0.2 to 0.3 mg/L, with a median concentration of 0.3 mg/L (Table 9); the magnesium concentrations from the study ranged from 0.41 to 12.0 mg/L, with a median concentration of 6.96 mg/L. As can be seen, at Location A the range and median concentration of magnesium were different than the historical concentrations in the NURE database (Table 9). For Location B (Table 10 and Figure 15), although the range of magnesium data collected in study Location B overlapped with the historical magnesium data, the median magnesium concentrations was lower than the historical data. For Location C, the magnesium concentration from the study was lower than the concentrations in the historical data (Table 11).

Sodium (Table 7) occurs naturally in most ground water (Hounslow, 1995). Anthropogenic sources of sodium include waste water, industrial activities, water treatment, and road salt. Sodium in our ground water ranged from 25.8 to 889 mg/L, with a median concentration of 161 mg/L. It should be noted that the wide range in the study's ground water data was due to two wells in Location B (WISETXGW01 and WISETXGW08). The sodium concentrations in the produced water from the Barnett Shale ranged from 60,100 to 96,400 mg/L, with a median concentration of 78,250 mg/L.

The sodium data from the study were compared with the historical sodium data on a countywide scale (Table 8 and Figure 13). As can be seen, the median concentrations and ranges from the study differed from those from the NWIS and NURE databases. The historical sodium concentrations found in the TXWDB data base had a few higher sodium concentrations, similar to the study. The median concentration from the study data was approximately double the concentration in the TXWDB database. Statistical ANOVA analysis revealed that for both the untransformed data and the transformed data, the study data were significantly higher than the historical data (p-values = 0.007 and 0.03, respectively. The Kruskal-Wallis nonparametric test also indicated nearly significant differences (p-value = 0.06).

The results from all three study locations were compared with the historical data for locations within a 3-mile radius. The NURE database had historical sodium concentrations ranging from 141 to 215 mg/L for Location A, and a median concentration of 150 mg/L (Table 9). The study had sodium concentrations for Location A ranging from 81.8 to 149 mg/L, with a median concentration of 100 mg/L, and the minimum sodium concentration and median sodium concentration were lower than the historical sodium concentrations (Table 9). For Location B (Table 10 and Figure 15), the maximum sodium concentration and the median sodium concentration were higher than the historical sodium data, most likely because of two wells, WISETXGW01 and WISETXGW08. Because of the lack of data on this scale, the statistical test for individual databases could not be performed. The pooled data can shed some light if the historical data are different than the study data, but these interpretations need to be used with caution. Both the ANOVA and Kruskal-Wallis statistics showed that the historical data and study data were significantly different (p-values = 0.036 and 0.011, respectively). For Location C, the sodium concentrations from the study were similar to those in the historical databases (Table 11).

In summary, there were no significant differences in the concentrations in the parameters discussed above between the study data and the historical data for Locations A and C. For Location B, bicarbonate, chloride, calcium, and sodium were significantly different when comparing the study data with the historical data. These differences were likely due to the concentrations observed in WISETXGW01 and WISETXGW08. These differences could potentially be due to an impact to WISETXGW01 and WISETXGW08.

6.3.3. Trace Elements

Trace elements can occur naturally in ground water, surface water, and produced water (Alpha Environmental Consultants, 2009; U.S. House of Representatives, 2011; Veil et al. et al., 2004). Trace elements can also result from industrial, agricultural, and oil and gas exploration activities.

Bromide is a naturally occurring element found primarily in seawater, brines, and evaporites (Hounslow, 1995). Because the bromide concentration in freshwater are naturally low, it is often used as an indicator of brine intrusion (Hounslow, 1995). Potential anthropogenic sources of bromide include water purification agents, anti-knocking agents in gasoline, bleaching agents, fire retardants, and pharmaceuticals (Hounslow, 1995). Detectable bromide concentrations in ground water samples collected during the study ranged from 0.03 to 7.57 mg/L, with a median concentration of 0.18 mg/L (Table 7). In most cases, the highest bromide concentrations were collected in two wells at study Location B (WISETXGW01 and WISETXGW08). The bromide concentration in the produced water samples from the Barnett Shale was 903 mg/L, which is within the range of bromide concentrations expected for natural brines (100 mg/L to 1,000 mg/L; Hounslow, 1995).

All the study data for bromide were compared with historical data from the NWIS and TXWDB databases on a countywide scale (Table 8 and Figure 13). Although the median bromide concentration from the study was lower than the median concentration from the historical data, the bromide concentrations from the study had a wider range than that seen in the historical data. This was due to two wells at Location B, WISETXGW01 and WISETXGW08, which had higher bromide concentrations, skewing the data. This can be seen in Figure 13, which shows these two outliers.

The bromide ground water data from Locations B and C were compared with historical ground water data from the NWIS and TXWDB databases within a 3-mile radius of each of these locations. As was the case with the countywide scale, the differences between the bromide concentrations at Location B and the historical data can be attributed to two wells, WISETXGW01 and WISETXGW08, which had higher concentrations of bromide (Table 10 and Figure 15). For Location C, the historical bromide concentrations were comparable to the concentrations obtained from samples collected in the study (Table 11).

Iodide occurs naturally in the environment and, depending on the type of water, can have detectable concentrations in ground water (Lloyd et al., 1982). Typical sources of iodide in the environment include evaporites, caliche deposits, and marine or oceanic deposits rich in organic matter (Lloyd, 1982).

Ground water in contact with these deposits typically has higher iodide concentrations than water that is not in contact with these types of deposits (Lloyd et al., 1982). Lloyd et al. (1982) stated that much of the work with iodide in ground water was associated with petroleum brines and with salt water intrusion. Therefore, iodide may be a good indicator of brine intrusion. Iodide concentrations found in produced water in this study ranged from 57,800 to 126,000 µg/L in the Barnett-Shale-produced water, with a median concentration of 91,900 µg/L (Table 7). Ground water at Location B had detectable concentrations of iodide that ranged from 16.4 to 269 µg/L, with a median concentration of 19.8 µg/L. Since no historical samples containing iodide could be found, the iodide concentrations from the study cannot be compared with historical iodide concentrations in the Trinity aquifer.

The first screening round for these trace elements used ICP-OES because of data quality problems (interferences) associated with the ICP-MS data in the first round of sampling. In all cases, the ICP-OES had much higher detection limits than those of ICP-MS. Thus, only the trace element data from ICP-MS was used for this study (see Table B-3). A more complete explanation is presented in Appendix A.

Boron can be from naturally occurring sources, and several recent reports have linked the use of boron to hydraulic fracturing and produced water (U.S House of Representatives, 2011; Alpha Environmental Consultants, 2009). In the study, boron concentrations in ground water ranged from 64 to 481 µg/L, with a median concentration of 175 µg/L (Table 7). Produced water samples collected from the Barnett Shale over the course of the study had boron concentrations ranging from 25,800 to 27,100 µg/L, with a median concentration of 26,450 µg/L.

The TXWDB and NURE databases both contain historical boron data that can be compared with the data collected in the study on a countywide scale (Table 8 and Figure 13). The countywide distributions of boron can be seen in Figure 17. Although the ranges of boron concentrations overlap, the median boron concentrations in the historical data and the study data are different. The study's median concentrations are somewhat higher than the historical data. Statistical analysis using ANOVA could only be done using the log normal transformed data. The ANOVA analysis indicated that the historical boron concentrations were lower than those collected as part of this study (p-value = 0.03). This is also supported by the Kruskal-Wallis test, which also indicated significant differences (p-value = 0.0035).

The historical boron data from the NURE database for locations within a 3-mile radius of Locations A, B, and C were compared to the boron data from the study locations. For Location A, boron concentrations from the study generally agreed with the historical concentrations (Table 9). For Location B, the median boron concentrations from the study were generally similar to the historical boron concentrations (Table 10 and Figure 15). For Location B, the maximum boron concentrations from the study were higher than the historical concentrations. For Location C, the median concentrations and ranges for boron obtained from the study differed from the historical boron concentrations and ranges (Table 11).

Barium is another element that has been found as potentially associated with hydraulic fracturing and has been found in produced water (U.S. House of Representatives, 2011; Veil et al., 2004; Alpha Environmental Consultants, 2009). Detectable barium concentrations in ground water samples collected during the study ranged from 13 to 138 µg/L, with a median concentration of 23 µg/L (Table 7). The barium concentrations in produced water from the Barnett Shale were much greater than in ground water and ranged from 8,510 to 12,300 µg/L, with a median concentration of 10,405 µg/L.

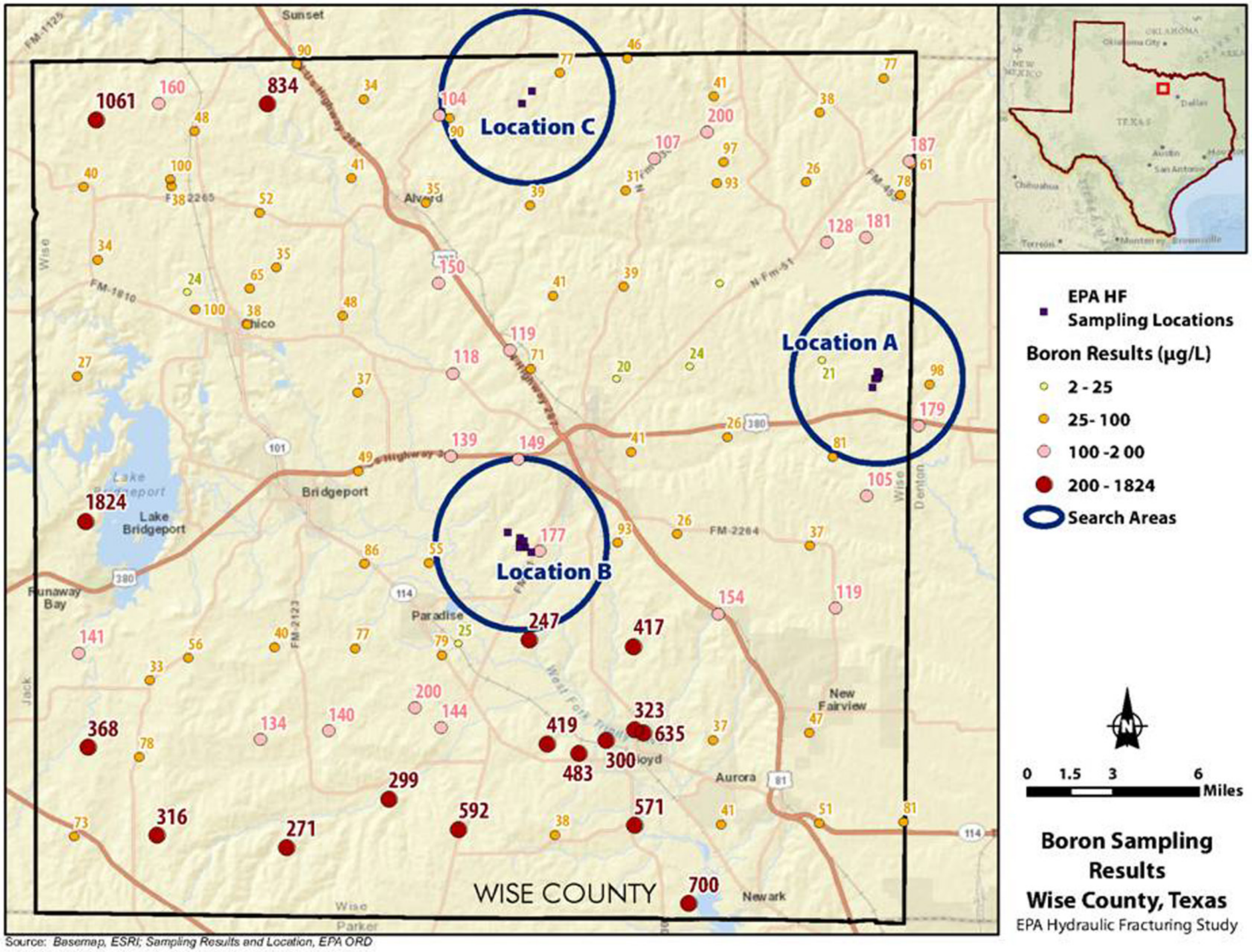


Figure 17. Map of boron concentrations and boron distributions within Wise County based on historical databases. (Data Sources: USGS (2013b) and TXWDB (2013b)).

The barium concentrations obtained from the study were compared with historical barium concentrations obtained from the TXWDB and NURE databases on a countywide basis (Table 8 and Figure 13). The distribution of historical barium concentrations are shown on Figure 18. The study data concentrations of barium fall within the historical data ranges. The median barium concentration in the study was somewhat lower than the historical data. The Kruskal-Wallis statistical test revealed that historical barium concentrations were significantly different than the study data (p-value = 0.0397).

Barium concentrations from the individual study locations were also compared with barium concentrations from the TXWDB and NURE databases using data from sites within a 3-mile radius of the study locations. For Location A, (Table 9), the study barium concentrations on this scale differ from the historical barium concentrations. The barium concentrations from Location B had a lower median concentration than that in the historical databases (Table 10 and Figure 15). The barium concentrations from Location C were similar to those found in the historical databases (Table 11).

Strontium has also been found in produced water (U.S. House of Representatives, 2011; Alpha Environmental Consultants, 2009). The strontium concentration in produced water from the Barnett Shale ranged from 584,000 to 752,000 µg/L, with a median concentration of 668,000 µg/L (Table 7). Strontium concentrations in ground water samples collected at all study locations ranged from 51 to 9,454 µg/L, with a median concentration of 605 µg/L. It should be noted that samples from wells WISETXGW01, WISETXGW05, and WISETXGW08 had much higher strontium concentrations than samples from the other wells in the study. The results from these two wells biased the strontium ranges to higher concentrations.

As was the case with barium, strontium concentrations from the study were compared with historical strontium concentrations from the NURE and TXWDB databases on a countywide basis (Table 8 and Figure 13). The historical distribution of strontium concentrations in Wise County is shown on Figure 19. Although the ranges of strontium concentrations from the study and the historical databases were similar, the median concentration of strontium in the study data was lower than the median concentration from the historical data.

Strontium concentrations from the individual study locations were also compared with strontium concentrations from the TXWDB and NURE databases using data obtained from sites within a 3-mile radius of the study locations. For Location A, the historical strontium data and study strontium data were different (Table 9). For Location B, the differences in the maximum strontium concentrations in the study data and the historical data (Table 10 and Figure 15) were due primarily to the results from three study wells, WISTETXGW01, WISETXGW05, and WISTETXGW08, both of which produced high strontium concentrations. For Location C, median concentration from the study data were similar to the historical data from the TXWDB database (Table 11). However, the range of strontium concentrations from the study data (WISETXGW06) had a higher maximum concentration than the range from the historical data (Table 11).

Both iron and manganese also have been found in hydraulic fracturing and produced water (U.S. House of Representatives, 2011; Alpha Environmental Consultants, 2009). Iron and manganese were also analyzed for in this study. On several occasions, the concentrations of these elements approached or exceeded their respective SMCL regulatory threshold. SMCLs are not health-based, but they are important because they are generally set for aesthetic purposes or for water supply issues (US EPA, 2009).

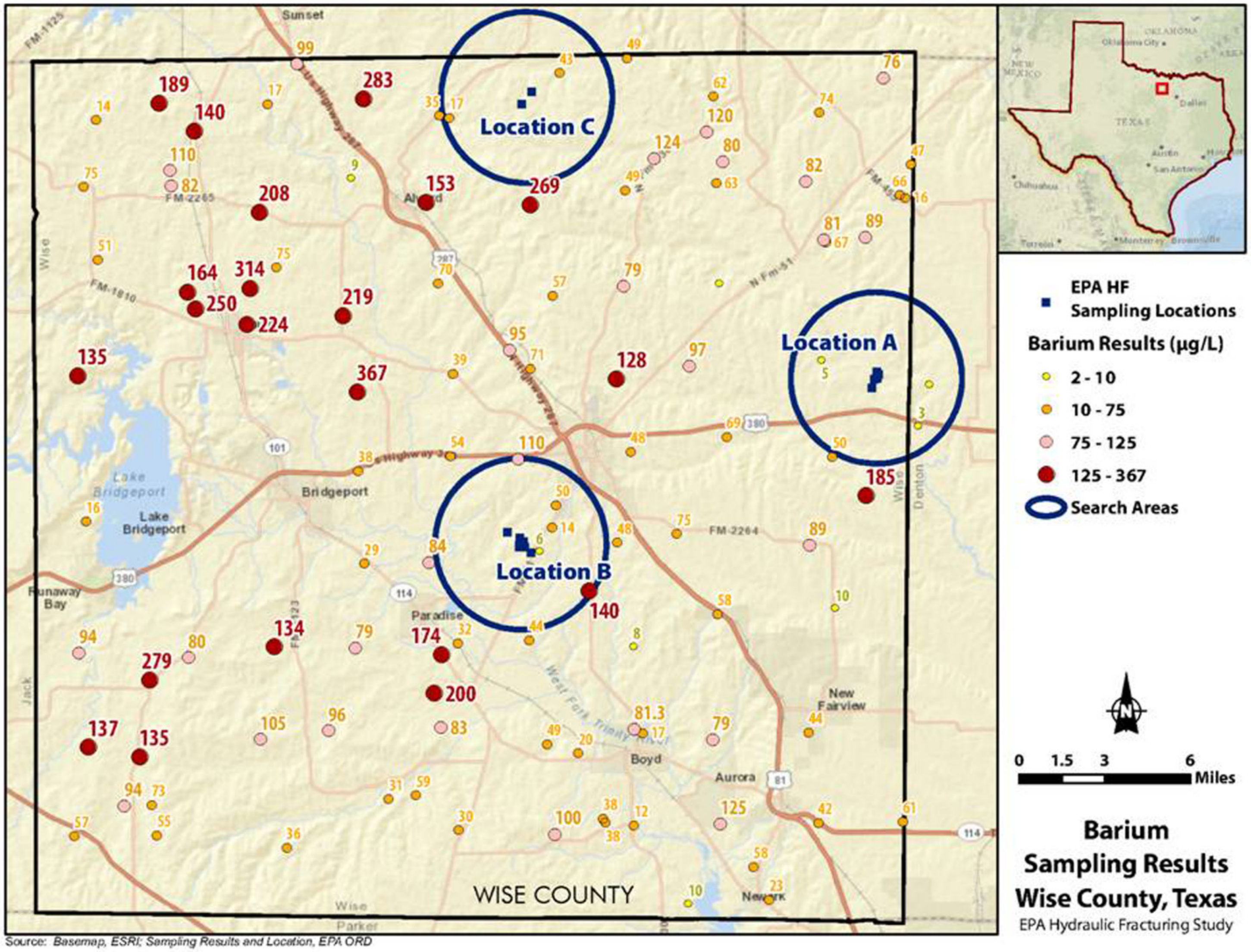
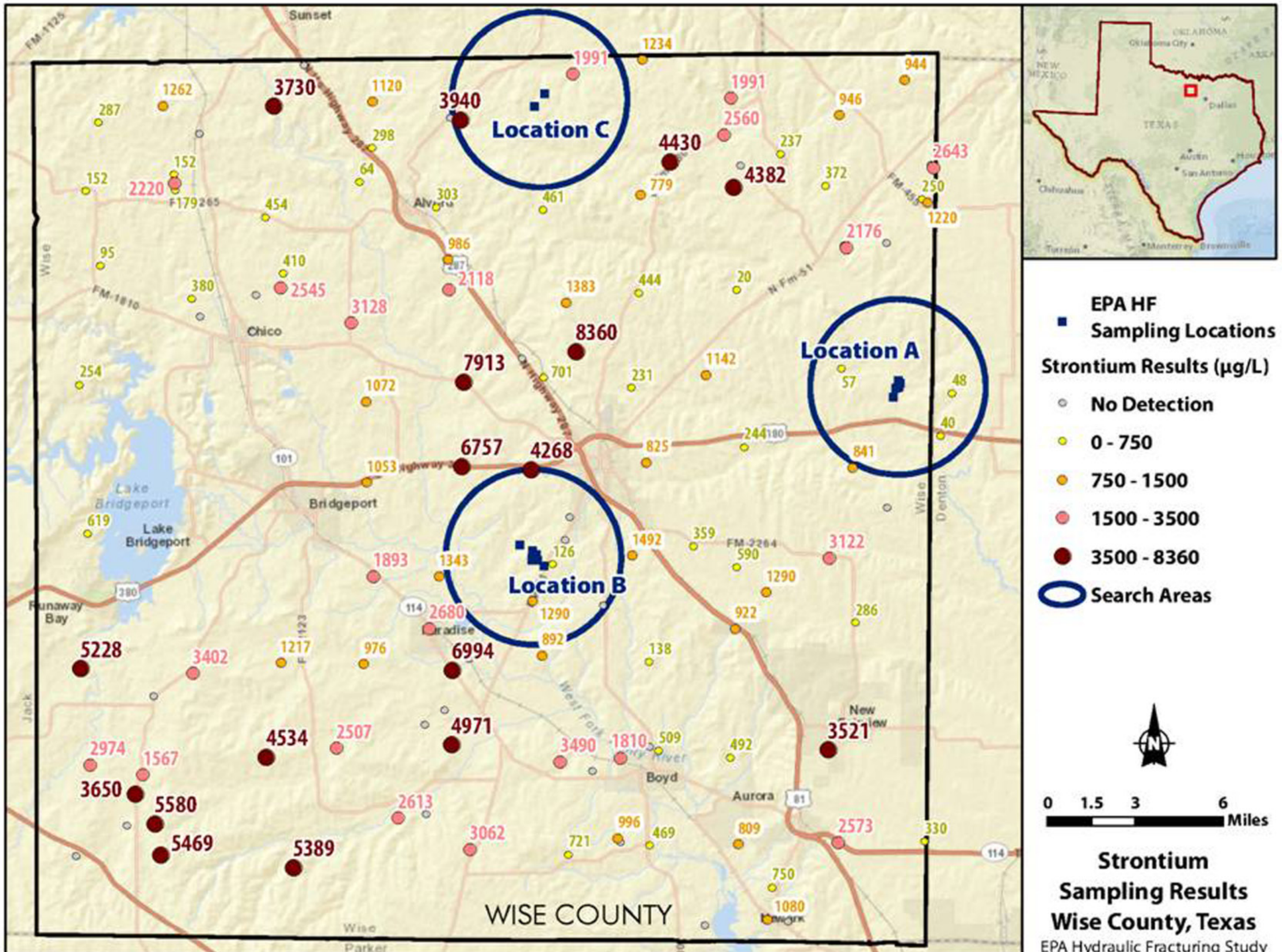


Figure 18. Map of barium concentrations and barium distributions within Wise County based on historical databases. (Data Sources: USGS (2013b) and TXWDB (2013b)).



Source: Basemap, ESRI; Sampling Results and Location, EPA ORD

Figure 19. Map of strontium concentrations and strontium distributions within Wise County based on historical databases. (Data Sources: USGS (2013b) and TXWDB (2013b)).

Several samples show differences between dissolved and total manganese. The reasons for the differences are attributed to colloidal manganese. The detectable dissolved manganese concentrations ranged from 2 to 71 µg/L, with a median concentration of 12 µg/L (Table 12); the detectable total manganese concentrations ranged from 2 to 72 µg/L, with a median concentration of 12 µg/L. In the produced water samples collected from the Barnett Shale, the dissolved manganese concentrations ranged from 2,560 to 3,400 µg/L, with a median concentration of 2,980 µg/L. Produced waters samples had higher manganese concentrations than those detected in the surface water and ground water samples collected in the study.

In summary, boron and barium concentrations observed in the study were significantly different than the historical data. Boron study concentrations were greater than the boron historical concentrations and barium study concentrations were lower than the historical concentrations overall. However, there were no significant differences found for boron and barium concentrations using a 3-mile radius for any of the study locations. The study bromide concentrations were greater than historical bromide concentrations at location B. This was due do the concentrations of bromide in WISETXGW01 and WISETXGW08. Similarly, at Location B, the study strontium concentrations observed were greater than the historical strontium concentrations. However, this was due to three wells WISETXGW01, WISETXGW05, and WISETXGW08.

6.3.4. Geochemical Relationships

The previous analysis compared only the single parameters with their historical counterparts. These single comparisons do not account for the more complicated geochemical relationships that also contribute to water quality or that can be used to detect changes in water quality or fingerprint source waters. The use of ratios and graphical techniques are also important in discussing water quality relationships and determining potential sources of water (Hounslow, 1995). These relationships are discussed below within the framework of the historical data for each study location.

Location A and C Groundwater

The water types give an overall impression of the dominant anions and cations in the water samples. Figure 20 shows the study water types for Locations A and C as a percentage of the samples. The countywide historical data indicate that the dominant water types in the NWIS and TXWDB databases are sodium-bicarbonate and calcium-bicarbonate waters, with smaller percentages of other water types. The NURE data do not contain several of the major anions needed to calculate water types, so no information on water types is obtainable from this database.

In Location A, all the study samples were sodium-bicarbonate waters (Figure 20A). Both the historical data and study data for Location A contain sodium-bicarbonate waters. No water-type data from within a 3-mile radius of Location A was obtainable; therefore this scale cannot be used. In Location C, all study samples were calcium-bicarbonate water type. Similar to Location A, on a countywide scale, the water types from Location C are comparable to the dominant water types in the historical data (Figure 20B). This is even more evident when the study data is compared with the historical data for locations within a 3-mile radius of Location C. In both the historical data and study data, the only water type is calcium-bicarbonate (Figure 20C).

Table 12. Study data summaries and statistics for ground water.

Location	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
Brine Components											
A	SpC		µS/cm	601	605	41	555	641	4	4	0
B	SpC		µS/cm	1619	846	1630	726	5077	10	10	0
C	SpC		µS/cm	932	932	---	668	1195	2	2	0
Combined	SpC		µS/cm	1278	781	1349	555	5077	16	16	0
A	TDS		mg/L	391	393	27	361	416	4	4	0
B	TDS		mg/L	1052	549	1060	472	3301	10	10	0
C	TDS		mg/L	606	606	---	434	777	2	2	0
Combined	TDS	Dissolved	mg/L	831	506	877	361	3301	16	16	0
A	Bicarbonate	Dissolved	mg/L	314	308	19	301	341	4	4	0
B	Bicarbonate	Dissolved	mg/L	302	306	51	189	385	10	10	0
C	Bicarbonate	Dissolved	mg/L	374	374	---	320	427	2	2	0
Combined	Bicarbonate	Dissolved	mg/L	314	312	51	189	427	16	16	0
A	Chloride	Dissolved	mg/L	5.85	5.89	1.02	4.59	7.03	4	4	0
B	Chloride	Dissolved	mg/L	294	64.7	511	34.9	1434	10	10	0
C	Chloride	Dissolved	mg/L	27.8	27.8	---	25.8	29.8	2	2	0
Combined	Chloride	Dissolved	mg/L	188.9	42.6	420	4.59	1434	16	16	0
A	Sulfate	Dissolved	mg/L	30.2	28.7	6.46	24.5	39.0	4	4	0
B	Sulfate	Dissolved	mg/L	83.7	79.8	43.1	25.8	167	10	10	0
C	Sulfate	Dissolved	mg/L	122	122	---	24.8	219	2	2	0
Combined	Sulfate	Dissolved	mg/L	75.1	65.4	57.1	24.5	219	16	16	0

Table 12. Study data summaries and statistics for ground water.

Location	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
A	Bromide	Dissolved	mg/L	0.06	0.06	0.02	0.03	0.08	4	4	86
B	Bromide	Dissolved	mg/L	1.43	0.26	2.62	0.09	7.57	10	10	37
C	Bromide	Dissolved	mg/L	0.24	0.24	---	0.13	0.36	2	2	25
Combined	Bromide	Dissolved	mg/L	0.94	0.18	2.14	0.03	7.57	16	16	43
A	Iodide	Dissolved	µg/L	---	---	---	---	---	0	0	n
B	Iodide	Dissolved	µg/L	50	19	88	16	269	10	8	0
C	Iodide	Dissolved	µg/L	134	134	---	134	134	2	1	n
Combined	Iodide	Dissolved	µg/L	60	20	87	16	269	9	9	0
A	Calcium	Dissolved	mg/L	18.0	18.6	14.3	1.13	33.5	4	4	0
B	Calcium	Dissolved	mg/L	21.5	4.11	31.2	2.12	90.3	10	10	0
C	Calcium	Dissolved	mg/L	106	106	---	68.4	144	2	2	0
Combined	Calcium	Dissolved	mg/L	31.2	9.51	40.8	1.13	144	16	16	0
A	Potassium	Dissolved	mg/L	2.01	2.16	1.17	0.50	3.23	4	4	0
B	Potassium	Dissolved	mg/L	2.08	1.44	1.69	1.03	6.63	10	10	0
C	Potassium	Dissolved	mg/L	3.12	3.12	---	2.24	4.00	2	2	0
Combined	Potassium	Dissolved	mg/L	2.19	1.79	1.49	0.50	6.63	16	16	0
A	Magnesium	Dissolved	mg/L	6.57	6.96	4.97	0.41	12.0	4	4	0
B	Magnesium	Dissolved	mg/L	9.29	1.58	14.1	0.71	42.4	10	10	0
C	Magnesium	Dissolved	mg/L	45.9	45.9	---	29.1	62.7	2	2	0
Combined	Magnesium	Dissolved	mg/L	13.2	4.06	18.1	0.41	62.7	16	16	0

Table 12. Study data summaries and statistics for ground water.

Location	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
A	Sodium	Dissolved	mg/L	108	100	29.7	81.8	149	4	4	0
B	Sodium	Dissolved	mg/L	310	174	287	144	889	10	10	0
C	Sodium	Dissolved	mg/L	28.7	28.7	---	25.8	31.7	2	2	0
Combined	Sodium	Dissolved	mg/L	224	161	251	25.8	889	16	16	0
A	Boron	Dissolved	µg/L	104	113	25	68	124	4	4	14
B	Boron	Dissolved	µg/L	231	180	110	157	481	10	10	0
C	Boron	Dissolved	µg/L	65	65	---	64	67	2	2	50
Combined	Boron	Dissolved	µg/L	179	175	111	64	481	16	16	7
A	Barium	Dissolved	µg/L	77	78	50	16	138	4	4	14
B	Barium	Dissolved	µg/L	32	19	29	13	92	10	10	33
C	Barium	Dissolved	µg/L	45	45	---	32	59	2	2	25
Combined	Barium	Dissolved	µg/L	45	23	38	13	138	16	16	17
A	Strontium	Dissolved	µg/L	992	999	812	51	1920	4	4	0
B	Strontium	Dissolved	µg/L	1887	414	2983	237	9454	10	10	0
C	Strontium	Dissolved	µg/L	4790	4790	---	2580	7000	2	2	0
Combined	Strontium	Dissolved	µg/L	2026	605	2728	51	9454	16	16	0
Geochemical Parameters											
A	Temp		ºC	20.0	20.1	0.8	19.0	20.9	4	4	0
B	Temp		ºC	20.7	20.8	0.6	19.7	21.5	10	10	0
C	Temp		ºC	22.0	22.0	---	20.8	23.3	2	2	0
Combined	Temp		ºC	20.7	20.7	1.0	19.0	23.3	16	16	0

Table 12. Study data summaries and statistics for ground water.

Location	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
A	DO		mg/L	0.27	0.27	0.21	0.07	0.50	4	4	0
B	DO		mg/L	0.99	0.71	1.10	0.10	3.36	10	10	0
C	DO		mg/L	0.40	0.40	---	0.37	0.43	2	2	0
Combined	DO		mg/L	0.74	0.41	0.92	0.07	3.36	16	16	0
A	pH			8.02	7.78	0.72	7.47	9.04	4	4	0
B	pH			8.29	8.44	0.47	7.24	8.70	10	10	0
C	pH			6.91	6.91	---	6.85	6.97	2	2	0
Combined	pH			8.05	8.20	0.67	6.85	9.04	16	16	0
A	ORP		mV	168	167	55	111	227	4	4	0
B	ORP		mV	140	179	98	-103	213	10	10	0
C	ORP		mV	60	60	---	48	71	2	2	0
Combined	ORP		mV	137	165	87	-103	227	16	16	0
A	Turbidity	Dissolved	NTU	0.45	0.48	0.11	0.30	0.55	4	4	0
B	Turbidity	Dissolved	NTU	1.15	0.46	1.34	0.13	4.34	10	10	0
C	Turbidity	Dissolved	NTU	11.5	11.5	---	8.7	14.4	2	2	0
Combined	Turbidity	Dissolved	NTU	2.27	0.48	3.90	0.13	14.4	16	16	0
A	Alkalinity	Dissolved	mg $CaCO_3$/L	219	237	45	153	251	4	4	0
B	Alkalinity	Dissolved	mg $CaCO_3$/L	249	244	48	146	341	10	10	0
C	Alkalinity	Dissolved	mg $CaCO_3$/L	306	306	---	266	347	2	2	0
Combined	Alkalinity	Dissolved	mg $CaCO_3$/L	249	244	52	146	347	16	16	0

Table 12. Study data summaries and statistics for ground water.

Location	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
Nutrients/DOC/Other Anions											
A	Ammonia	Dissolved	mg N/L	1.22	1.36	0.64	0.42	1.74	4	4	0
B	Ammonia	Dissolved	mg N/L	0.91	0.66	0.68	0.59	2.82	10	10	0
C	Ammonia	Dissolved	mg N/L	0.06	0.06	---	0.02	0.11	2	2	25
Combined	Ammonia	Dissolved	mg N/L	0.88	0.66	0.69	0.02	2.82	16	16	2
A	Nitrate + Nitrite	Dissolved	mg N/L	0.02	0.02	0.01	0.01	0.03	4	4	57
B	Nitrate + Nitrite	Dissolved	mg N/L	0.06	0.02	0.08	0.01	0.25	10	10	40
C	Nitrate + Nitrite	Dissolved	mg N/L	0.01	0.01	---	0.01	0.02	2	2	75
Combined	Nitrate + Nitrite	Dissolved	mg N/L	0.04	0.02	0.07	0.01	0.25	16	16	61
A	DOC		mg/L	0.29	0.22	0.29	0.04	0.70	4	4	57
B	DOC		mg/L	0.35	0.28	0.19	0.10	0.67	10	10	34
C	DOC		mg/L	0.74	0.74	---	0.68	0.79	2	2	0
Combined	DOC		mg/L	0.38	0.28	0.24	0.04	0.79	16	16	35
A	Fluoride	Dissolved	mg/L	0.11	0.12	0.05	0.06	0.17	4	4	14
B	Fluoride	Dissolved	mg/L	0.10	0.08	0.06	0.05	0.22	10	10	43
C	Fluoride	Dissolved	mg/L	0.24	0.24	---	0.16	0.33	2	2	0
Combined	Fluoride	Dissolved	mg/L	0.12	0.10	0.07	0.05	0.33	16	16	26
Trace Elements											
A	Iron	Dissolved	µg/L	20	19	10	11	30	4	4	71
B	Iron	Dissolved	µg/L	35	18	50	11	176	10	10	80
C	Iron	Dissolved	µg/L	214	214	---	150	279	2	2	0
Combined	Iron	Dissolved	µg/L	---	---	---	---	---	16	0	72

Table 12. Study data summaries and statistics for ground water.

Location	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
A	Manganese	Dissolved	µg/L	16	19	10	2	26	4	4	29
B	Manganese	Dissolved	µg/L	15	7	21	2	71	10	10	11
C	Manganese	Dissolved	µg/L	60	60	---	53	68	2	2	0
Combined	Manganese	Dissolved	µg/L	21	12	23	2	71	16	16	15
A	Lithium	Dissolved	µg/L	---	---	---	---	---	0	0	---
B	Lithium	Dissolved	µg/L	55	45	29	29	120	10	9	0
C	Lithium	Dissolved	µg/L	---	---	---	---	---	2	0	---
Combined	Lithium	Dissolved	µg/L	55	45	29	29	120	16	9	0
Dissolved Gases											
A	Methane	Dissolved	mg/L	0.0008	0.0008	0.0001	0.0007	0.0009	4	2	71
B	Methane	Dissolved	mg/L	0.0043	0.0017	0.0058	0.0013	0.0171	10	10	19
C	Methane	Dissolved	mg/L	0.0215	0.0215	---	0.0215	0.0215	2	1	75
Combined	Methane	Dissolved	mg/L	0.0051	0.0016	0.0072	0.0007	0.0215	16	13	33
Organic Parameters- VOCs											
A	acetone	Dissolved	µg/L	---	---	---	---	---	4	0	n
B	acetone	Dissolved	µg/L	5.09	2.75	3.93	2.10	12.9	10	8	20
C	acetone	Dissolved	µg/L	---	---	---	---	---	2	0	n
Combined	acetone	Dissolved	µg/L	5.09	2.75	3.93	2.10	12.9	16	8	50
A	Tert-amyl methyl ether	Dissolved	µg/L	---	---	---	---	---	4	0	n
B	Tert-amyl methyl ether	Dissolved	µg/L	0.08	0.08	---	0.08	0.08	10	1	n
C	Tert-amyl methyl ether	Dissolved	µg/L	---	---	---	---	---	2	0	n
Combined	Tert-amyl methyl ether	Dissolved	µg/L	0.08	0.08	---	0.08	0.08	16	1	n

Table 12. Study data summaries and statistics for ground water.

Location	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
A	benzene	Dissolved	µg/L	---	---	---	---	---	4	0	n
B	benzene	Dissolved	µg/L	0.12	0.12	---	0.12	0.12	10	1	n
C	benzene	Dissolved	µg/L	---	---	---	---	---	2	0	n
Combined	benzene	Dissolved	µg/L	0.12	0.12	---	0.12	0.12	16	1	n
A	m+p xylene	Dissolved	µg/L	---	---	---	---	---	4	0	n
B	m+p xylene	Dissolved	µg/L	0.25	0.25	---	0.25	0.25	10	1	n
C	m+p xylene	Dissolved	µg/L	---	---	---	---	---	2	0	n
Combined	m+p xylene	Dissolved	µg/L	0.25	0.25	---	0.25	0.25	16	1	n
A	methyl tert-butyl ether	Dissolved	µg/L	---	---	---	---	---	4	0	n
B	methyl tert-butyl ether	Dissolved	µg/L	0.56	0.56	---	0.56	0.56	10	1	n
C	methyl tert-butyl ether	Dissolved	µg/L	---	---	---	---	---	2	0	n
Combined	methyl tert-butyl ether	Dissolved	µg/L	0.56	0.56	---	0.56	0.56	16	1	n
A	o-xylene	Dissolved	µg/L	---	---	---	---	---	4	0	n
B	o-xylene	Dissolved	µg/L	0.09	0.09	---	0.09	0.09	10	1	n
C	o-xylene	Dissolved	µg/L	---	---	---	---	---	2	0	n
Combined	o-xylene	Dissolved	µg/L	0.09	0.09	---	0.09	0.09	16	1	n
A	tert-butyl Alcohol	Dissolved	µg/L	---	---	---	---	---	4	0	n
B	tert-butyl Alcohol	Dissolved	µg/L	38	38	---	38	38	10	1	n
C	tert-butyl Alcohol	Dissolved	µg/L	---	---	---	---	---	2	0	n
Combined	tert-butyl Alcohol	Dissolved	µg/L	38	38	---	38	38	16	1	n

Table 12. Study data summaries and statistics for ground water.

Location	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
Organic Parameters- Low Molecular Weight Acids											
A	Acetate	Dissolved	mg/L	0.23	0.23	---	0.23	0.23	4	1	n
B	Acetate	Dissolved	mg/L	0.16	0.15	0.05	0.12	0.23	10	4	n
C	Acetate	Dissolved	mg/L	0.15	0.15	---	0.14	0.16	2	2	n
Combined	Acetate	Dissolved	mg/L	0.17	0.16	0.05	0.12	0.23	16	7	n
A	Formate	Dissolved	mg/L	0.23	0.22	0.04	0.20	0.28	4	3	n
B	Formate	Dissolved	mg/L	0.51	0.43	0.17	0.39	0.85	10	9	n
C	Formate	Dissolved	mg/L	0.19	0.19	---	0.16	0.22	2	2	n
Combined	Formate	Dissolved	mg/L	0.41	0.40	0.16	0.16	0.76	16	14	n
Organic Parameters- sVOCs											
A	Bis-(2-ethylhexyl) phthalate	Dissolved	µg/L	2.02	2.02	---	2.02	2.02	4	1	n
B	Bis-(2-ethylhexyl) phthalate	Dissolved	µg/L	---	---	---	---	---	10	0	n
C	Bis-(2-ethylhexyl) phthalate	Dissolved	µg/L	2.51	2.51	---	2.51	2.51	2	1	n
Combined	Bis-(2-ethylhexyl) phthalate	Dissolved	µg/L	2.27	2.27	---	2.02	2.51	16	2	n
Organic Parameters- DRO/GRO											
A	DRO		µg/L	---	---	---	---	---	4	0	n
B	DRO		µg/L	---	---	---	---	---	10	0	n
C	DRO		µg/L	---	---	---	---	---	2	0	n
Combined	DRO		µg/L	---	---	---	---	---	16	0	n

Table 12. Study data summaries and statistics for ground water.

Location	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z[1]
A	GRO/TPH	Dissolved	µg/L	---	---	---	---	---	4	0	n
B	GRO/TPH	Dissolved	µg/L	20.4	20.4	---	20.4	20.4	10	1	n
C	GRO/TPH	Dissolved	µg/L	---	---	---	---	---	2	0	n
Combined	GRO/TPH	Dissolved	µg/L	---	---	---	---	---	16	0	N

[1] Percentage of left censored data.

n = Percentage of left censored data was not calculated because a few data points had detectable concentrations.

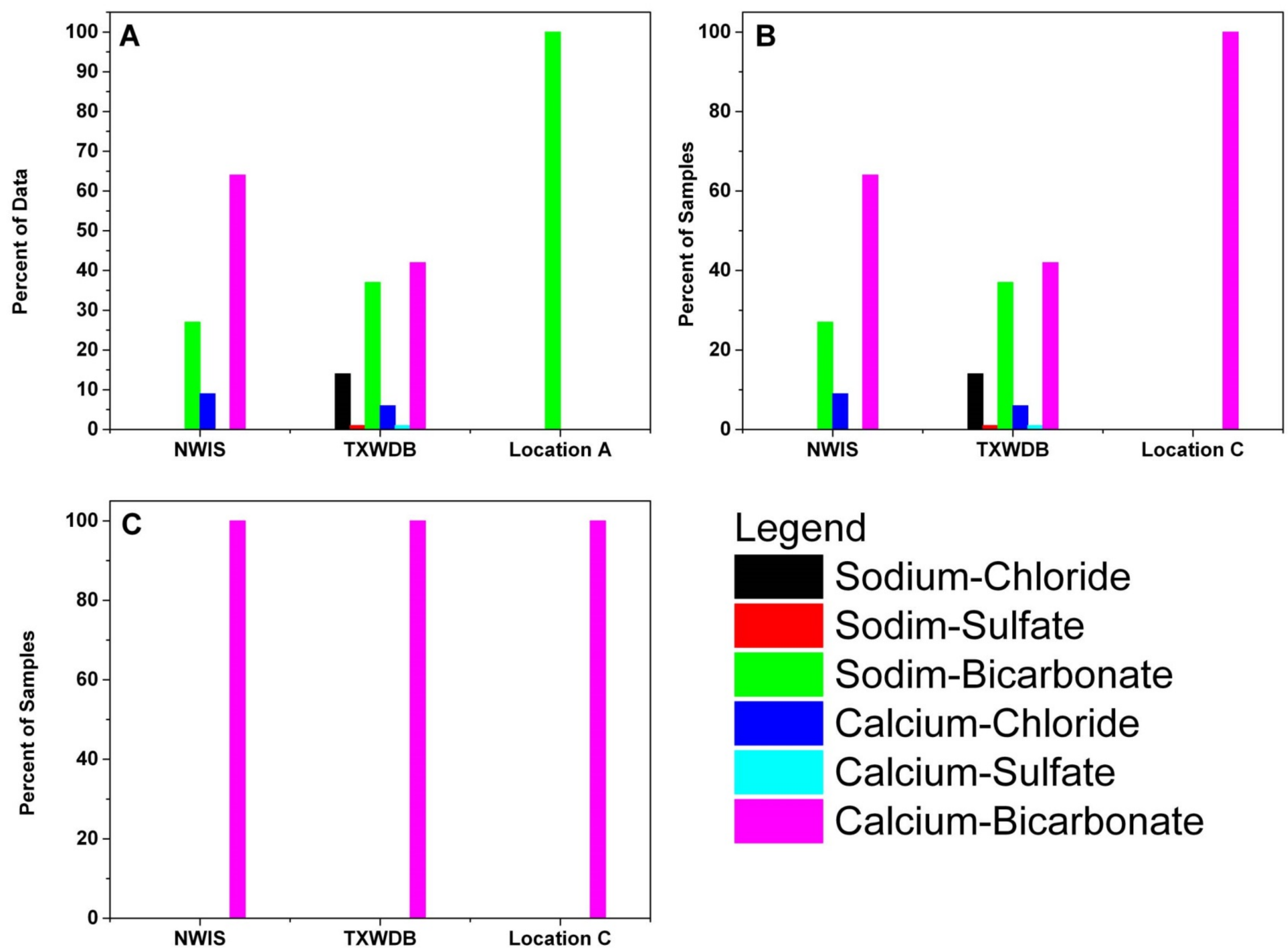


Figure 20. Water type percentages for the study data collected in Locations A and C along with the historical data in the NWIS and TXWDB databases. (A) Location A countywide scale, (B) Location C countywide scale, and (C) Location C 3-mile radius.

Figure 21 and Figure 22 shows Piper diagrams for Locations A and C, respectively using the countywide historical data. Figure 23 and Figure 24 shows Schoeller diagrams for Locations A and C, respectively using the countywide historical data. All the study data for Locations A and C plot in the range of the historical data, and there do not appear to be any significant deviations from background in these locations at this scale.

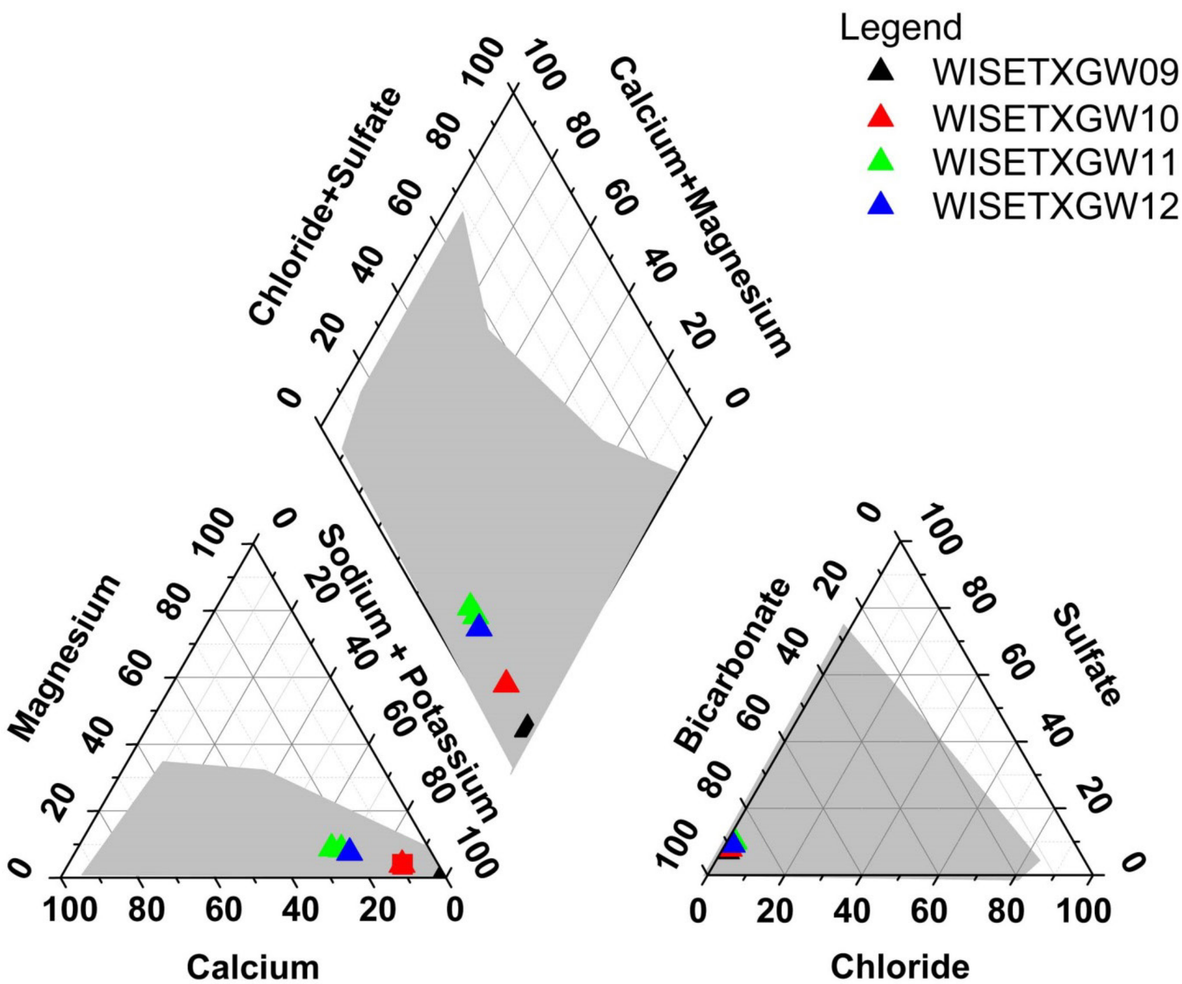


Figure 21. Piper diagram showing major cation and anion relationships for Location A and a comparison to the historical data from the NWIS and TXWDB databases. The gray areas show the limits of the historical data from the NWIS and TXWDB databases. The lower left triangular field is the cation field and the lower right triangular field is the anion field. The center diamond field is the mixing field of the anions and cations. All study wells are within the historical background on a countywide scale. (Data Sources: USGS (2013a) and TXWDB (2013b)).

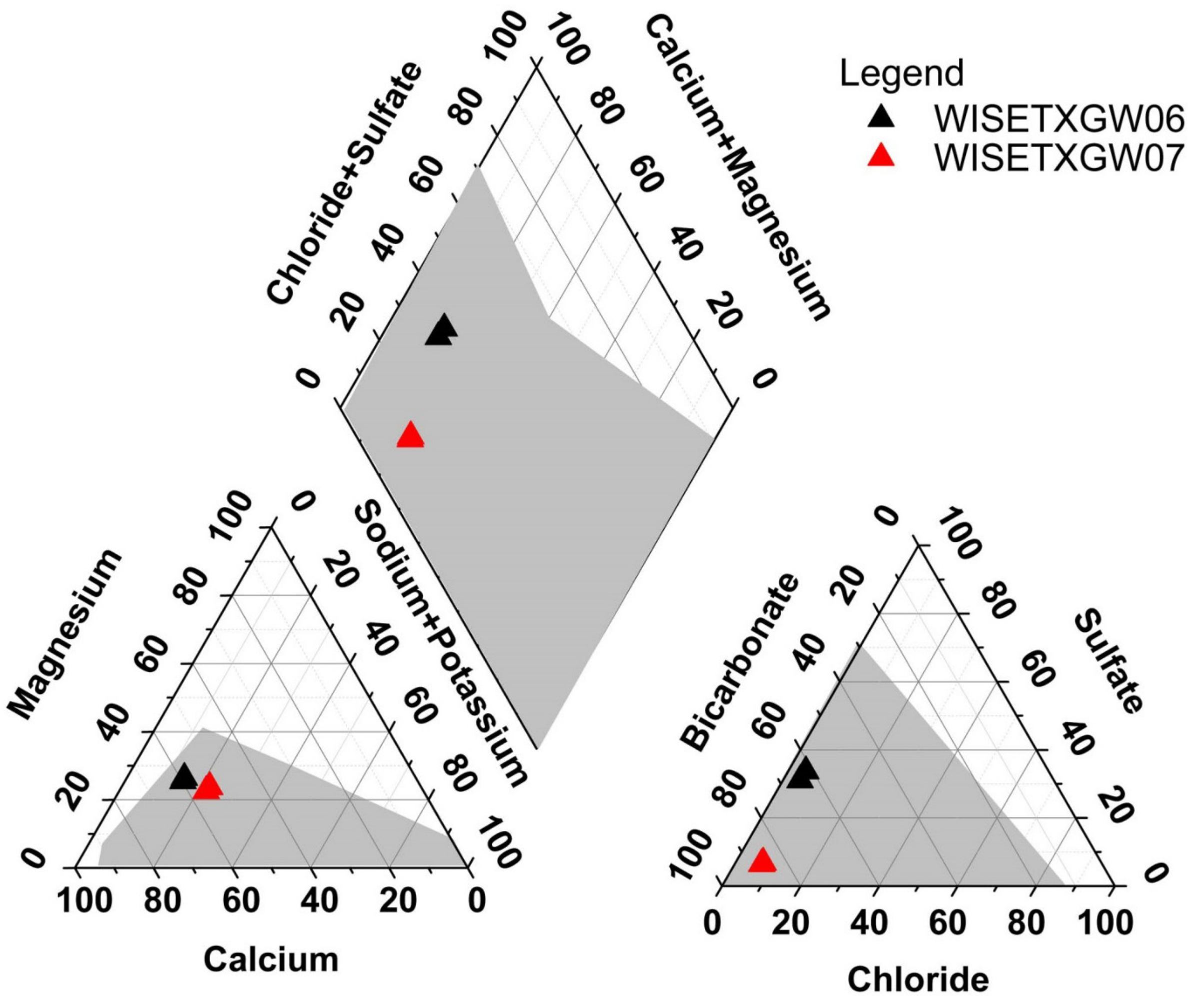


Figure 22. Piper diagram showing major cation and anion relationships for Location C and a comparison to the historical data from the NWIS and TXWDB databases. The gray areas show the limits of the historical data from the NWIS and TXWDB databases. The lower left triangular field is the cation field and the lower right triangular field is the anion field. The center diamond field is the mixing field of the anions and cations. All study wells are within the historical background on a countywide scale. (Data Sources: USGS (2013a) and TXWDB (2013b)).

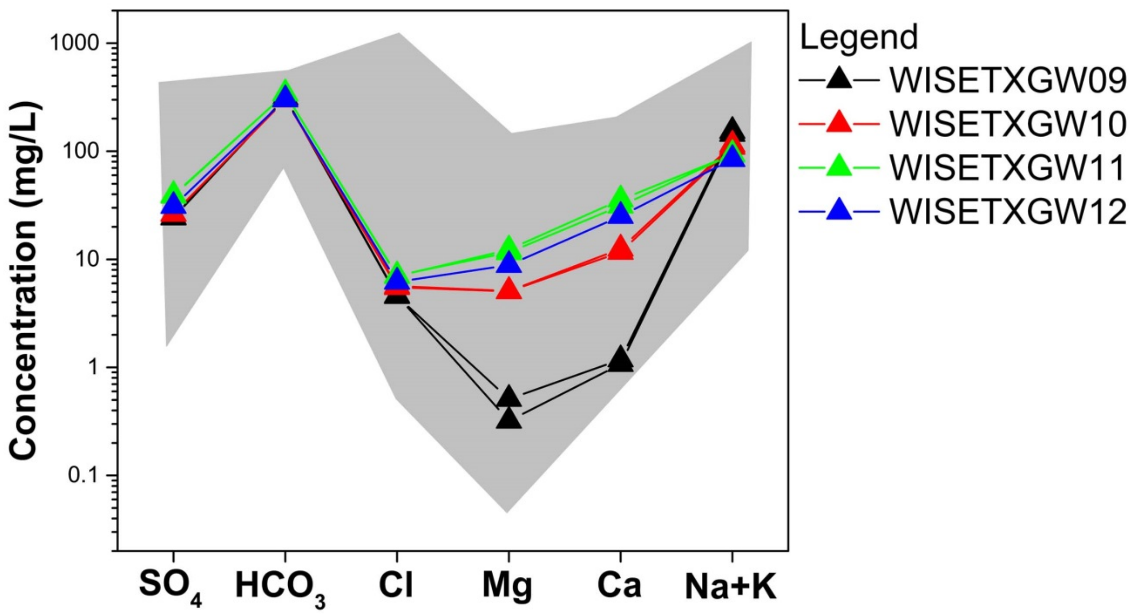


Figure 23. Schoeller diagram showing major cation and anion relationships for Location A and a comparison to the historical data from the NWIS and TXWDB databases. The gray areas show the limits of the historical data from the NWIS and TXWDB databases. All study wells are within the historical background on a county wide scale. (Data Sources: USGS (2013a) and TXWDB (2013b)).

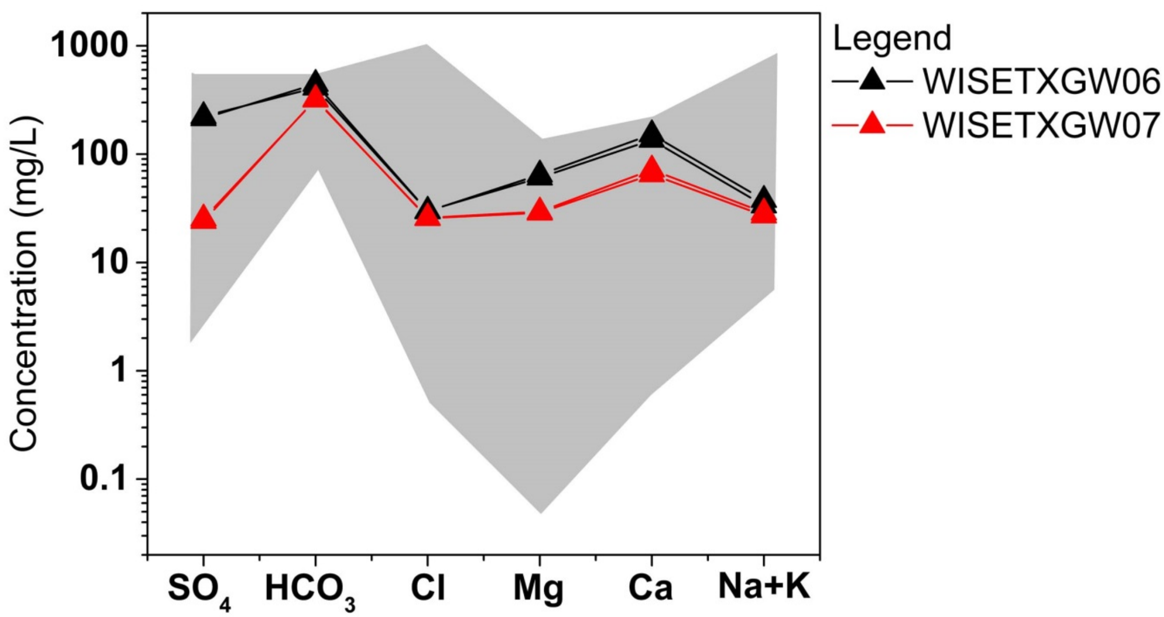


Figure 24. Schoeller diagram showing major cation and anion relationships for Location C and a comparison to the historical data from the NWIS and TXWDB databases. The gray areas show the limits of the historical data from the NWIS and TXWDB databases. All study wells are within the historical background on a county wide scale. (Data Sources: USGS (2013a) and TXWDB (2013b)).

For Location A, the only wells within a 3-mile radius are from the NURE database, but the NURE database does not contain all the major anions needed to make Piper and Schoeller diagrams. Therefore, no comparisons could be done on this scale for this location. For Location C, a comparison at this scale can be shown on a Piper diagram (Figure 25). At this scale, the data from WISETXGW06 are within the limits of the historical data in the Piper diagram; however, the data from WISETXGW07 are outside the historical data limits in the Piper mixing field and tri-linear plot for anions. The Schoeller diagram (Figure 26) indicates that the data from both WISETXGW06 and WISETXGW07 are dissimilar to the historical data at this scale. For WISETXGW06, the red dashed areas indicate that this well is slightly enriched in calcium compared with background. WISETXGW07 is somewhat depleted with respect to sulfate and magnesium compared with historical background.

Two types of plots and ratios have been suggested as potential ways to screen between waters with brine sources from waters from other sources (Hounslow, 1995): brine differentiation plots and TDS versus the ratio of chloride to the sum of anions (Cl/Σ anions). The brine differentiation plots for Locations A and C are shown on Figure 27 and Figure 28. The red dashed lines in this plot representing a triangular area are what Hounslow (1995) indicated as brine-impacted waters using data he collected from Texas and Oklahoma. To check this, the data from the USGS produced water database (USGS, 2002) for Texas were plotted. These data are represented by the rectangular area with the blue dashed lines. On Figure 27, the brine differentiation plot indicates that all the study data are well outside the areas that Hounslow and the USGS would suggest as being impacted by petroleum brines for Location A. It should also be noted that on Figure 27, that many of the data points in the historical data from the NWIS and TXWDB plot in the area that the brine differentiation plot would predict are petroleum brines. This could suggest that these historical data points come from locations that were impacted by brine or that the brine differentiation plots should be used with caution as a screening tool for potential brine impacts. For Location C, Figure 28 indicates that the study data are just outside the region of the plot one would expect for water potentially impacted by petroleum brine, and this is also true of the historical data from the NWIS and TXWDB. The Location C study data are within the background water quality on a countywide scale. The plots of TDS versus Cl/Σ anions (Figure 29) show that the water in Locations A and C are not influenced to any extent by brines. At Locations A and C, the water is primarily influenced by rock weathering.

Based on the above analysis, there is very little evidence that the ground water in study Locations A and C have been impacted. The slight variations in certain parameters from the historical ground water data are likely the result of local variations in ground water quality. Other ground water parameters in Locations A and C are discussed in other sections and in Appendix D.

Location B Ground Water

Water types in Location B give an overall impression of the dominant anions and cations in the water samples, and Figure 30 shows the percentage of the samples in Locations B of a given water type. The NURE data do not contain several of the major anions needed to calculate water types; therefore, no information on water types is obtainable from this database. For Location B, a majority of the study samples were sodium-bicarbonate waters (80 %), but 20 % of the samples were sodium-chloride type waters. The countywide historical data indicate that the dominant water types in the NWIS and TXWDB databases were calcium-bicarbonate waters and sodium-bicarbonate, with smaller percentages of other water types, including approximately 14% as sodium-chloride type water (Figure 30A). As discussed earlier, Wise County has a diverse geology, and it is important to also compare the site data with the historical data at a smaller scale. Data obtained for a 3-mile radius from Location B indicated that, in the NWIS database, all the wells at this scale were calcium-chloride type water (Figure 30B). In the TXWDB database, most of the waters were either sodium-bicarbonate or calcium-bicarbonate types, with a small percentage being calcium-chloride type waters (Figure 30B). Location B in general differs in terms of the dominant cation: a majority of the samples in the historical data were calcium dominant, whereas in the study data, the dominant cation was sodium.

Figure 31 shows Piper diagram and Figure 32 shows Schoeller diagram for Locations B using the countywide historical data. The countywide assessment using the Piper diagram indicates that the samples from Location B are similar to those in the historical data. Samples from WISETXGW01 and WISETXGW08 were also the sodium-chloride water type, and this is reflected in the Schoeller diagram. For these wells, both sodium and chloride are enriched compared to the historical background on a countywide basis.

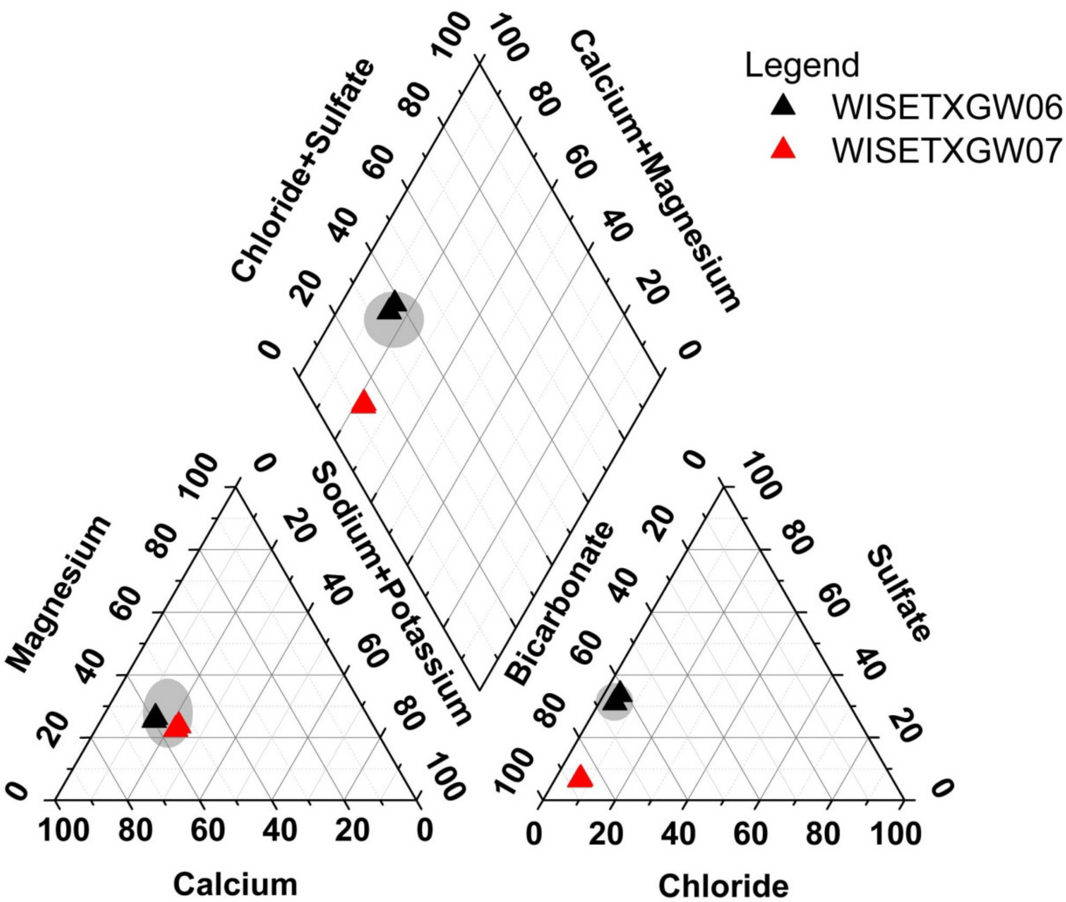


Figure 25. Piper diagram showing major cation and anion relationships for Location C and a comparison to the historical data from the NWIS and TXWDB databases using a three mile radius. The gray areas show the limits of the historical data from the NWIS and TXWDB databases. The lower left triangular field is the cation field and the lower right triangular field is the anion field. The center diamond field is the mixing field of the anions and cations. This indicates that WISETXGW07 is different than the historical background data using a 3-mile radius; however, the historical data at this scale are extremely limited. (Data Sources: USGS (2013a) and TXWDB (2013b)).

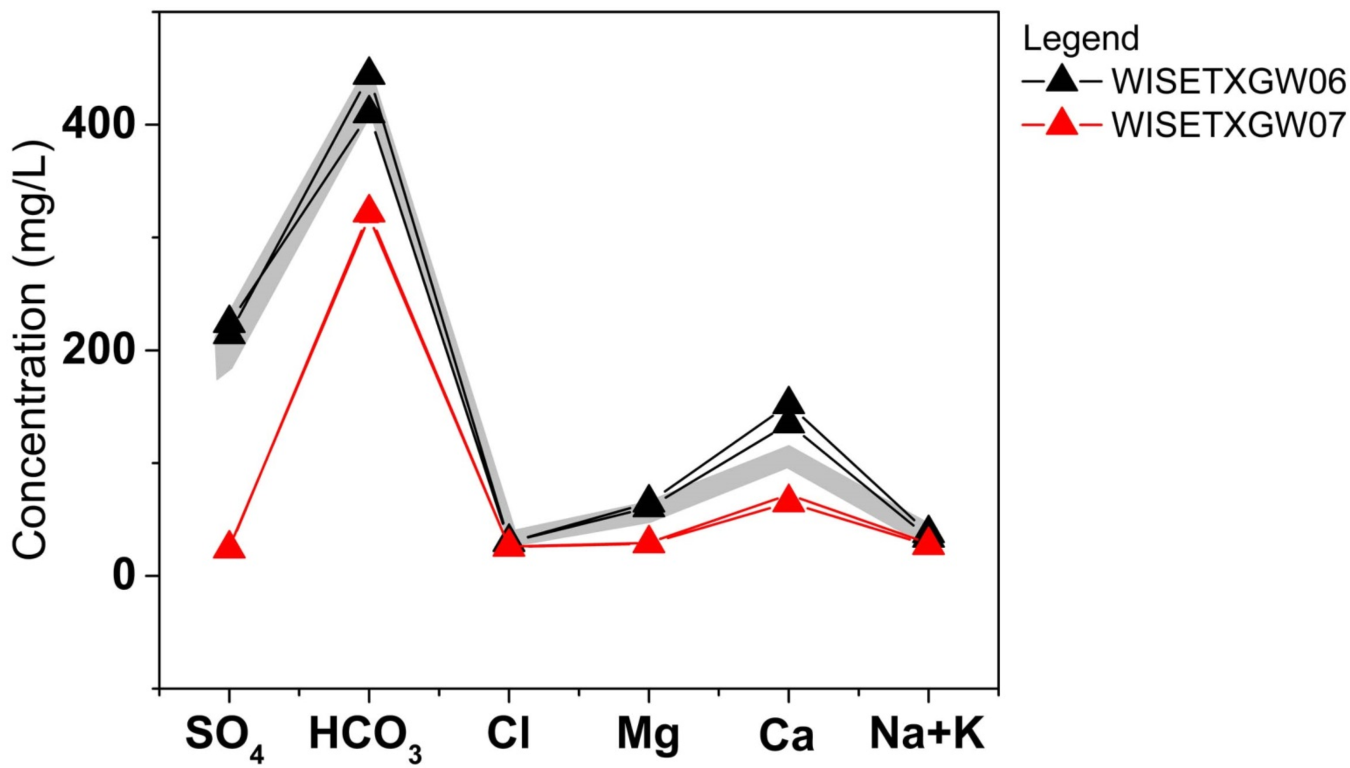


Figure 26. Schoeller diagram showing major cation and anion relationships for Location C and a comparison to the historical data from the NWIS and TXWDB databases using a 3-mile radius. The gray areas show the limits of the historical data from the NWIS and TXWDB databases. This indicates that WISETXGW07 is different than the historical background data using a 3-mile radius; however, the historical data at this scale are extremely limited. (Data Sources: USGS (2013a) and TXWDB (2013b)).

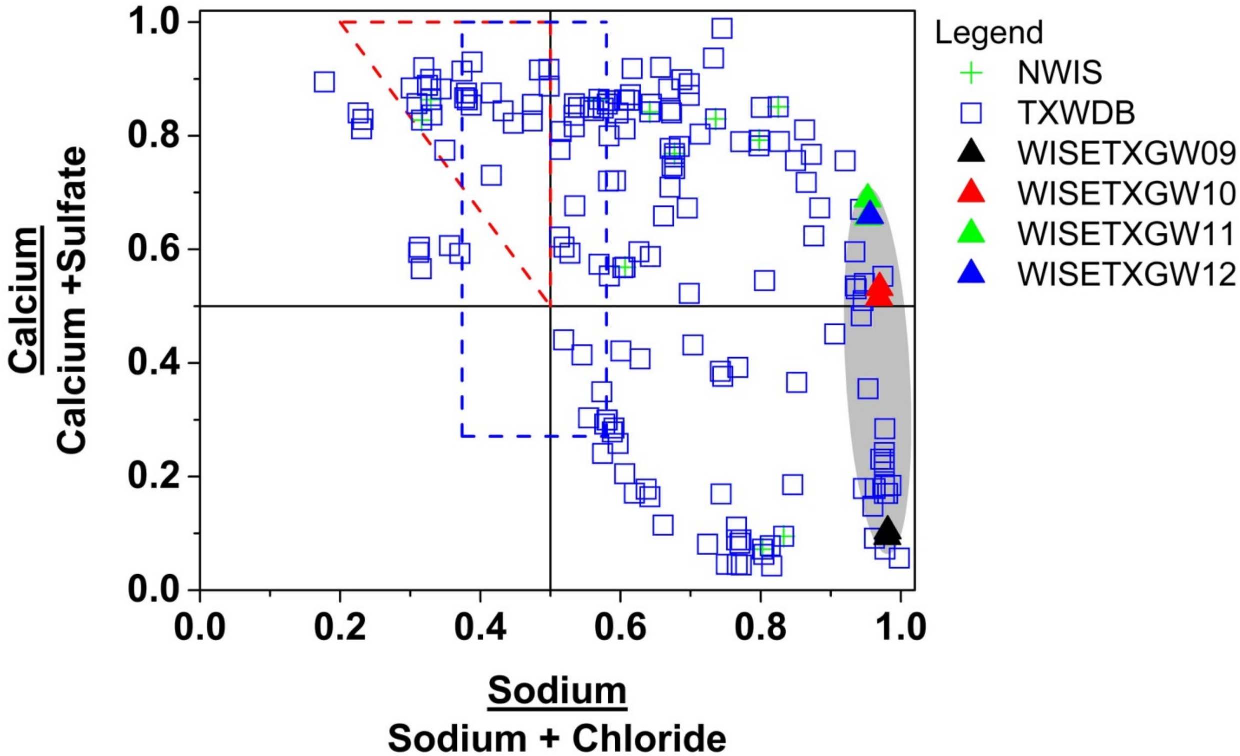


Figure 27. Brine differentiation plots for study Location A. Brine differentiation plots were used to screen study data to indicate if the water was potentially impacted by brine. The triangular area inside the red dash areas are water potentially impacted by oil field brines that was proposed by Hounslow (1995). The area inside the blue dash areas are water potentially impacted by formation brines based on the USGS Produced Water Data base (USGS, 2002). The gray shades areas highlight the study data. Although there were no study data that plotted within the region expected for brine impacted water, several of the historical data points did fall within that region. (Data Sources: USGS (2013a) and TXWDB (2013b)).

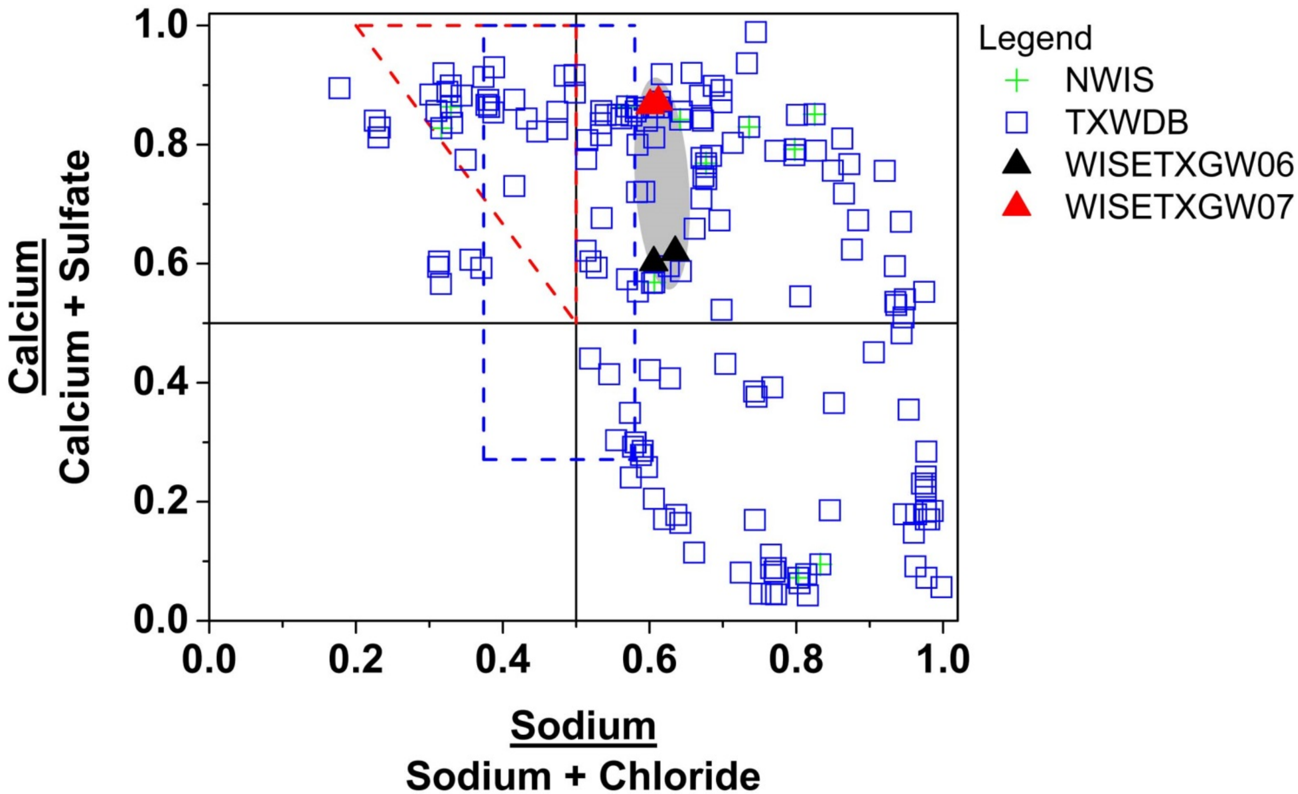


Figure 28. Brine differentiation plots for study Location C. Brine differentiation plots were used to screen study data to indicate if the water was potentially impacted by brine. The triangular area inside the red dash areas are waters potentially impacted by oil field brines that was proposed by Hounslow (1995). The area inside the blue dash areas are waters potentially impacted by formation brines based on the USGS Produced Water Data base (USGS, 2002). The gray shades areas highlight the study data. Although there were no study data that plotted within the region expected for brine impacted water, several of the historical data points did fall within that region. (Data Sources: USGS (2013a) and TXWDB (2013b)).

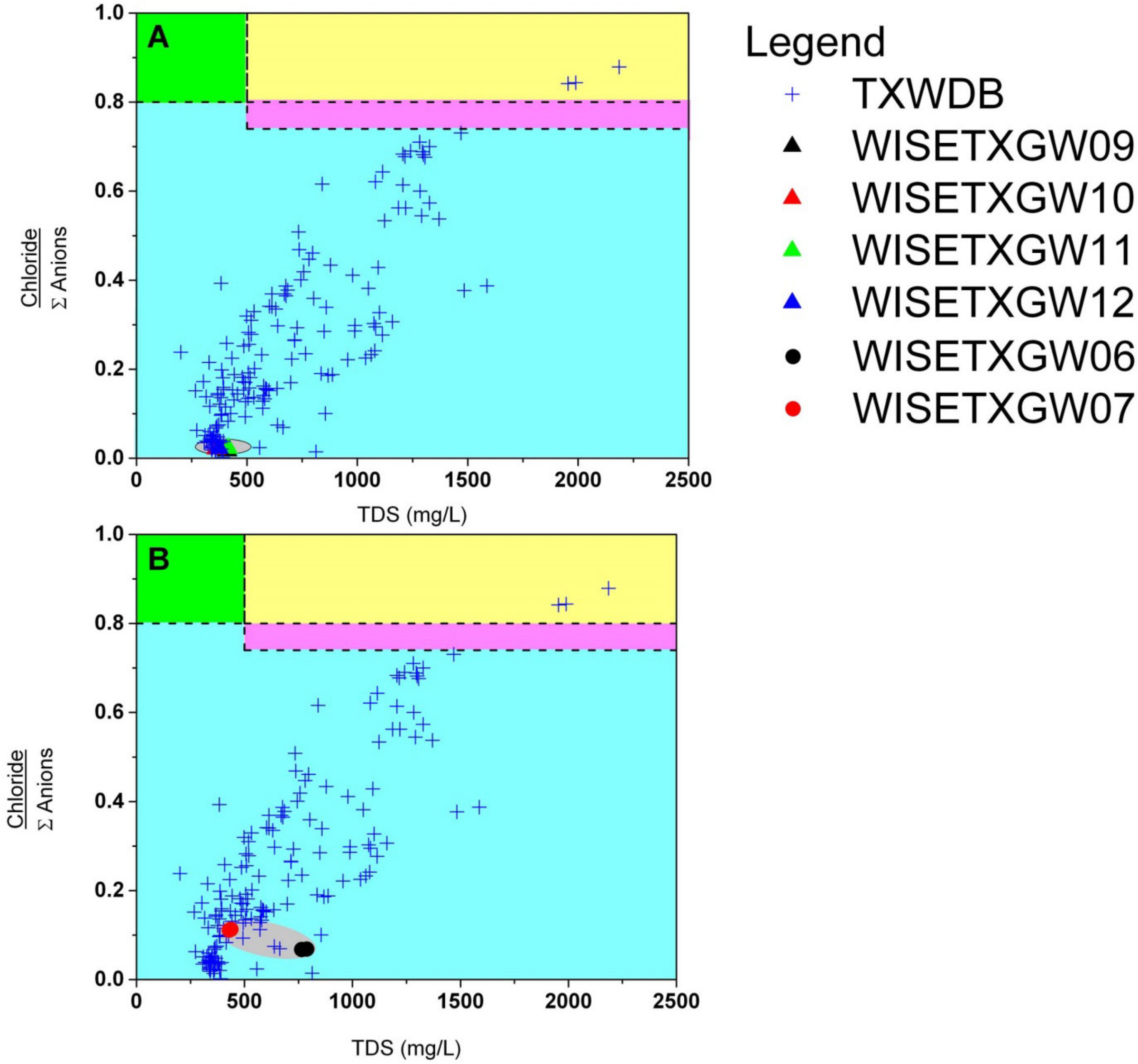


Figure 29. Plots of TDS versus Chloride/Σ Anions for (A) Location A and (B) Location C. These plots were also used to screen study and historical data for potential sources. The green shaded area represents precipitation like water; the yellow shaded area is brine, seawater, and evaporite like water suggested by Hounslow (1995); the magenta shaded area plus the yellow shaded areas are brine influenced water based on USGS Produced Water data base (USGS, 2002); the cyan shaded area represents water influenced by rock weathering; and gray area is the study data. Although there were no study data that plotted within the region expected for brine impacted water, several of the historical data points did fall within that region. (Data Sources: USGS (2013a) and TXWDB (2013b)).

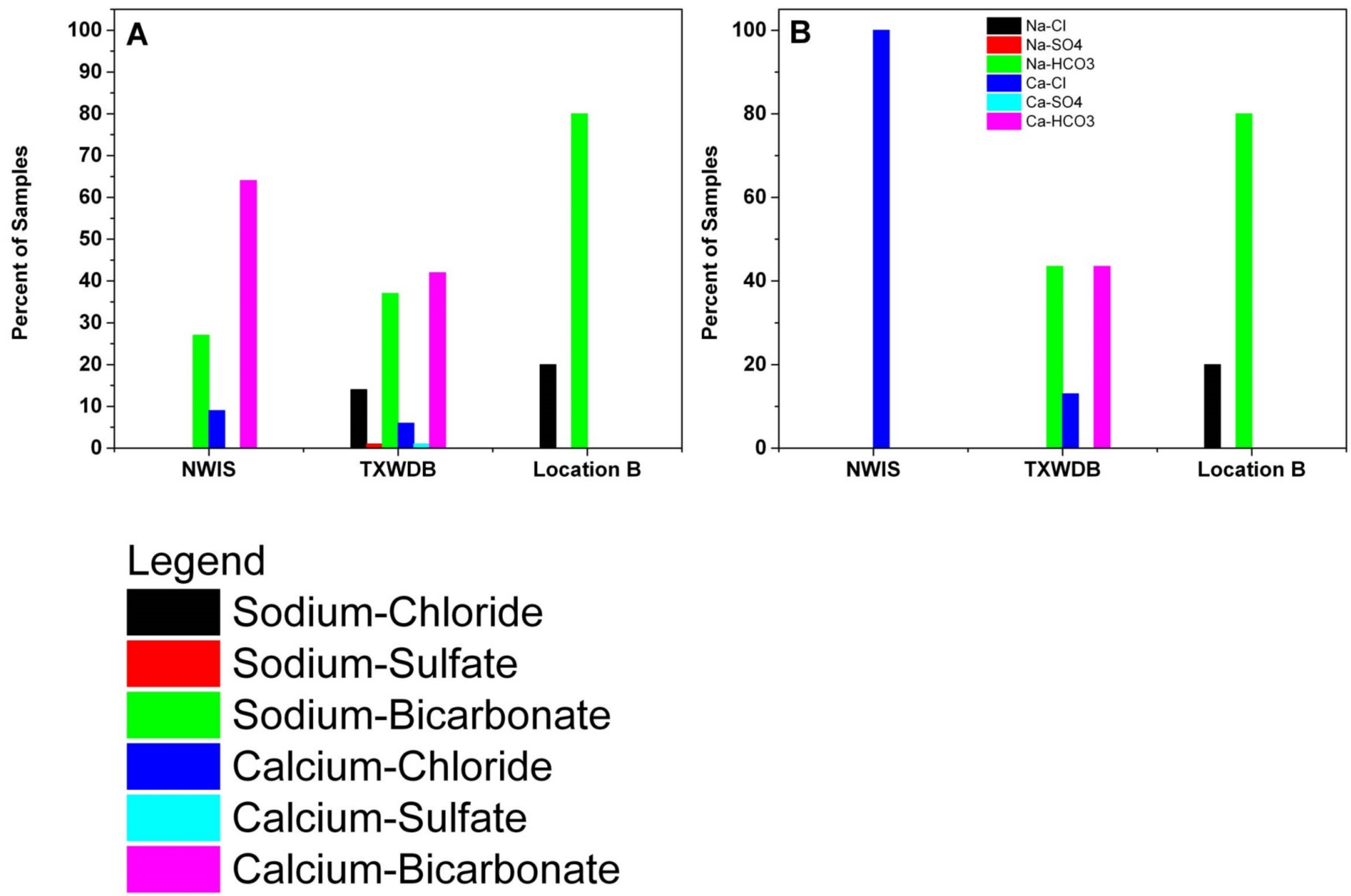


Figure 30. Water type percentages for the study data collected at Location B using (A) a county-wide scale and (B) using a 3-mile radius. The historical data used were from the NWIS and TXWDB databases. (Data Sources: USGS (2013a) and TXWDB (2013b)).

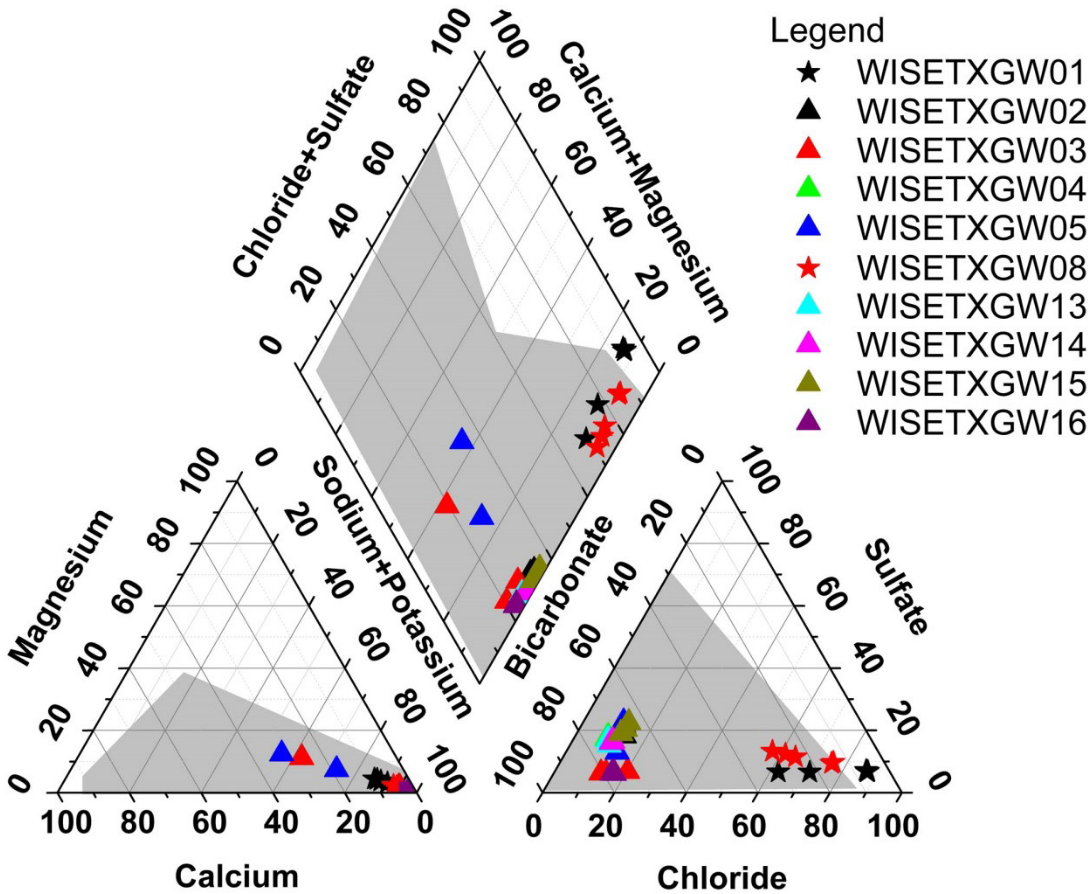


Figure 31. Piper diagram showing major cation and anion relationships for Location B and a comparison to the historical data from the NWIS and TXWDB databases using a county wide scale. The gray areas show the limits of the historical data from the NWIS and TXWDB databases. The lower left triangular field is the cation field and the lower right triangular field is the anion field. The center diamond field is the mixing field of the anion and cations. This plot suggest that WISETXGW01 and WISETXGW08 did have differences in water quality based on data from the historical databases on the county wide scale. (Data Sources: USGS (2013a) and TXWDB (2013b)).

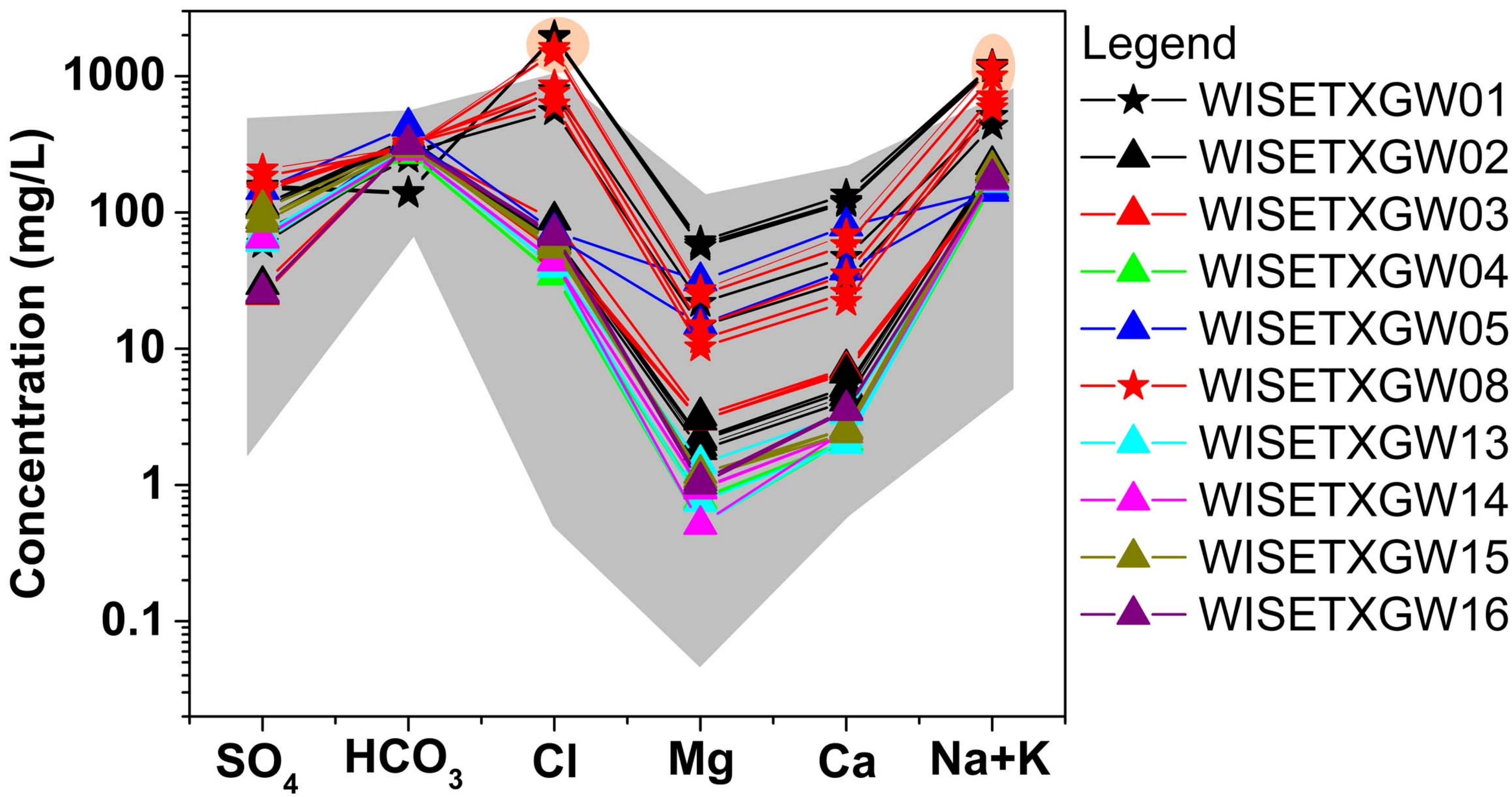


Figure 32. Schoeller diagram showing major cation and anion relationships for Location B and a comparison to the historical data from the NWIS and TXWDB databases using a county wide scale. The gray areas show the limits of the historical data from the NWIS and TXWDB databases. The data highlighted in tan indicates deviation from historical water quality on this scale. This plot suggest that WISETXGW01 and WISETXGW08 did have differences in water quality based on data from the historical databases on the county wide scale. (Data Sources: USGS (2013a) and TXWDB (2013b)).

Figure 33 shows a Piper diagram and Figure 34 shows a Schoeller diagrams for a 3-mile radius area around Location B. Unlike the countywide assessment, the anion tri-linear plot in the Piper diagram for the 3-mile-radius area shows that there are differences between the historical data and the study data (Figure 33). This is also seen in the mixing diamond. In both cases, the data from wells WISETXGW01 and WISETXGW08 differ from the historical data. The Schoeller diagram also shows more differences on the 3-mile radius scale than the countywide scale (Figure 34). Again, several of the samples from WISETXGW01 and WISETXGW08 were enriched in chloride and sodium compared with the historical data. Also, several samples from WISETXGW08 were enriched with sulfate, and a sample from WISETXGW01 was depleted with respect to bicarbonate compared with the historical data.

The brine differentiation plots for Location B are shown on Figures 35 and 36. The plots show that WISETXGW01 and WISETXGW08 are influenced by brine. In comparing this with the historical data on a countywide basis, one can see that there are historical data that also are indicative of a brine influence (Figure 35). It is also important to note that on Figure 27, that many of the data points in the historical data from the NWIS and TXWDB plot in the area that the brine differentiation plot would predict are petroleum brines. This could suggest that these historical data points come from locations that were impacted by brine or that the brine differentiation plots should be used with caution as a screening tool for potential brine impacts. When looking at the historical data on the more relevant 3-mile radius basis (Figure 36), it can be seen that there are no historical data indicated brine influenced. Further support of this is seen in the plots of TDS versus chloride/Σ anions on Figure 37. This type of plot is useful in deducing the source of the water, but it is not a definitive. As shown on Figure 37A, many of the historical wells in the countywide assessment appeared to have a brine influence. As was stated previously for the brine differentiation plots, it is not known if some of the historical data were influenced by brine contamination; however caution should be used with this screening tool. The TDS versus chloride/Σ anions plot shows that most of those wells appear to have been influenced by rock weathering (Figure 37A). The historical data using a 3-mile radius indicated that all the historical water samples near Location B would be influenced by rock weathering processes (Figure 37B). The study data show that two wells are influenced by brine, WISETXGW01 and WISETXGW08. Samples from both of these wells also showed that the samples could have been influenced by the natural chemical constituents of the bedrock released by rock weathering. This issue is discussed in more detail in the site-specific focus area section of this report.

The above analysis indicates that the ground water in two wells in study Location B, WISETXGW01 and WISETXGW08, are potentially impacted by brine. There is also evidence that the other wells could be used as site-specific background for Location B. The potential influence of brine intrusion is discussed in more detail in the site-specific focus area section of this report.

6.4. Other Collected Data Comparisons

6.4.1. Dissolved Gases

As part of this study, dissolved gas samples were collected and analyzed for methane, ethane, propane, and butane. The dissolved gas samples were collected only for ground water and surface water. These gases have also been found in hydraulic fracturing (U.S. House of Representatives, 2011; Alpha Environmental Consultants, 2009). With the exception of one ground water sample, there was no detectable ethane, propane, or butane in any of the dissolved gas samples collected as part of this study. In one ground water sample, these gases (ethane, propane, and butane) were detected at concentrations below the QL and were not detected in samples from this well during any following sampling rounds. This would indicate that the concentrations of ethane, propane, and butane detected in the study locations are not of concern.

Methane was detected in 64% of the samples collected during the study. Methane concentrations in the ground water ranged from 0.007 to 0.0242 mg/L, with a median concentration of 0.0016 mg/L. No historical dissolved gas data for Wise County were identified; however, a report published by Zhang et al. (1998) for the Trinity aquifer south of Wise County indicated that the methane concentrations ranged from 0.0014 to 0.0347 mg/L. Based on the Zhang et al. (1998) data for the Trinity aquifer, the low-level concentrations found in the study samples are likely background concentrations of methane (Table 12).

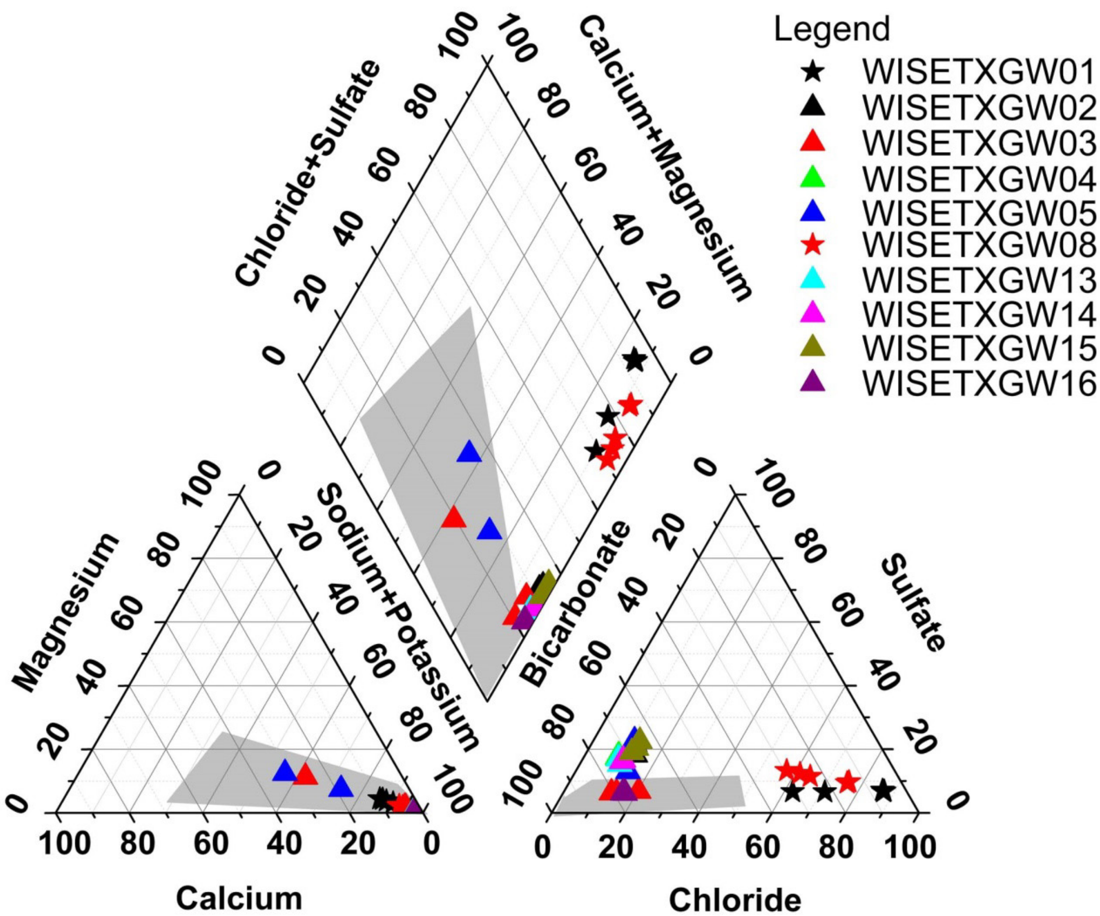


Figure 33. Piper diagram showing major cation and anion relationships for Location B and a comparison to the historical data from the NWIS and TXWDB databases using a 3-mile radius. (Data Sources: USGS (2013a) and TXWDB (2013b)).

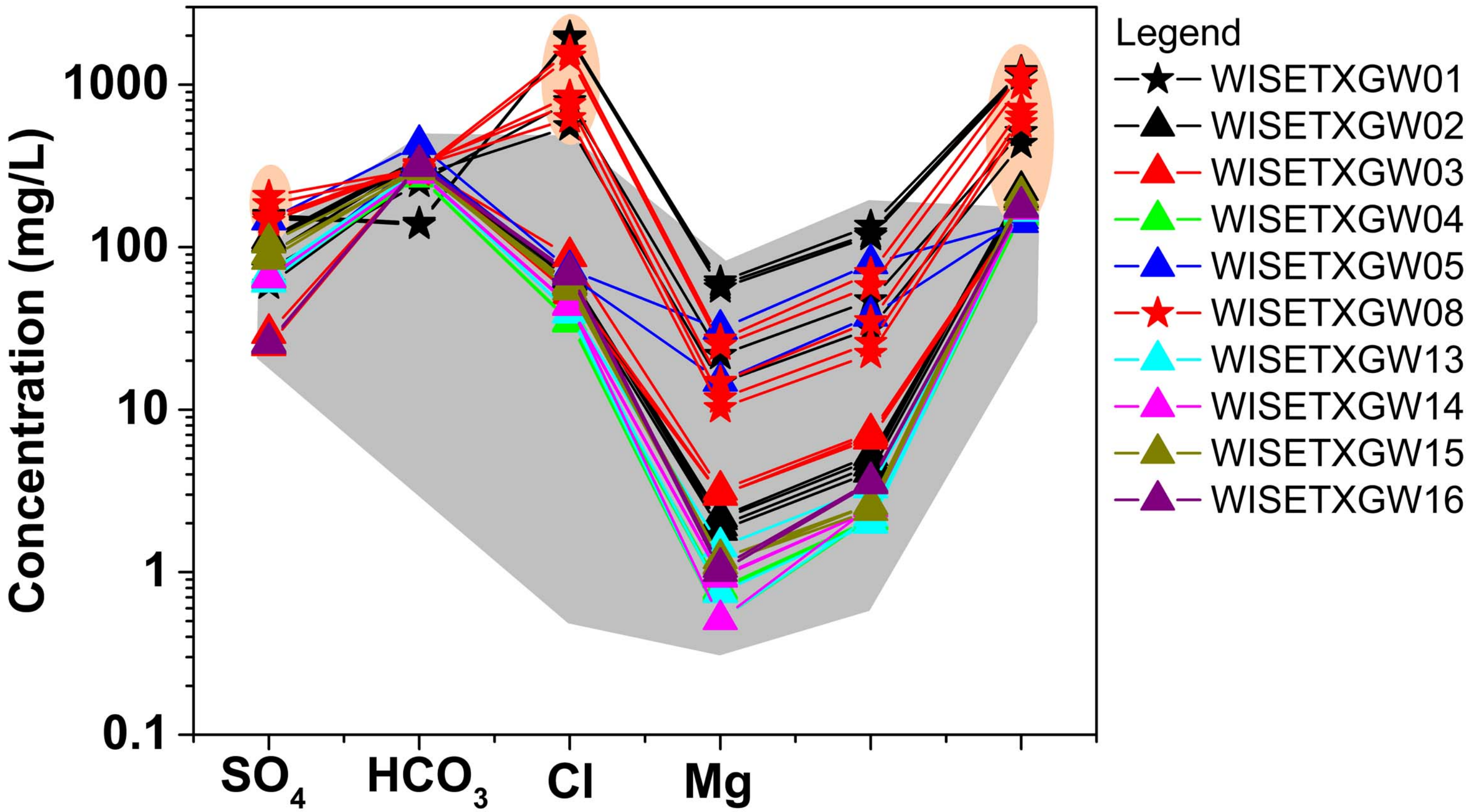


Figure 34. Schoeller diagram showing major cation and anion relationships for Location B and a comparison to the historical data from the NWIS and TXWDB databases using a 3-mile radius. The gray areas show the limits of the historical data from the NWIS and TXWDB databases. The data highlighted in tan indicates deviation from historical water quality on this scale. This plot demonstrates that WISETXGW01 and WISETXGW08 did have differences in water quality based on data from the historical databases using a 3-mile radius. (Data Sources: USGS (2013a) and TXWDB (2013b)).

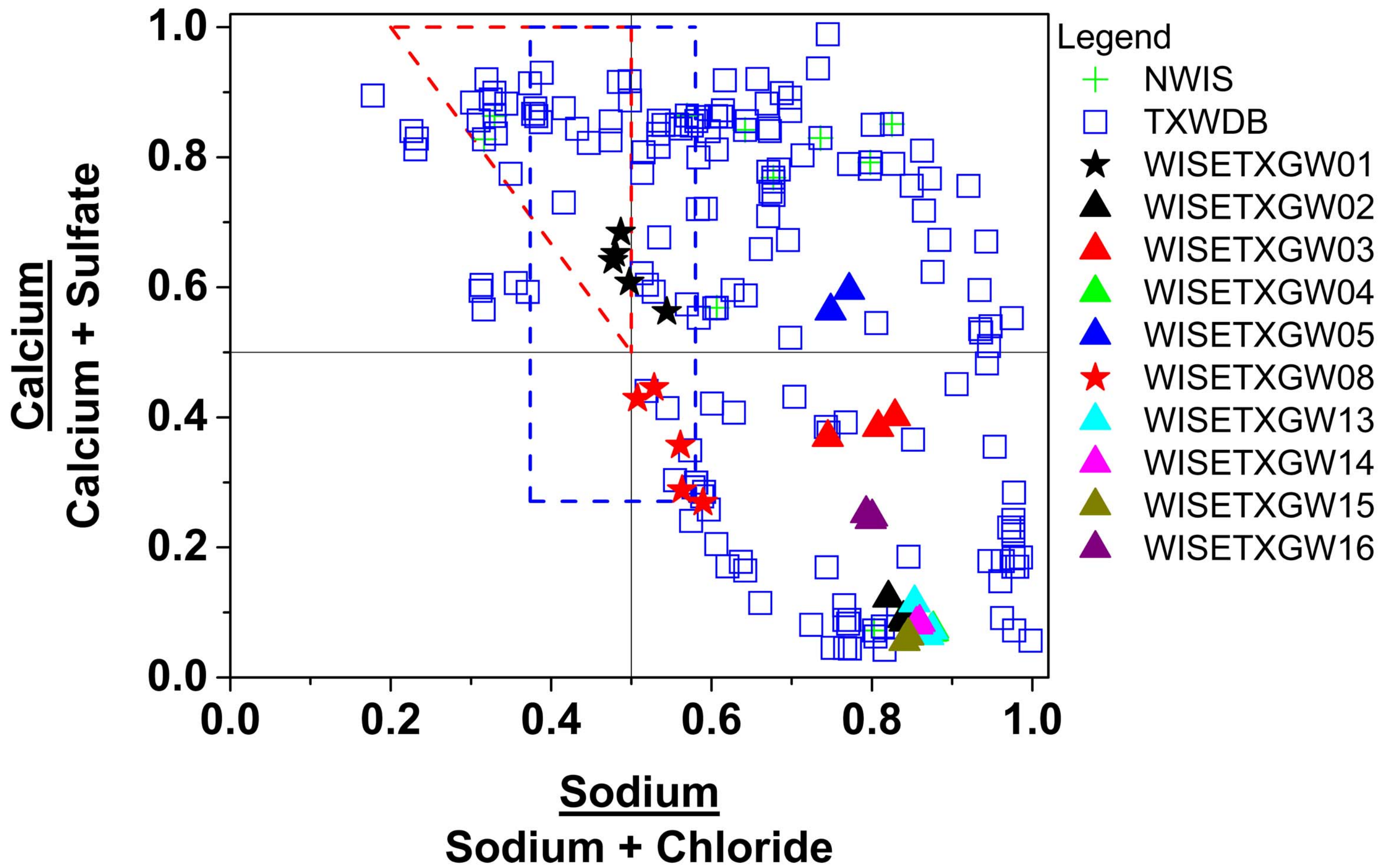


Figure 35. Brine differentiation plots for study Location B using historical data from the NWIS and TXWDB using a countywide scale. Brine differentiation plots were used to screen study data to indicate if the water was potentially impacted by brine. The triangular area inside the red dash areas are water potentially impacted by oil field brines that was proposed by Hounslow (1995). The area inside the blue dash areas are water potentially impacted by formation brines based on the USGS Produced Water Data base (USGS, 2002). Based on this plot, WISETXGW01 and WISETXGW08 would be potentially impacted by brines. (Data Sources: USGS (2013a) and TXWDB (2013b)).

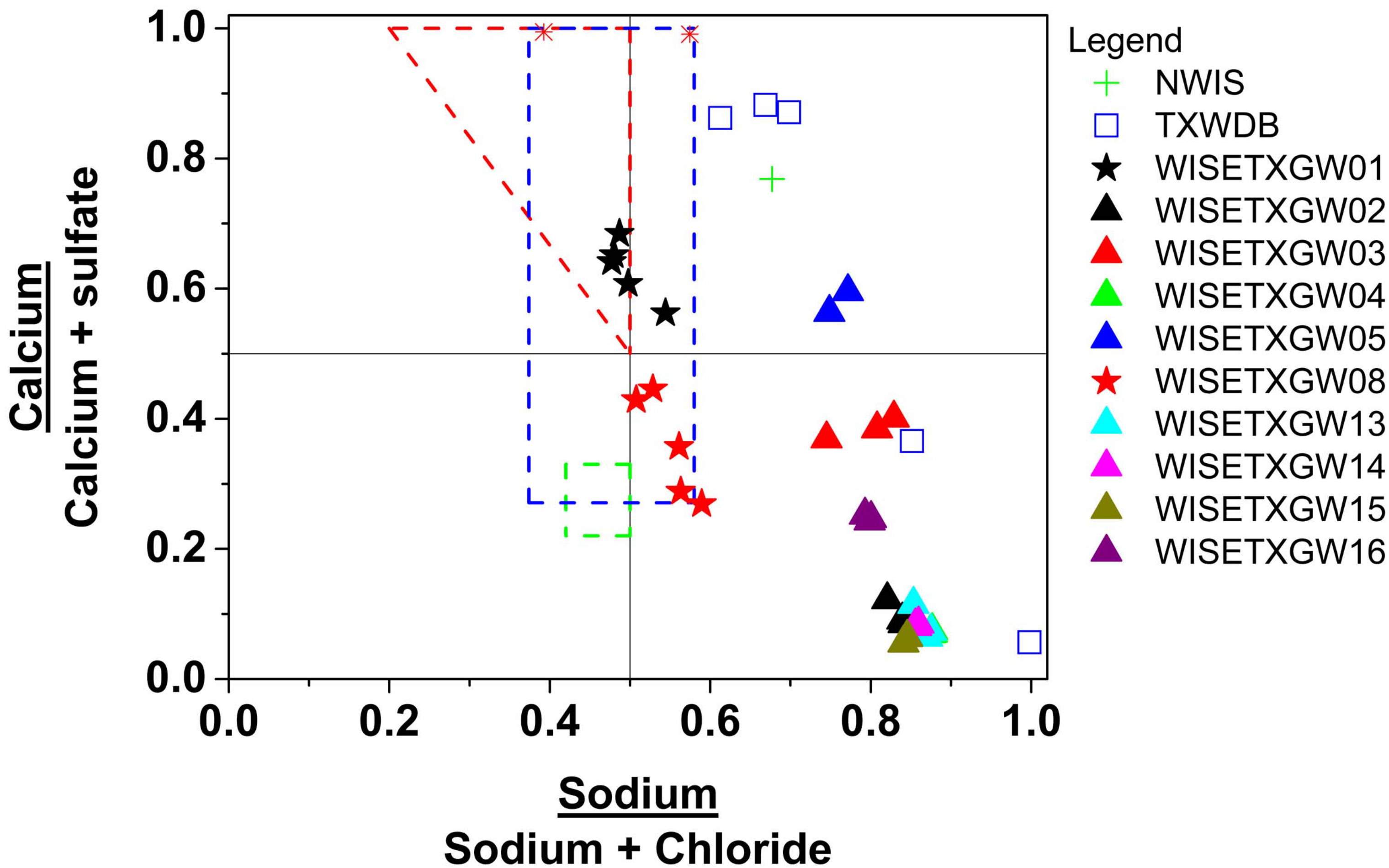


Figure 36. Brine differentiation plots for study Location B using historical data from the NWIS and TXWDB using a 3-mile radius. Brine differentiation plots were used to screen study data to indicate if the water was potentially impacted by brine. The triangular area inside the red dash areas are water potentially impacted by oil field brines that was proposed by Hounslow (1995). The area inside the blue dash areas are water potentially impacted by formation brines based on the USGS Produced Water Data base (USGS, 2002). The gray shades areas highlight the study data. Based on this plot, WISETXGW01 and WISETXGW08 would be potentially impacted by brines. (Data Sources: USGS (2013a) and TXWDB (2013b)).

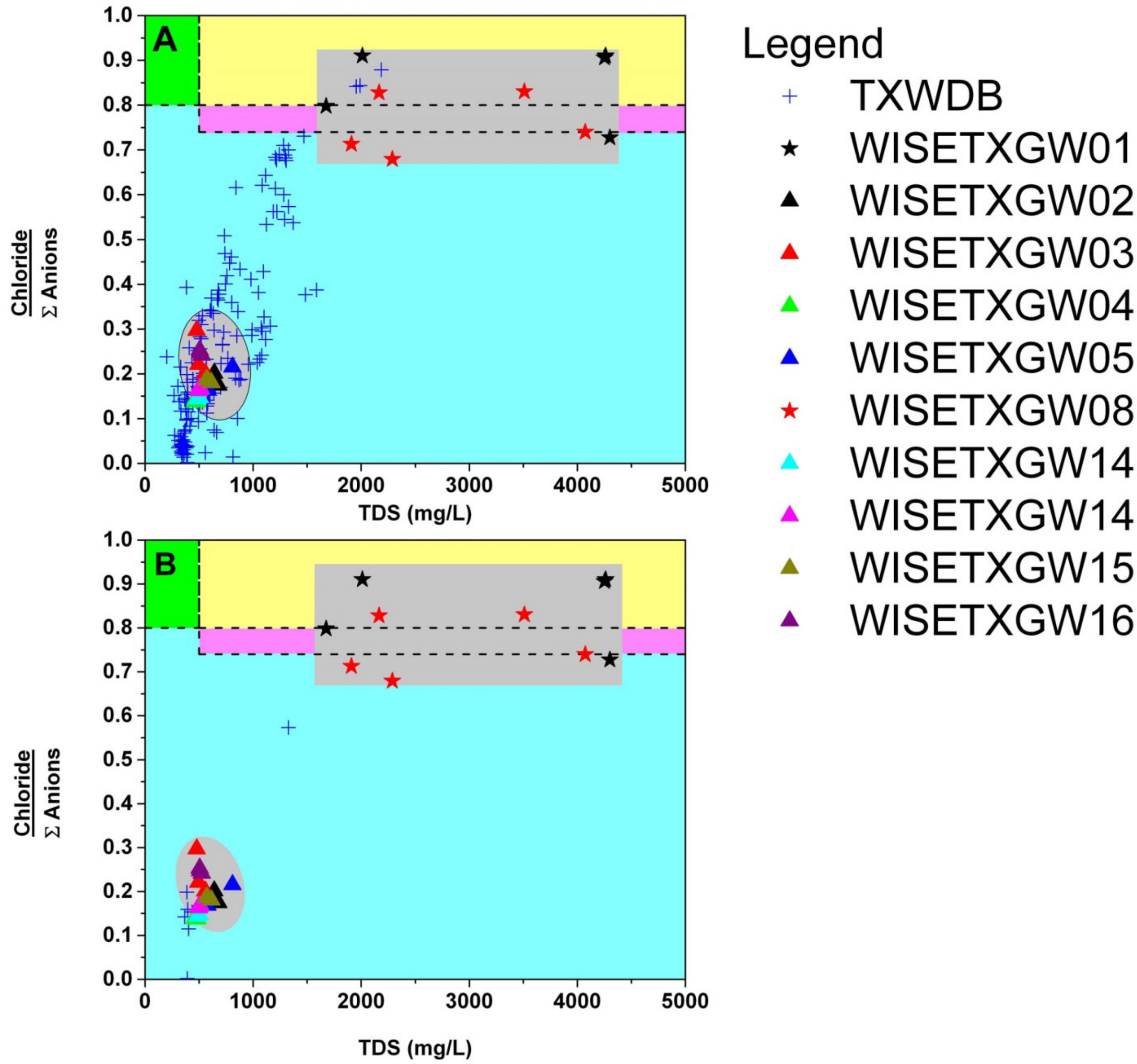


Figure 37. Plots of TDS versus Chloride/Σ Anions for Location B using a (A) county wide scale and using a (B) 3-mile radius. These plots were also used to screen study and historical data for potential sources. The green shaded area represents precipitation like water; the yellow shaded area is brine, seawater, and evaporite like water suggested by Hounslow (1995); the magenta shaded area plus the yellow shaded areas are brine influenced water based on USGS Produced Water data base (USGS, 2002); the cyan shaded area represents water influenced by rock weathering; and gray area is the study data. Based on this plot, WISETXGW01 and WISETXGW08 would be potentially impacted by brines. (Data Sources: USGS (2013a) and TXWDB (2013b)).

6.4.2. Organic Components

The organic parameters analyzed for during this study comprised several suites: VOCs, low-molecular-weight acids, glycols, SVOCs, DROs, and GROs. Each of these suites of analysis is discussed in the following sections.

Volatile Organic Compounds (VOCs)

VOCs are generally thought of as indicators of anthropogenic sources of contamination, e.g., leaky underground storage tanks and industrial activities. Several recent references also indicate that some VOCs are also found in hydraulic fracturing fluids (U.S. House of Representatives, 2011; Alpha Environmental Consultants, 2009; Veil et al., 2004). Tables 8 and 13 list the VOCs analyzed in this study that were in common with the available historical data. A majority of the VOCs analyzed for during this study were not detected in the surface water, ground water, or produced water samples. Where available, the VOC data from this study are compared with historical VOC data (two detections of benzene) (Tables 8 and 12). Acetone, tert-butyl alcohol (TBA), methyl tert-butyl ether (MTBE), benzene, m+p-xylene, tert-amyl methyl ether, and o-xylene were detected in ground water (Tables 8 and 12), and only acetone was detected in surface water.

Acetone was detected in 11 ground water samples collected over the four sampling rounds in which VOCs were analyzed. During the QA process, it was determined that the acetone data were unusable because of blank contamination for ground water and surface water. Acetone is a common laboratory and field contaminant (US EPA, 1992; Douglas, 2012; Miller, 2015). In the produced water samples, acetone was only analyzed for once. In the produced water from the Barnett Shale, the acetone concentration was 770 µg/L.

With the exception of acetone, no other VOCs were detected in surface water samples during the study. In ground water (Tables 8 and 12), the other VOC detections (except benzene) already identified were detected in only one sample (WISETXGW08) in the December 2012 sampling round. Just prior to the December 2012 sampling round, the homeowner’s pump failed and the top of the well casing was left uncovered and exposed to the atmosphere. These two factors make it very difficult to identify the source of the detected VOCs. Benzene was also detected in two additional samples, WISETXGW01 (May 2013 sampling round) and WISETXGW05 (March 2012 sampling round). Because there were no additional detections of benzene in previous VOC sampling rounds, no potential source for the detected benzene can be ascertained. WISETXGW05 is a well located at a brine disposal facility and is not used as a drinking water source. During the March 2012 sampling round, considerable truck traffic and off-loading of brine took place during the sampling. Brine disposal collection tanks also are vented to the atmosphere at this location. Benzene is also a common laboratory and field contaminant (US EPA, 1992; Douglas, 2012; Miller, 2015). These factors suggest that the benzene detected in this sample was the result of field contamination.

The VOCs detected in the produced water samples from the Barnett Shale are consistent with what has previously been reported for produced water (U.S House of Representatives, 2011; Alpha Environmental Consultants, 2009; Veil et al., 2004). Although VOCs were detected in several study samples, the detections could also be explained by other activities that were occurring at the time of sampling. No trends in the data for any well suggest contamination by VOCs. Therefore, VOCs could not be definitively linked to any potential source.

Semi-Volatile Organic Compounds

A listing of the SVOCs analyzed for is presented in Table B-6 in Appendix B. Several SVOCs have been recognized as potentially associated with hydraulic fracturing and produced water (U.S. House of Representatives, 2011; Alpha Environmental Consultants, 2009; GWPC, 2009). SVOCs are also linked to other anthropogenic sources.

There were no detectable concentrations of SVOCs in any surface water samples collected during the study. There were two detections of bis-(2-ethylhexyl) phthalate in ground water samples, which ranged from 2.02 to 2.51 µg/L (Table 12). Bis-(2-ethylhexyl) phthalate is ubiquitous in the environment and is, therefore, not useful for source identification (Griffiths et al., 1985) or to determine whether water was impacted by any particular source. Bis-(2-ethylhexyl) phthalate contamination is problematic in ground water sampling (WDNR, 2002; Miller, 2015).

Low-Molecular-Weight Acids

Low-molecular-weight acids are both naturally occurring and of anthropogenic origin. In nature, low-molecular-weight acids are produced through biological processes and microbial degradation of other organic compounds (Dwyer and Tiedje, 1983, 1986; Mrklas et al., 2004; Wilson et al., 2005; Wilson and Adair, 2007; Carnegie and Ramsay, 2009; Da Silva et al., 2013; Rasa et al., 2013). Several of these low-molecular-weight acids are found in industrial processes, and acetate, formate, and lactate have been linked to components of hydraulic fracturing fluids and produced water (U.S. House of Representatives, 2011; Alpha Environmental Consultants, 2009). The low-molecular-weight acids analyzed for in this study were lactate, formate, acetate, propionate, and butyrate.

Formate was detected only in ground water (Table 12) and surface water samples. Although formate was analyzed for in three of the five sampling rounds, there were quality control issues (blanks) in the March 2012 and December 2012 sampling rounds (see Appendix A, Table A23). Table 12 presents the summary statistics for the data collected, but the data are questionable.

Acetate, like formate, was not detected in any of the produced water samples analyzed. However, there were quality control issues (all equipment blanks) during the September 2011 sampling round (See Appendix A for details concerning equipment blanks). Acetate was detected in a total of 17 surface water and ground water samples (Table 12), and 11 of those detections were for the September 2011 sampling round, which were deemed unusable. The five remaining detections were in ground water samples, and this is likely naturally occurring acetate in the aquifer. The surface water detections were likely indicative of background conditions.

Glycols

The presence and concentration of glycol compounds were evaluated in part because they are used in hydraulic fracturing (U.S. House of Representatives, 2011; Alpha Environmental Consultants, 2009; GWPC, 2009). Both surface water and ground water samples were analyzed for glycols (2-butoxyethanol, diethylene glycol, triethylene glycol, and tetraethylene glycol). Glycols were not detected in any of the surface water or ground water samples (Table B-5, Appendix B).

Diesel Range Organic Compounds (DRO) and Gasoline Range Organic Compounds (GRO)

DROs and GROs were used to screen for petroleum contamination in this study. A summary of all the data collected for DROs and GROs is presented in Table B-5, Appendix B.

DROs were detected in surface water samples at concentrations ranging from 162 to 770 µg/L, with a median concentration of 178 µg/L (Table 12). Although DROs were detected in these samples, there were no corresponding detections of other organic parameters that would be in this range.

Isotopes

Isotopic data collected as part of this study comprised stable water isotopes (δ^2H and $\delta^{18}O$) and strontium isotopes (^{87}Sr and ^{86}Sr). Isotopes can be used to fingerprint water to identify potential sources. In this study, isotope data were collected for ground water, surface water, and produced water. Stable isotope data collected during the study are detailed in Appendix B, Table B-7. Stable isotope results are discussed in detail in the site-specific section of this report; however, it should be noted that WISETXGW01, WISETXGW05 and WISETXGW 08 appear to be outliers.

7. Site-Specific Focus Area – Location B

The approach used for the historical data comparisons may not be representative of the true background, or geogenic background, in Wise County, because it potentially neglects data that may be impacted by other sources of contamination. For example, Battelle (2013) reported that there were 211 known ground water contaminations between 1993 and 2008 as the result of oil and gas activities in Wise County. This means that the water quality data from the historical databases used for the previous comparisons may have been impacted. In their analysis of the Trinity and Woodbine aquifers, Chandhuri and Ale (2013) concluded there should be zone-specific groundwater management. This conclusion was based on the evolving hydrogeochemical facies and increasing salinization in distinct spatial zones over time.

7.1. Other Approaches to Determining Background

Other approaches can be used to help delineate background in geochemical data (Matschullat et al., 2000; Reimann et al., 2008). Matschullat et al. (2000) proposed several other means of determining background concentrations, specifically, methods designed to predict the upper limits of the threshold of background. These methods include the Iterative 2σ technique, the 4σ outlier test, the calculated distribution function, and the Inflection points on a cumulative frequency curve. Reimann et al. (2008) suggested the use of the mean±2σ. Matschullat et al. (2000) concluded that the iterative 2σ-technique and the calculated distribution function provide realistic approximations of the background condition; however, they further point out that no single method can provide absolute results due to the inherent complexity of geochemical data sets.

These techniques were applied to the chloride data from the NWIS and TXWDB databases and collected in the study. Chloride was chosen because of chloride's conservative chemical behavior in most ground water environments and showed the biggest differences when compared with previous discussion comparing study data to historical data. The results of these tests are summarized in Table 13. The critical value for the upper threshold of background is the mean±2σ. Examination of the table indicates that when all the historical and collected study data are used, the mean±2σ is at least 1.5 times greater than the other methods and can be as much as 6.9 times greater than the other methods. This suggests that the use of all of the chloride data is much more prone to include outliers that are not part of the background. In addition, it has already been pointed out from another study (Battelle, 2013) that the historical data should be used with caution and there have been many reported ground water contaminations. These facts need to be factored into any background water quality assessment, as there could be outliers that need to be accounted for before comparing the study data with background data.

The Iterative 2σ technique and the calculated distribution function were the least conservative approaches, and the use of these two approaches presents the greatest risk of developing erroneous conclusions (Table 13). The other three methods, the 4σ outlier test, inflection points on a cumulative frequency curve, and the classical mean±2σ, all yielded comparable critical mean±2σ values (Table 13). The latter three methods are more likely to provide realistic reflections of the background chloride concentrations and the natural variability of chloride concentrations.

Table 13. Alternative approaches to determining background using chloride concentrations as an example.

Method	n	Mean	Median	Std Dev	Min	Max	Mean + 2STD
All Data	223	176	60.2	317	0.5	1970	810
Classical (2x Standard Deviation)	214	123	57.9	163	0.5	788	449
Iterative 2σ technique	198	86	52.3	101	0.5	449	288
4σ outlier test	218	139	59	202	0.5	1170	544
Calculated Distribution Function	160	46	39.5	36	0.5	143	118
Inflection points on cumulative frequency curve	---	---	---	---	---	---	500

Samples from WISETXGW01 had the three highest concentrations of chloride ever detected in Wise County, based on the historical data used. In fact, all of the samples collected from WISETXGW01 had chloride concentrations that were above the 90th percentile, and four of the five samples collected had concentrations above the 95th percentile. Similarly, samples collected from WISETXGW08 had the fourth and fifth highest concentrations of chloride detected in Wise County. All of the samples from this well had chloride concentrations above the 90th percentile, and four of these five samples also had chloride concentrations above the 95th percentile. This further supports the conclusion that the results from WISETXGW01 and WISETXGW08 are outliers and have impacted ground water. Most samples for WISETXGW01 and WISETXGW08 exceed the critical mean±2σ value using all the data, and exceed the critical mean±2σ value for all other tests. This also supports the conclusions that the results from WISETXGW01 and WISETXGW08 are outliers and the ground water from these wells has been impacted.

The chloride concentrations in the site-specific background wells never exceeded the 61st percentile. The presence of five site-specific background wells less than 1,025 ft from WISETXGW01 and five site-specific background wells within 2,000 ft of WISETXGW08, in which chloride concentrations were least 6.5 times to more than 25 times lower, also supports the conclusion that these two wells have been impacted. Based on this analysis, further investigations were needed into the cause of the anomalies found for WISETXGW01 and WISETXGW08. Therefore a standard methodology for how to establish the background conditions of these impacted wells was developed and is discussed below.

7.2. EPA Guidance on Establishment of Background (Site-Specific Background)

Consistent with almost all reported incidents of private water well contamination, no site-specific, pre-existing baseline water quality monitoring data were available at the Wise County retrospective case study locations. Therefore, background concentrations of potential constituents of concern cannot be established based on data from before the nearby oil and gas activities were implemented.

EPA has long-established policies and guidance documents for establishing background concentrations. Examples include the Resource Conservation and Recovery Act (RCRA) Corrective Action Program, *RCRA Facility Investigation (RFI) Guidance* (US EPA, 1989), and the Superfund program, *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final* (US EPA, 1988). These guidance documents were developed for robust investigations at either RCRA-regulated facilities conducting corrective action investigations or Superfund remedial investigations at National Priorities

List (NPL) sites. In addition to the review of existing information and available reports, these programs require extensive testing of environmental media at and/or near the site, including the installation of monitoring wells in unimpacted, upgradient areas to establish background conditions. These requirements exceed what is appropriate for an initial investigation of reports of impacts in private water wells.

A more appropriate analogy for comparison of the Tier 2 investigatory efforts for this case study is the approach of the Superfund program's Preliminary Assessment and Site Inspection (PA/SI) process. The case study was an initial investigation, designed not to characterize the full extent of potential contamination but to confirm that an impact on the site exists and could inform future work. This is very similar to the PA/SI purpose.

The Superfund program's document, *Establishing Background Levels*, (US EPA, 1995), provides guidance on how EPA establishes background concentrations for the PA/SI process and describes the approach taken in the Tier 2 of this case study.

Sampling is not always required to establish background, as some anthropogenic constituents can only be attributed to a source. Some constituents (e.g., metals) may occur either naturally or result from human activities. In the Wise County case study, generally all wells in each sampling round were sampled for the full suite of constituents (see Table 2) so that if anthropogenic or natural background levels were present, they would be accurately reflected (Table 2).

As described in detail in the Study Methods section, EPA sampled additional wells around the originally reported impacted wells in an attempt to (1) identify potentially unimpacted wells that could be used to establish background concentrations, and (2) evaluate the extent of impacts, if such impacts were confirmed. EPA also located published information about the aquifers in the area as well as any water quality data available from local, state, or federal entities. Where available, well construction records were also reviewed. EPA used a systematic approach to plan and implement well purging and sampling and analytical procedures, as documented in each case study QAPP, to ensure consistent results, comparability, and usefulness of data.

7.2.1. Application to Location B

Location B is located in central Wise County; five homeowners and one corporate-owned site, with a total of ten water wells in the area, participated in the study (Figure 10). All of the wells in this area were completed in the Trinity aquifer at similar depths by a single water well driller who has operated in the county for approximately 40 years. The driller indicated that all of the wells were completed in the Trinity aquifer, using similar well construction techniques (Bisidas, 2011). As noted in the guidance, this helps to ensure comparability between wells and allows confidence in establishing background concentrations. Local gradients could not be established because of the inability to measure static water levels and lack of surveyed well elevation data. The consistency of the analytical data from surrounding wells allows impacted wells with significantly different water quality to be identified. Samples from two wells in this area (WISETXGW01 and WISETXGW08) had significant deviations from the background water quality, which was established by comparison with the surrounding, unimpacted water wells. Additionally, several published reports that discuss water quality in the Trinity aquifer in this area were identified (Scott and Armstrong, 1932; Hudak and Blanchard, 1997; Nordstorm, 1982).

In summary, the analysis for Location B met the appropriate procedures for establishing background values by using the following: (1) historical reports of water quality in the area; (2) analytical data from nearby, unimpacted wells; (3) wells completed in the same aquifer; (4) wells completed with similar techniques; (5) consistent well purging and sampling techniques; and (6) documented quality assurance procedures that met project requirements. These procedures complied with the applicable and relevant guidance and allowed establishment of background levels of constituents of concern in the study areas sufficient for identifying potentially impacted wells. Comparisons of the potentially impacted wells with site-specific wells are discussed below.

7.3. Site-Specific Background Comparisons

7.3.1. Parameter-to-Parameter Comparisons

The summary statistic and statistical plot for anions are given in Table 14 and on Figure 38. Statistical analysis for chloride showed that the potentially impacted wells were significantly different from the site-specific background wells (p-value = 0.000001). The differences described at this scale for sulfate were also statistically significant (p-value = 0.002). WISETXGW01 and WISETXGW08 had bromide concentrations that were much higher than the concentrations in other wells in Location B (p-value = 0.000001). The iodide concentrations in the potentially impacted wells were also statistically different than in the site-specific background wells (p-value = 0.00003).

Summary statistics and statistical plots were also developed for cations analyzed during the study (Table 14 and Figure 28). As this comparison shows, calcium concentrations in the potentially impacted wells were different than the site-specific background wells (p-value = 0.000045). The potentially impacted wells had a wider range of potassium concentrations and a higher median potassium concentration than the site-specific background wells (p-value = 0.0009). The site-specific background has lower median concentration and ranges of magnesium than the potentially impacted wells (p-value = 0.00005). For sodium, the site-specific background wells and the potentially impacted wells are different (p-value = 0.000002). With regard to boron, there were differences between the site-specific background concentrations and the concentrations from the potentially impacted wells (p-value = 0.00006). As can be seen, the potentially impacted wells were in general higher in median barium concentration, and the maximum of the concentration range was higher (p-value = 0.047). Both the range of strontium concentrations and the median concentrations in the site-specific background wells were different than those from the potentially impacted wells (p-value = 0.00003). These differences were on the order of at least 10×. Fontenot et al. (2013) found that strontium and barium concentrations were elevated in areas near active gas extraction in the Barnett Shale.

Summary statistics and plots for SpC are shown in Table 14 and on Figure 38. Statistical analysis indicates that the three potentially impacted wells SpC were significantly different than the SpC for site-specific background wells (p-value = 0.000000).

7.3.2. Time Trends

In addition to comparing study data to background data, it is also useful to examine the temporal changes of the study data over the course of the study. This type of analysis allows one to understand the changes in a parameter over time and is useful in understanding the natural variability of

Table 14. Ground water summaries and statistics for Location B using site-specific background and potentially impacted wells.

Data Source	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z
Brine Components											
Site-Specific Background	SPC		µS/cm	821	788	94	726	998	7	7	0
Potentially Impacted Wells	SPC		µS/cm	3479	4293	2125	1067	5077	3	3	0
Site-Specific Background	TDS		mg/L	533	510	61	472	649	7	7	0
Potentially Impacted Wells	TDS		mg/L	2352	2790	1229	694	3301	3	3	0
Site-Specific Background	Bicarbonate	Dissolved	mg/L	306	303	23	273	343	7	7	0
Potentially Impacted Wells	Bicarbonate	Dissolved	mg/L	295	310	99	189	385	3	3	0
Site-Specific Background	Chloride	Dissolved	mg/L	53.7	57.5	13.5	34.9	68.7	7	7	0
Potentially Impacted Wells	Chloride	Dissolved	mg/L	856	1064	705	69.8	1434	3	3	0
Site-Specific Background	Sulfate	Dissolved	mg/L	63.8	65.7	29.9	25.8	104	7	7	0
Potentially Impacted Wells	Sulfate	Dissolved	mg/L	130	118	33.1	104	167	3	3	0
Site-Specific Background	Bromide	Dissolved	mg/L	0.20	0.21	0.07	0.09	0.27	7	7	0
Potentially Impacted Wells	Bromide	Dissolved	mg/L	4.31	4.95	3.62	0.42	7.57	3	3	0
Site-Specific Background	Iodide	Dissolved	µg/L	19	17.8	2.39	16.4	23.2	7	7	0
Potentially Impacted Wells	Iodide	Dissolved	µg/L	202	202	---	134	269	2	2	0
Site-Specific Background	Calcium	Dissolved	mg/L	3.53	2.54	1.73	2.12	6.91	7	7	0
Potentially Impacted Wells	Calcium	Dissolved	mg/L	63.5	58.4	24.6	41.8	90.3	3	3	0
Site-Specific Background	Potassium	Dissolved	mg/L	1.32	1.19	0.27	1.03	1.82	7	7	0
Potentially Impacted Wells	Potassium	Dissolved	mg/L	3.87	2.67	2.4	2.31	6.63	3	3	0
Site-Specific Background	Magnesium	Dissolved	mg/L	1.38	1.03	0.85	0.71	3.05	7	7	0
Potentially Impacted Wells	Magnesium	Dissolved	mg/L	27.8	23.2	13.0	17.7	42.4	3	3	0

Table 14. Ground water summaries and statistics for Location B using site-specific background and potentially impacted wells.

Data Source	Parameter	Dissolved/ Total	Units	Mean	Median	Standard Deviation	Min	Max	Locations	N	Z
Site-Specific Background	Sodium	Dissolved	mg/L	179	173	20	159	212	7	7	0
Potentially Impacted Wells	Sodium	Dissolved	mg/L	616	815	410	144	889	3	3	0
Site-Specific Background	Boron	Dissolved	µg/L	176	178	9	157	188	7	7	0
Potentially Impacted Wells	Boron	Dissolved	µg/L	360	386	136	212	481	3	3	0
Site-Specific Background	Barium	Dissolved	µg/L	19	19	3	16	24	7	7	32
Potentially Impacted Wells	Barium	Dissolved	µg/L	62	82	43	13	92	3	3	10
Site-Specific Background	Strontium	Dissolved	µg/L	350	295	128	237	553	7	7	0
Potentially Impacted Wells	Strontium	Dissolved	µg/L	5473	4226	3527	2740	9454	3	3	0
Geochemical Parameters											
Site-Specific Background	pH			8.52	8.6	0.21	8.12	8.70	7	7	0
Potentially Impacted Wells	pH			7.77	7.78	0.52	7.24	8.28	3	3	0
Trace Elements											
Site-Specific Background	Manganese	Dissolved	µg/L	5	5	2	2	7	7	7	20
Potentially Impacted Wells	Manganese	Dissolved	µg/L	39	28	29	17	71	3	3	0
Site-Specific Background	Lithium	Dissolved	µg/L	42	42	10	29	59	7	7	0
Potentially Impacted Wells	Lithium	Dissolved	µg/L	100	100	---	79	120	2	2	0

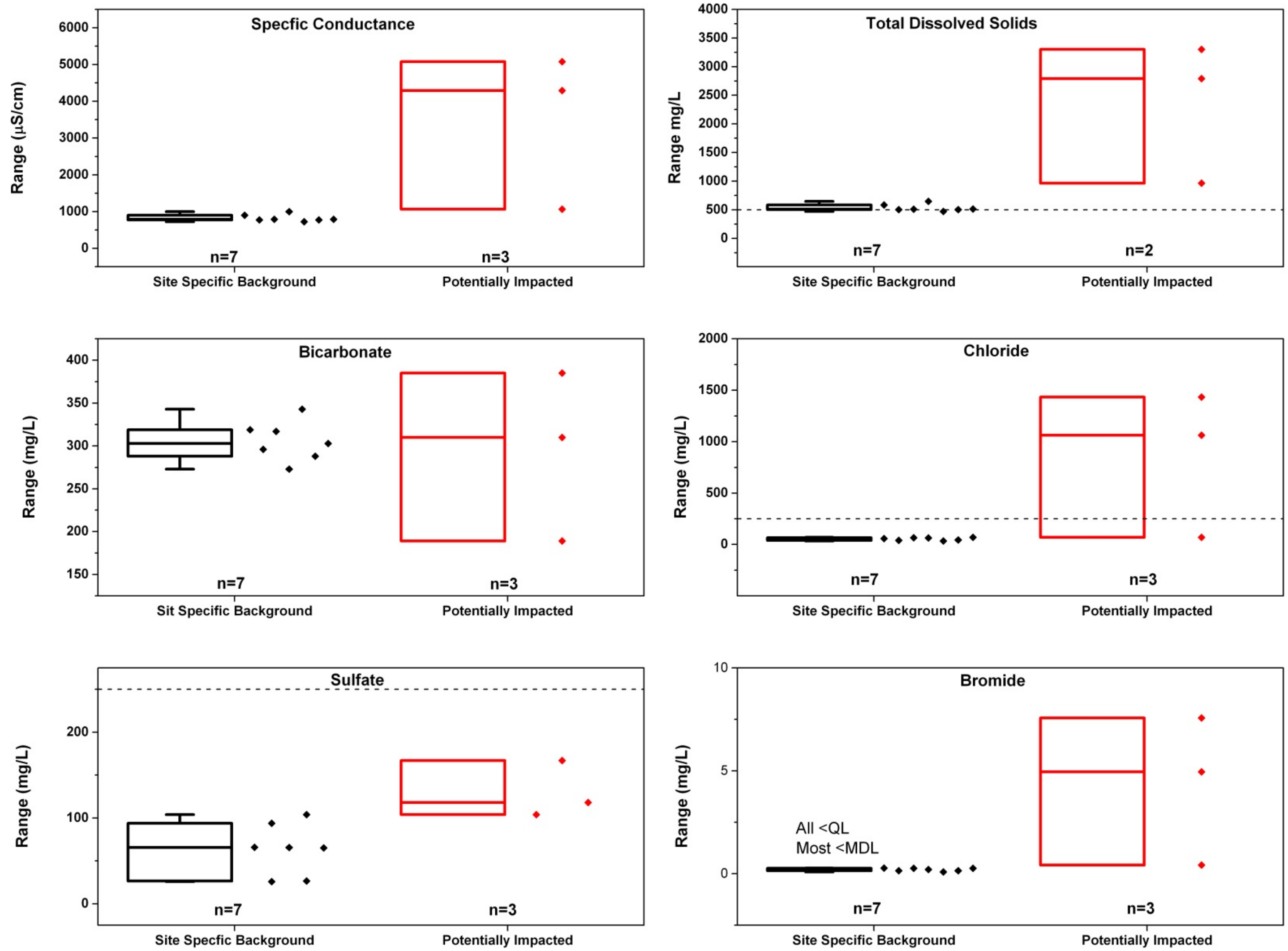


Figure 38. Ground water box and whisker plots comparing site-specific background with potentially impacted wells. The black dashed lines indicate, for constituents that have secondary MCLs, the concentrations of the secondary MCLs.

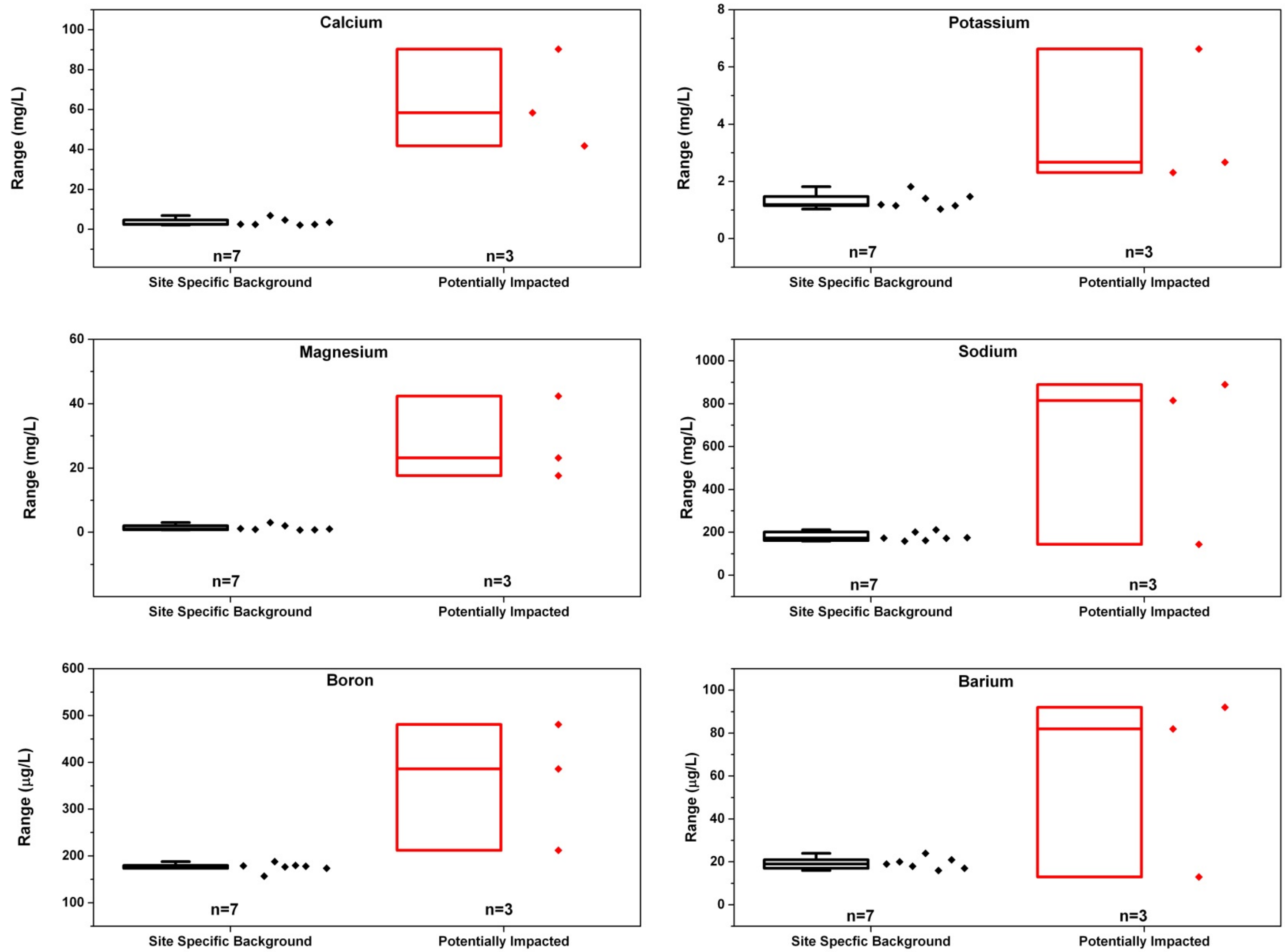


Figure 38 continued. Ground water box and whisker plots comparing site-specific background with potentially impacted wells. The black dashed lines indicate, for constituents that have secondary MCLs, the concentrations of the secondary MCLs.

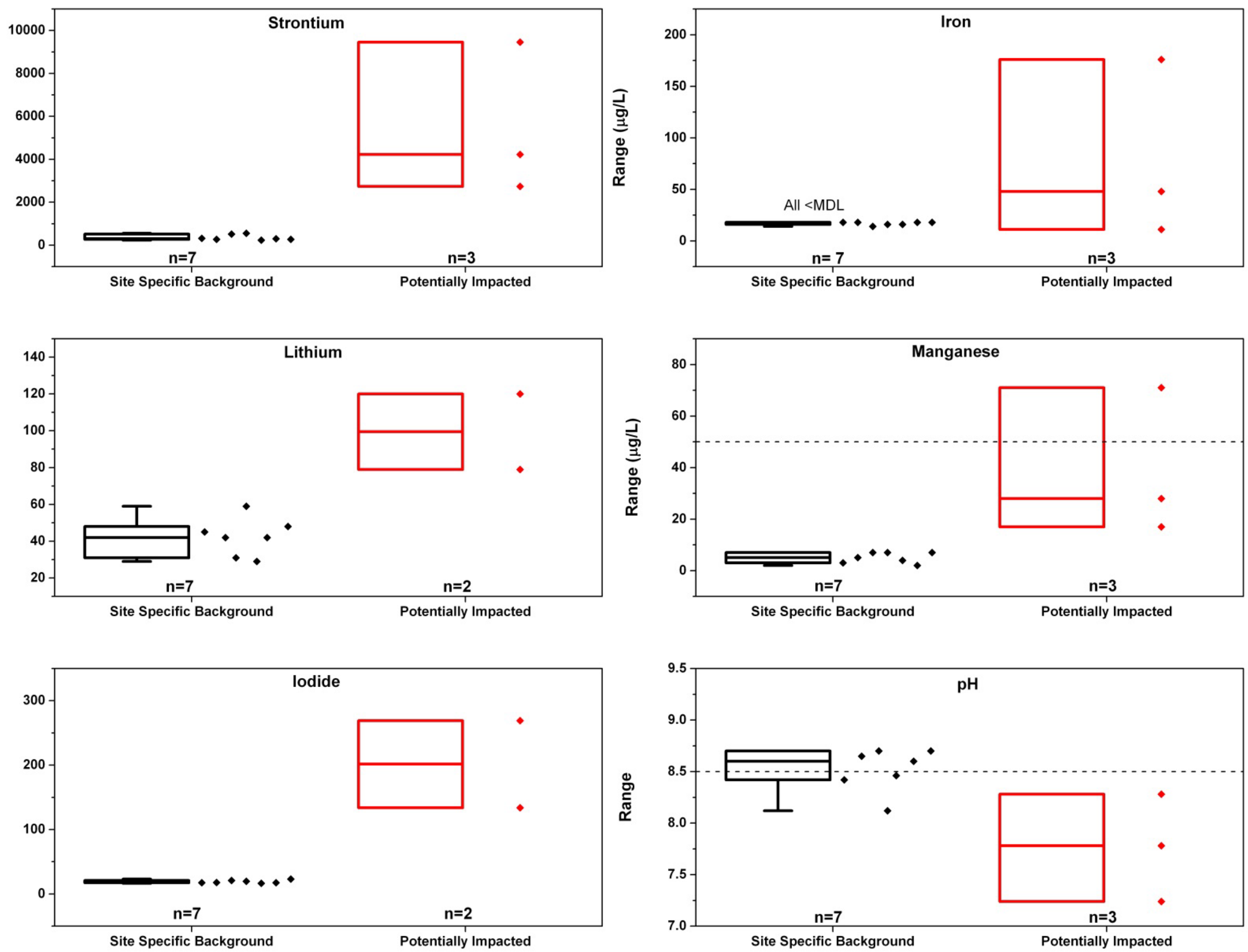


Figure 38 continued. Ground water box and whisker plots comparing site-specific background with potentially impacted wells. The black dashed lines indicate, for constituents that have secondary MCLs, the concentrations of the secondary MCLs.

parameters. Time trends are also valuable in understanding contaminant movement in the water (Guerrero et al., 2010; Olayiwola et al., 2013; Pérez Guerrero et al., 2013). The following discussion will focus on time trends in selected parameters from study Location B.

Time trend data for select parameters is shown on Figure 39. From Figure 39 it can be seen that in all cases, two wells—WISETXGW01 and WISETXGW08—had concentrations greater than most other wells. Additionally, calcium and magnesium in WISETXGW05 was much higher than the other wells at Location B (Figure 39C and 39E). It should be noted that iodide (Figure 39D) was not analyzed for in the initial two sampling rounds and, therefore, there are no iodide data for WISETXGW05.

The concentrations in the site-specific background wells were generally similar and consistent throughout the duration of the study (Figure 39). WISETXGW01 parameter concentrations varied throughout the duration of the study. The exact cause of this variation is unknown, but there are several possibilities. The variability seen in WISETXGW01 could be due to natural variability, contaminant migration, or an anomalous sample. It appears that the concentrations are fluctuating around a mean value or possibly increasing slightly, with the exception of iodide, which appears to have been increasing (Figure 39D). The trend for WISETXGW08 appears to be decreasing concentrations in all parameters except for iodide (Figure 39). This trend is possibly an artifact of the change in the sampling method. After the initial two rounds of sampling, the pump in the well at WISETXGW08 failed and was removed from the well and not replaced by the homeowner. During the remaining sampling rounds, WISETXGW08 was sampled using a portable pump. This could explain the dramatic drop in concentrations seen during the September 2012 sampling, because the well was not completely purged before sampling. The increase in concentrations seen in the May 2013 sampling round may have been caused by the increased purge time, which allowed the well to be purged more completely enabling more effective sampling of formation water. Additional sampling would be required to confirm the trends seen in the data for WISETXGW01 and WISETXGW08. Finally, WISETXGW05 trends cannot be ascertained because EPA was granted access to sample this well only during the initial two sampling rounds.

Several important points can be derived from the time-trend analysis. The site-specific background well samples, in general, have had minimal changes over the course of the study. WISETXGW01 and WISETXGW08, for the parameters discussed, were always higher than the site-specific background wells. Calcium and magnesium concentrations in WISETXGW05 were higher than in site-specific background wells.

7.3.3. Geochemical Relationships

Piper and Schoeller diagrams are useful in the investigation of major ion chemistry (Hounslow, 1995). Figure 40 shows Piper diagram for Location B. The Piper diagram in Figure 40 shows differences in water quality in three wells at Location B. The gray-shaded area represent the extent of the site-specific background in all fields of this plot. In the tri-linear cation field it is apparent that WISETXGW05 is different than the site-specific background. WISETXGW05 is enriched in calcium and magnesium compared with the site-specific background (Figure 40). This was also seen in the time-trend data. The tri-linear anion field of this diagram indicates that WISETXGW01 and WISETXGW08 are enriched with chloride compared with the site-specific background at Location B. The mixing diamond in this Piper

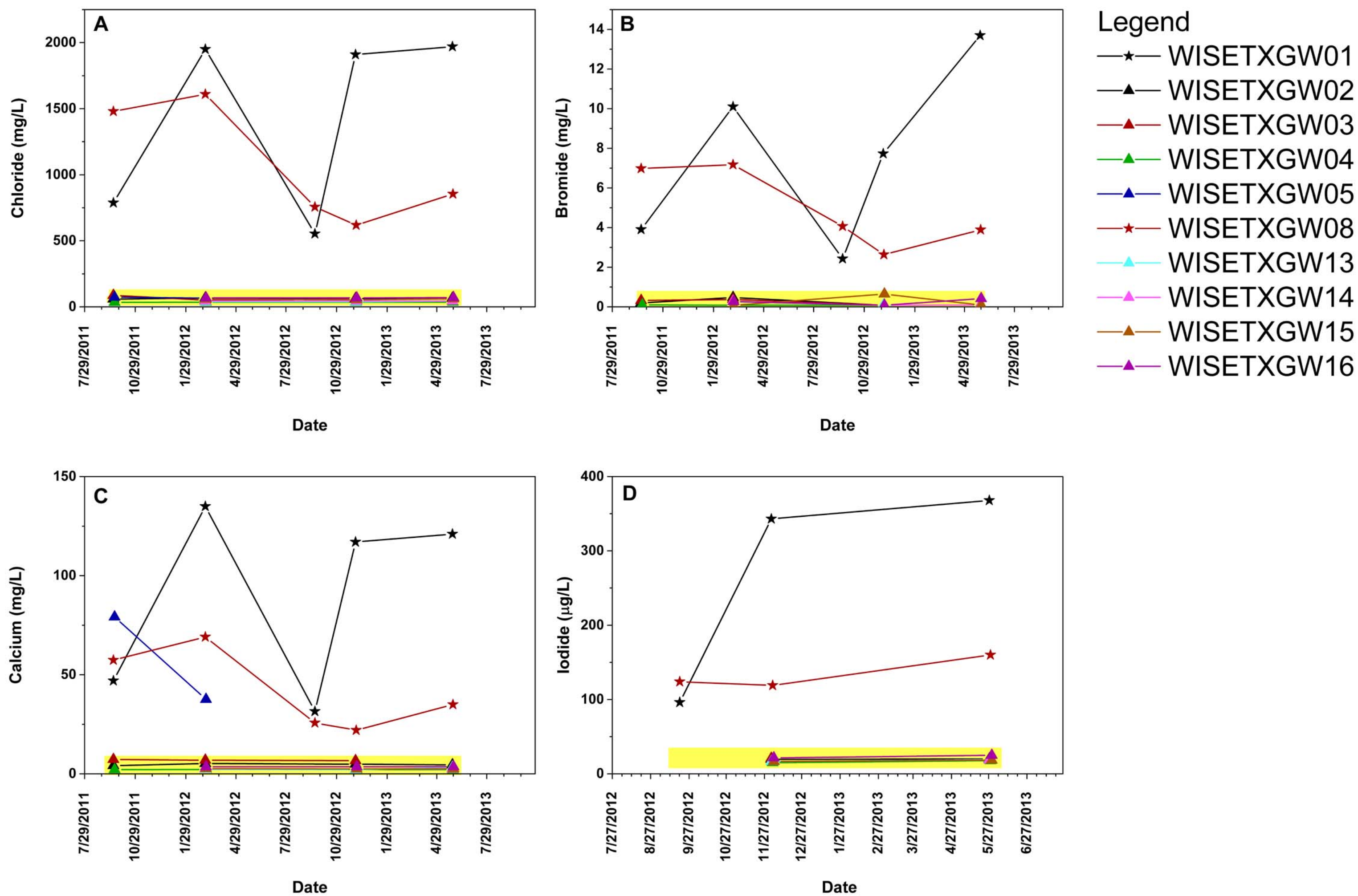


Figure 39. Time trend plots for Location B. (A) chloride, (B) bromide, (C) calcium, and (D) iodide. The yellow box indicates ± 1 standard deviation around the mean site specific background concentration. As is shown WISETXGW01 and WISETXGW08 over the duration of the study were different than site-specific background. WISETXGW05 was different than site-specific background for calcium and manganese when sampled.

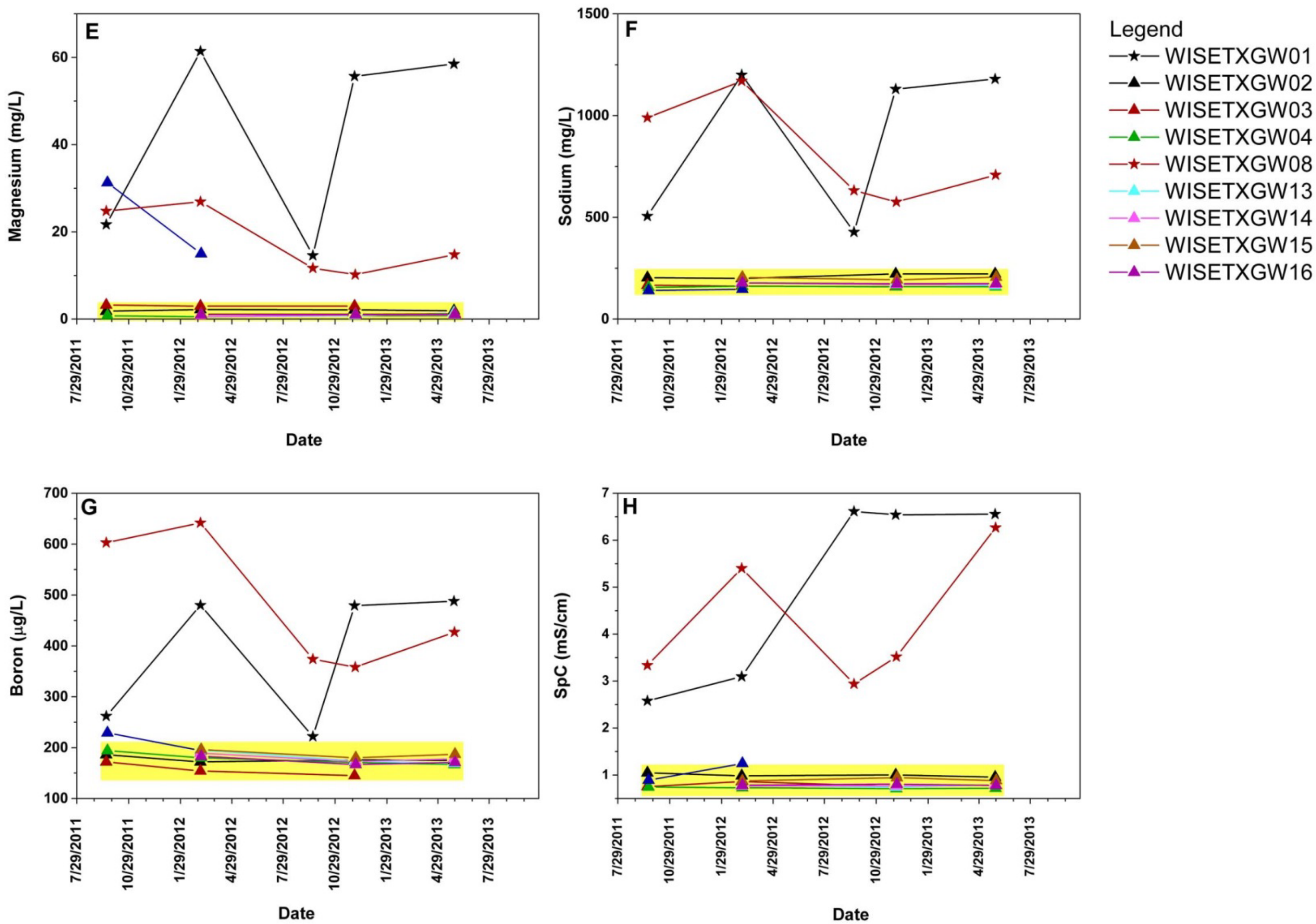


Figure 39 continued. Time trend plots for Location B. (E) magnesium, (F) sodium, (G) boron, and (H) SpC. The yellow box indicates ± 1 standard deviation around the mean site specific background concentration. As is shown WISETXGW01 and WISETXGW08 over the duration of the study were different than site-specific background. WISETXGW05 was different than site-specific background for calcium and manganese when sampled.

diagram also shows that WISETXGW01, WISETXGW05, and WISETXGW08 are different than the site-specific background. WISETXGW01 and WISETXGW08 are enriched with sulfate + chloride, but also are slightly enriched with respect to calcium + magnesium compared with the site-specific background. WISETXGW05 in the mixing diamond is enriched with respect to calcium + magnesium and slightly enriched with respect to sulfate + chloride.

The Schoeller diagram also provides evidence of differences in water chemistry at Location B (Figure 41). The extent of the site-specific background is highlighted by the gray shaded area on this plot. This Schoeller diagram indicates that WISETXGW01, WISETXGW05 and WISETXGW08 are different than the site-specific background. WISETXGW01 (Figure 41) is, in general, enriched with respect to chloride, magnesium, calcium, and sodium + potassium, and in two samples were slightly depleted with respect to bicarbonate. WISETXGW05 as was shown previously is enriched with respect to calcium and magnesium compared to site-specific background (Figure 41). The trends for WISETXGW08 are in general similar to those of WISETXGW01 with the exception that WISETXGW08 is not depleted with respect to bicarbonate and is enriched with respect to sulfate (Figure 41).

Another technique that can be used to infer information about water quality is the use of XY plots of chloride and other parameters (Stoessell, 1997; Faye et al., 2005). This type of plot is shown on Figure 42 for selected parameters. The relative extent of site-specific background is shown by the gray shaded area on this plot. In all cases, WISETXGW01 and WISETXGW08 lie between the site-specific background and the Barnett Shale formation water. (This is discussed in more detail below in the discussion of "Distinguishing Potential Sources of Contamination."). It can also be seen that barium and strontium in WISETXGW05 (Figure 42A, 42D) differ from the site-specific background (see also the discussion of potential sources of contamination for more details).

XY plots of SpC and other parameters can also be evaluated. The usefulness of SpC is that this measurement factors in all chemical species that contribute to the measurement of SpC, not just a single parameter. Figure 43 shows the XY plots of SpC versus barium, chloride, sulfate and strontium. Again, the relative extent of site-specific background is shown by the gray shaded area on this plot. What is apparent in this figure is that WISETXGW01 and WISETXGW08 are different than the site-specific background and Barnett Shale formation water. Barium and strontium concentrations in WISETXGW05 differ from the site-specific background (Figures 43A,C,D) and the other potentially impacted wells. Fontenot et al. (2013) found that strontium and barium concentrations were elevated in areas near active gas extraction in the Barnett Shale. This suggests a different source for WISETXGW01 and WISETXGW08 (see the discussion of potential sources of contamination for more detail).

WISETXGW01, WISETXGW05, and WISETXGW08 are also different than the site specific background with respect to trace elements (Figure 44). WISETXGW01 was elevated with respect to bromide, boron, barium, iron, manganese, strontium, iodide, and lithium. Similarly, WISETXGW08 was elevated with respect to bromide, boron, manganese, strontium, iodide, and lithium. On the other hand, WISETXGW05 was elevated with respect to barium, manganese and strontium. It is important to note that lithium and iodide analysis were not performed on WISETXGW05 since site access was only given for the first two sampling rounds. All of these trace elements are typically elevated in brines. Iron and manganese elevation can also be indicative of naturally occurring processes or other sources of potential impacts.

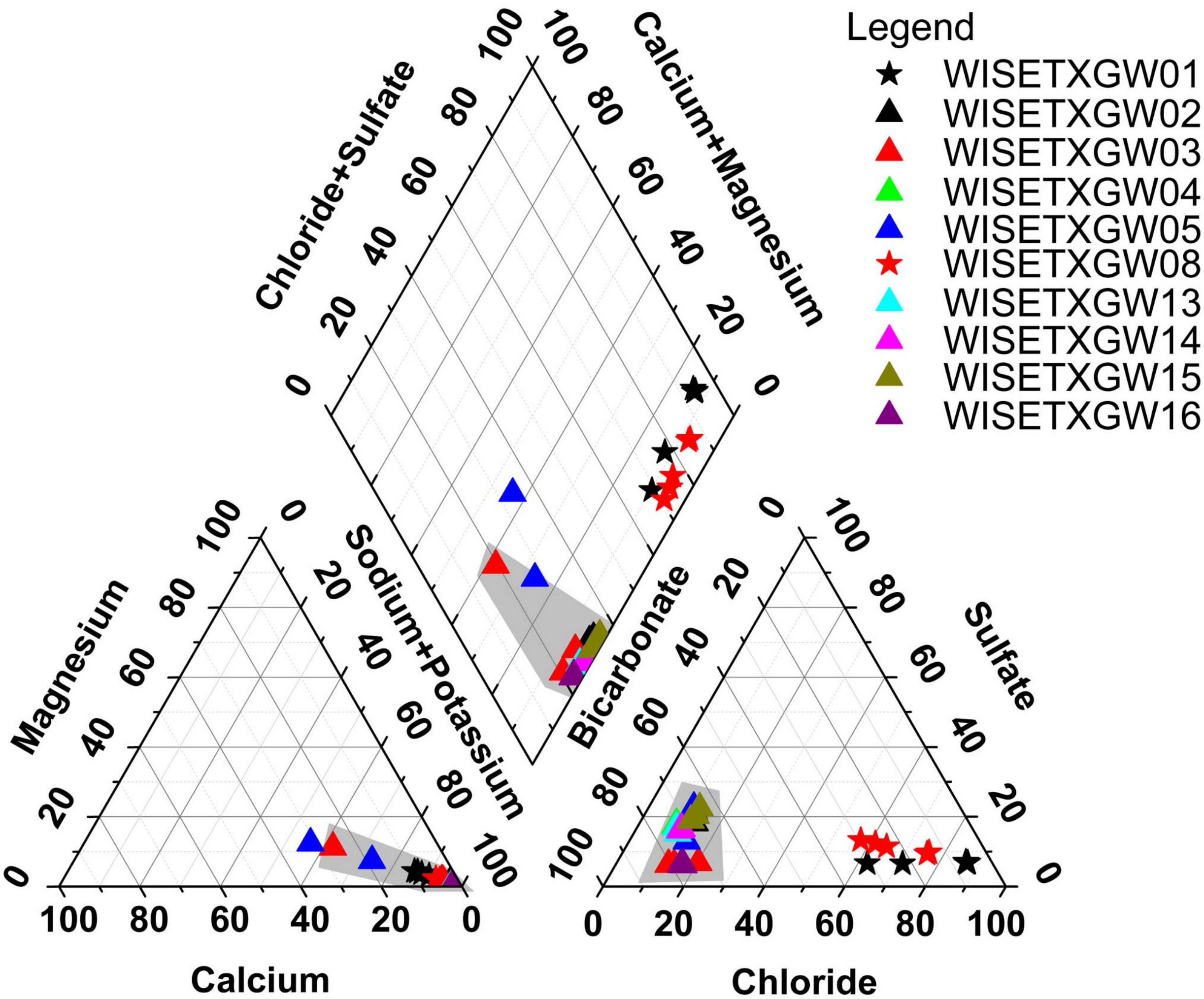


Figure 40. Piper diagram showing major cation and anion relationships for Location B and a comparison to site-specific background. The gray areas show the limits of the site-specific background. The lower left triangular field is the cation field and the lower right triangular field is the anion field. The center diamond field is the mixing field of the anion and cations. WISETXGW01, WISETXGW05 and WISETXGW08 show differences in water quality when compared to site-specific background.

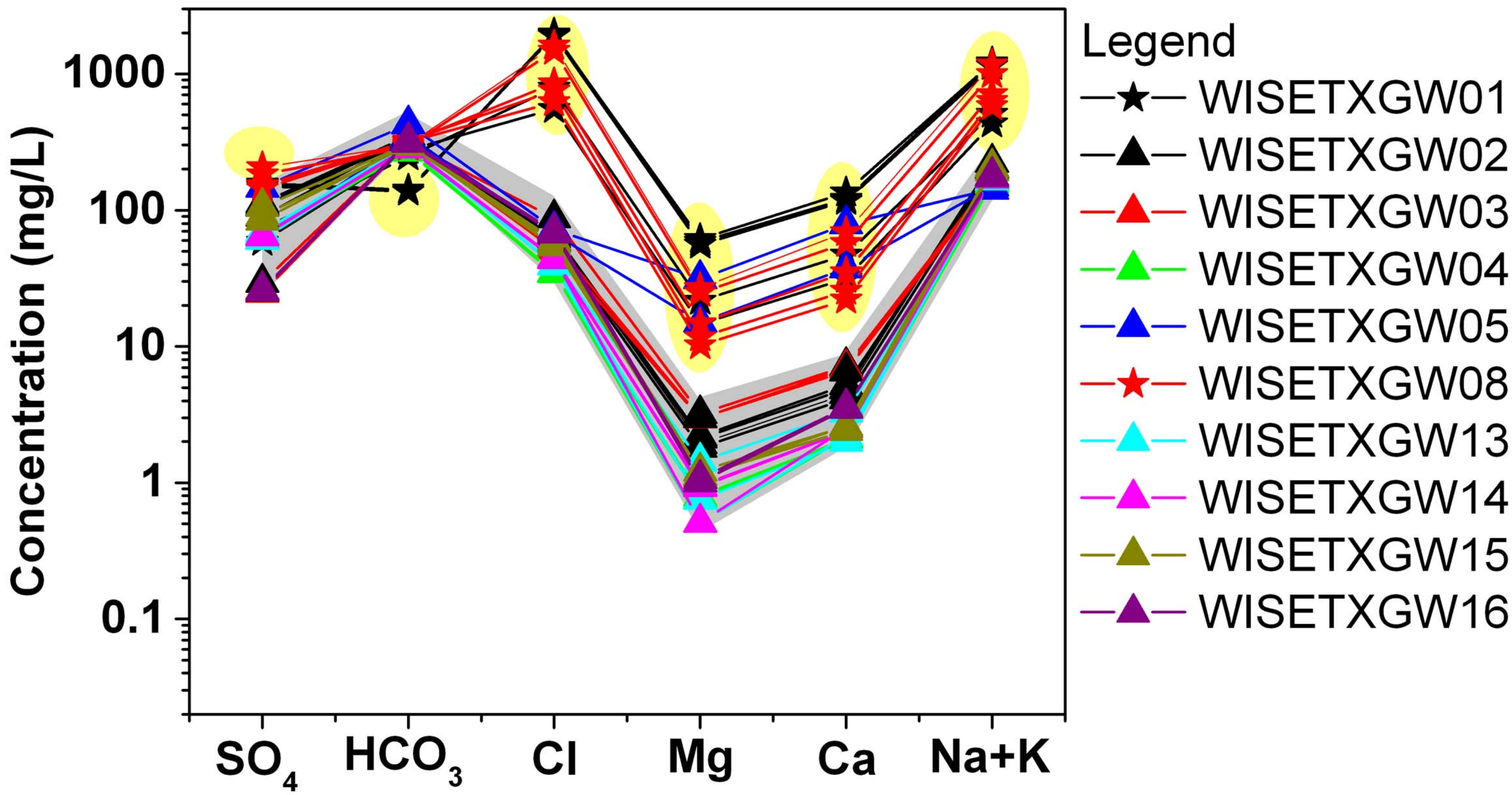


Figure 41. Schoeller diagram showing major cation and anion relationships for Location B and a comparison to site-specific background. The gray areas show the limits of the site-specific background and the yellow areas highlight the deviations from site-specific background. WISETXGW01, WISETXGW05 and WISETXGW08 show differences in water quality when compared to site-specific background.

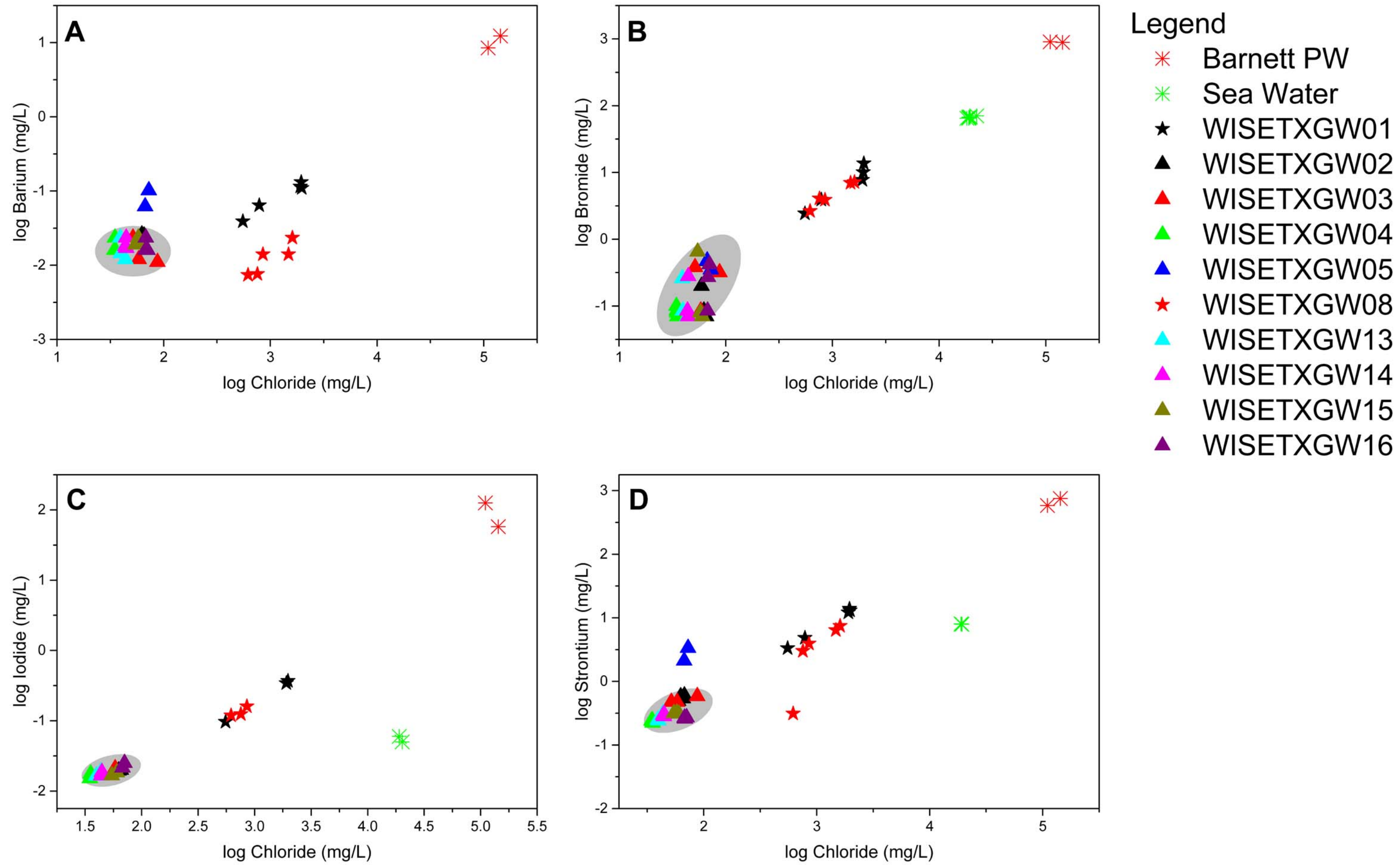


Figure 42. Scatter plots of chloride versus (A) barium, (B) bromide, (C) iodide, and (D) strontium for study Location B. Shaded areas represent the limits of the site-specific background. WISETXGW01 and WISETXGW08 show differences in water quality when compared to site-specific background and generally plot between the site-specific background and Barnett water. WISETXGW05 was different than site-specific background for barium and strontium, but may not plot between the site-specific background and the Barnett water; rather where it plots may indicate a different potential source.

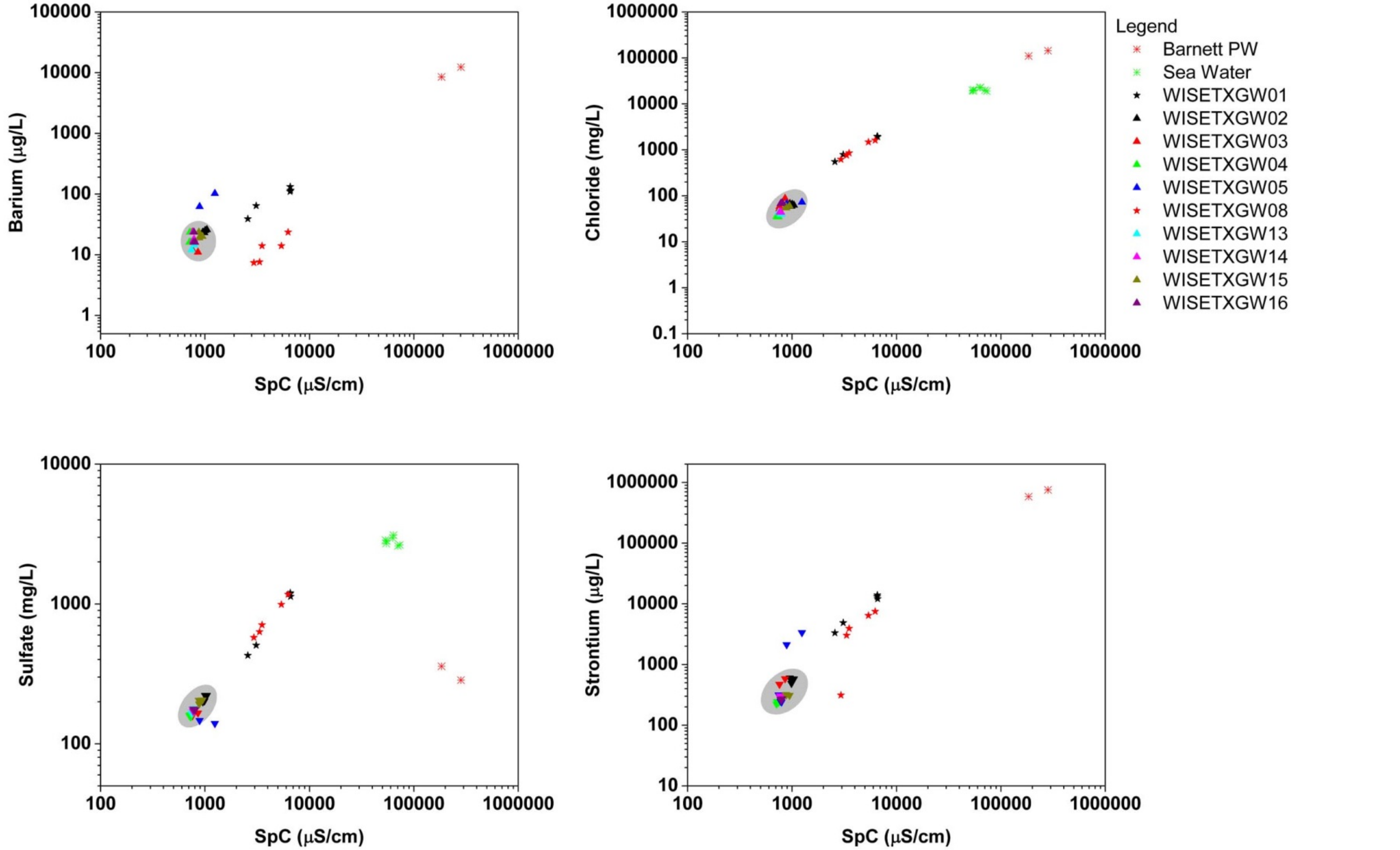


Figure 43. Scatter plots of SpC versus (A) barium, (B) chloride, (C) sulfate, and (D) strontium for study data in Locations B. The gray shaded areas show the limits of the site-specific data. WISETXGW01 and WISETXGW08 show differences in water quality when compared to site-specific background and generally plot between the site-specific background and Barnett water. WISETXGW05 was different than site-specific background for barium strontium, and sulfate, but may not plot between the site-specific background and the Barnett water; rather where it plots may indicate a different potential source.

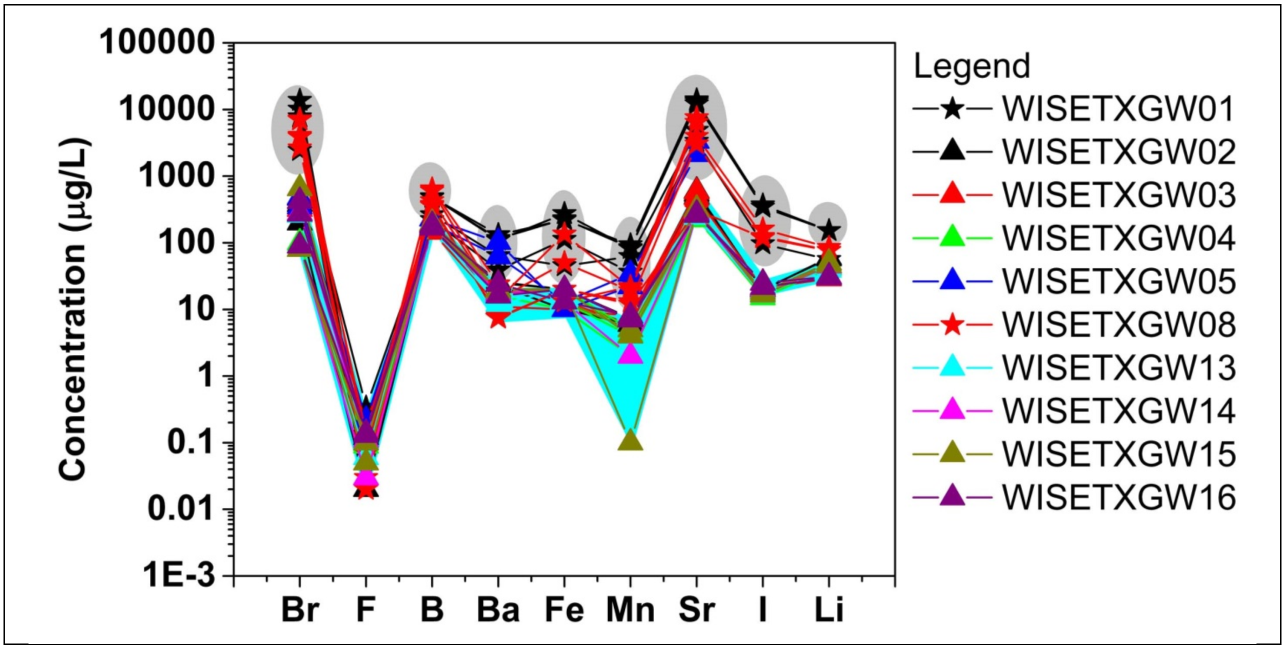


Figure 44. Schoeller diagram of select trace elements at Location B. The cyan shaded area is the limits of the site-specific background data at Location B. The gray shaded areas highlight the deviations from site-specific background. With the exception of fluoride, all selected trace elements for WISETXGW01 and WISETXGW08 were different than site-specific background; for WISETXGW05, barium, manganese, and strontium were different than site-specific background.

WISETXGW01 and WISETXGW08 are consistently different from the site-specific background for all parameters discussed. This indicates that an impact had occurred, although the source of the impact has not been identified. WISETXGW05 differs from the site-specific background for only a few parameters. The source of this contamination could possibly be the same as seen in WISETXGW01 and WISETXGW08, but another plausible explanation has to do with this well's intended purpose. WISETXGW05 is not primarily used for drinking water; it was designed as a supply well. The TRRC has explained to EPA that supply wells are often open bores, or sand-packed bores with just a shallow cementing of the casing at the surface (TRRC, 2013), because this type of well is designed to capture as many water-producing zones as possible to yield the maximum amount of water obtainable. Although WISETXGW05 is completed in the Trinity aquifer, if other water-bearing zones were allowed to mix with Trinity aquifer ground water one would expect this to affect the signature of the water and thus look different than what one would expect from the Trinity aquifer. Because the actual well construction details are unknown, this is a plausible explanation for the observed data for this well. However, other explanations, such as other sources of contamination, could also be plausible and will be addressed in the next section.

7.4. Distinguishing Potential Sources of Contamination

Chloride occurs naturally in groundwater, but elevated concentrations may be due to a number of anthropogenic sources. The Hydraulic Fracturing Study Plan (US EPA, 2011b) states that the retrospective case studies would attempt to identify sources or potential sources of impacts on drinking water quality. The following text discusses the potential sources of contamination at study Location B.

EPA conducted a comprehensive search to identify potential sources of contamination at the study locations (see Appendix C). Based on the initial comparisons of historical background data with the study data collected from Location B, chloride and other components of brine are believed to be what caused the impacts on water quality at this location. This narrows the potential sources of contamination in this location to migration of brines from underlying formations either through naturally occurring fractures or fissures or through penetrations that allow migration of underlying brine into the Trinity aquifer; leaks from reserve pits or impoundments migrating downward to the Trinity aquifer; landfill leachate; and/or land uses such as agriculture. Additionally, there could be other sources of contamination that are currently unknown. Likewise, Battelle (2013), in its assessment of background in Wise County, considered that the most significant sources of contamination were livestock, oil/gas, and construction. Battelle also discussed other sources such an agriculture, mining, waste water, and manufacturing and commercial activities, many of which were found in EPA's search.

Based on the above discussion, an analysis was conducted to help identify the potential source or sources of contamination observed at this study location. Local data for formation brines were available for Wise County from the USGS Produced Water database (USGS, 2002). However, local data were not available for the other potential sources of contamination such as landfill leachate and other land uses. Therefore, a literature search was conducted for data from these sources. It should be noted that there are limitations to the use of literature data over site-specific data for this type of analysis. For example, the fluids from which the literature data were obtained may not derive from the same precipitation, geology, and ambient groundwater chemistry as the study samples, which could cause variations in the signatures of the source fluids. However, the use of literature data can be useful in screening potential sources of contamination as long as the limitations are recognized. The subsequent analysis used a combination of site-specific data and literature review data to provide insight into which potential sources could potentially explain the contamination at Study Location B.

7.5. Source Identification

Hounslow (1995) proposed methods for determining impacts on ground water from petroleum brines using a brine differentiation plot (TDS versus the ratio of chloride to the sum of anions (Cl/Σ anions; Figure 45). The brine differentiation plot (Figure 45A) shows that the site-specific background is not related to petroleum brines. The WISETXGW05 samples are also not impacted by petroleum brines, but are different than the site-specific background and the other potentially impacted wells. Thus, this brine differentiation plot does not provide clues as to the origin of the differences in water quality for WISETXGW05. The data from WISETXGW01 and WISETXGW08, with the exception of one point for WISETXGW08, clearly are consistent with brine impact. This plot does not rule out other sources of contamination; it only suggests that brine is a potential source of the impacts.

Figure 45B indicates that the site-specific background data are consistent with water that is influenced by water-rock interactions, as one would expect. This plot shows that WISETXGW05 is consistent with the site-specific background for Location B and consistent with water sourced from water-rock interactions. A majority of the data for WISETXGW01 is consistent with brine impacts, and two out of

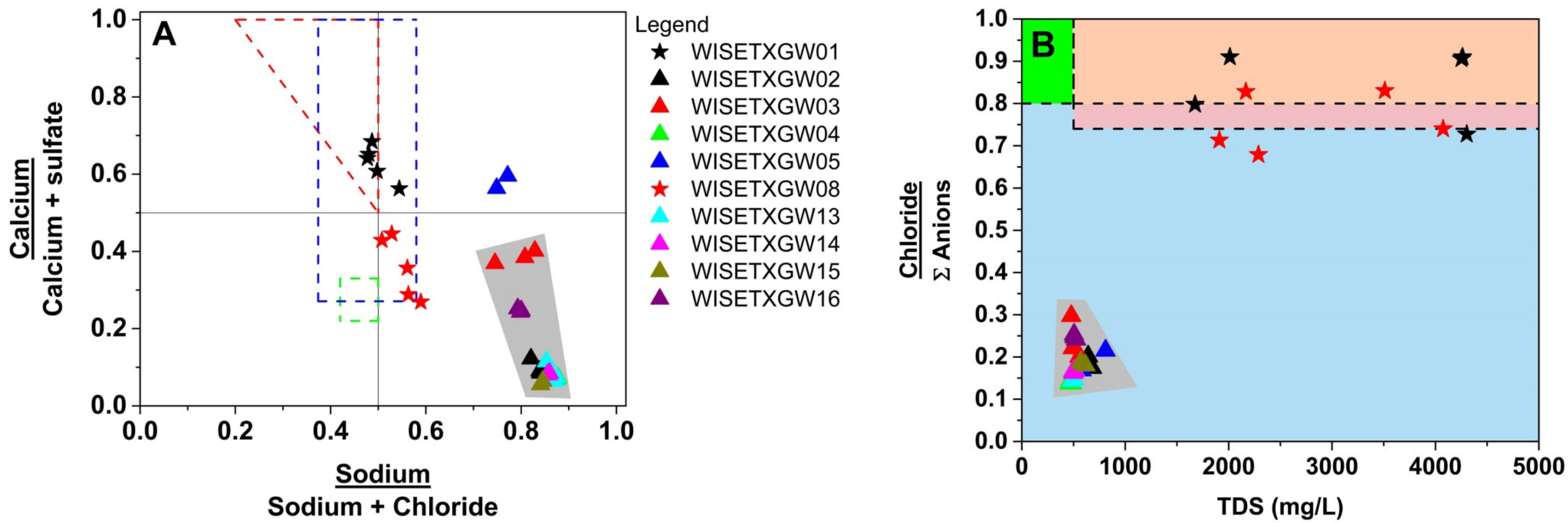


Figure 45. Location B (A) Brine differentiation plots and (B) TDS versus chloride/∑anions plots indicating the potential brine impacts to WISETXGW01 and WISETXGW08. Brine differentiation plots and TDS versus chloride/∑anions plots were used to screen study data to indicate if the water was potentially impacted by brine. (A) The triangular area inside the red dash areas are water potentially impacted by oil field brines that was proposed by Hounslow (1995). The area inside the blue dash areas are water potentially impacted by formation brines based on the USGS Produced Water Data base (USGS, 2002). The gray shades areas highlight the site-specific background wells. (B) The green shaded area represents precipitation like water; the tan shaded area is brine, seawater, and evaporates like water suggested by Hounslow (1995); the magenta shaded area plus the tan shaded areas are brine influenced water based on USGS Produced Water data base (USGS, 2002); the cyan shaded area represents water influenced by rock weathering; and the gray area is the study data. Both plots indicate that WISETXGW01 and WISETXGW08 are potentially brine impacted. WISETXGW05 in the brine differentiation plot is different that the site-specific background, but this plot suggests that WISETXGW05 is not brine impacted based on this screening technique.

three data points for WISETXGW08 are consistent with brine-impacted water. This plot points to the potential for samples from WISETXGW01 and WISETXGW08 to be derived from brines.

Much work has been done to determine sources of contamination in ground water and surface water using ratios, correlation plots, and mixing curves (Leonard and Ward, 1962; Chaudhuri and Clauer, 1993; Howard and Beck, 1993; Stoessell, 1997; Lloyd et al., 1982; Davis et al., 1998; Vengosh and Pankratov, 1998; Hudak and Wachal, 2001; Sánchez-Martos et al., 2002; Hudak, 2003; Faye et al., 2005, Panno et al., 2005; Panno et al., 2006; Freeman, 2007; Peterman et al., 2010; Katz et al., 2011; Hudak, 2012; Peterman et al. 2012; Harkness et al., 2015) as well as the use of isotopes. These ratios, correlation plots, isotopes, and mixing curves are discussed below to try to ascertain the source of the brine seen in the potentially contaminated wells at Location B.

The use of chloride/bromide ratios (Cl/Br) or chloride/iodide ratios (Cl/I) can be used to distinguish between different sources of contamination in water (Stoessell, 1997; Davis et al. 1998; Vengosh and Pankratov, 1998; Panno et al., 2006; Katz et al., 2011; Osborn et al., 2012; Harkness et al., 2015). Data for the several potential sources (sewage/septic tank, halite/road salt, landfill leachate, animal waste, and formation brines) were taken from the literature using U.S. data. It is important to note that although these sources may not be completely appropriate for Location B, they are useful in screening potential sources. Figure 46 shows the Cl/Br and Figure 47 shows the Cl/I for Location B plotted against chloride. Figure 46 shows that the Cl/Br of the site-specific background are very similar to those of the potentially impacted wells, sea water, and water from the Barnett Shale. The dashed lines represent the mixing curves between the median value of the site-specific background and the median values of other sources. What is apparent from this is that potentially impacted wells WISETXGW01 and WISETXGW08 could be the product of mixing of several sources: halite/road salt, seawater, water from the Barnett Shale and/or basin brines. For WISETXGW05 the Cl/Br ratio is similar to site-specific background and no source is suggested. If the native Cl/Br are similar to those of the source, then the effect could be difficult to see (Vengosh and Pankratov, 1998) as is the case at Location B. Therefore the use of the Cl/Br may not be usable as the sole indicator of source (Vengosh and Pankratov, 1998). Sea water can be eliminated as a potential source since Location B is a considerable distance from any sea water source. Halite/road salt is still a potential source even though it is unlikely that road salt is used at Location B, but halite is commonly used in water softeners. Water from the Barnett Shale and basin brines are also potential sources. To provide a better understanding of potential sources, the colored geometric areas represent the chloride and Cl/Br distributions of the various sources (Figure 46). From this, another potential source of the impacts would be landfill leachate. Landfill leachate is a potential source of contamination at Location B, because during the search for other potential contamination sources, a closed landfill was found less than a mile from Location B (see Appendix C).

Figure 47 shows the Cl/I for the data from Location B plotted against chloride. In the case of Cl/I, the produced water from the Barnett Shale is different than the site-specific background and potentially impacted wells. The potentially impacted data lie between the mixing curves of halite/road salt and basin brines and produced water from the Barnett Shale, using the median values to develop the mixing curve. Depending on the point chosen, it would be possible to develop a mixing curve that would go through the potentially impacted data. Therefore, these are potential sources of the impacts. Stoessell (1997) also used ratios of I/Cl (the inverse of Cl/I) to help distinguish water impacted by formation brines in Louisiana and found that it could be a useful tool. Using this method, other sources such as landfill

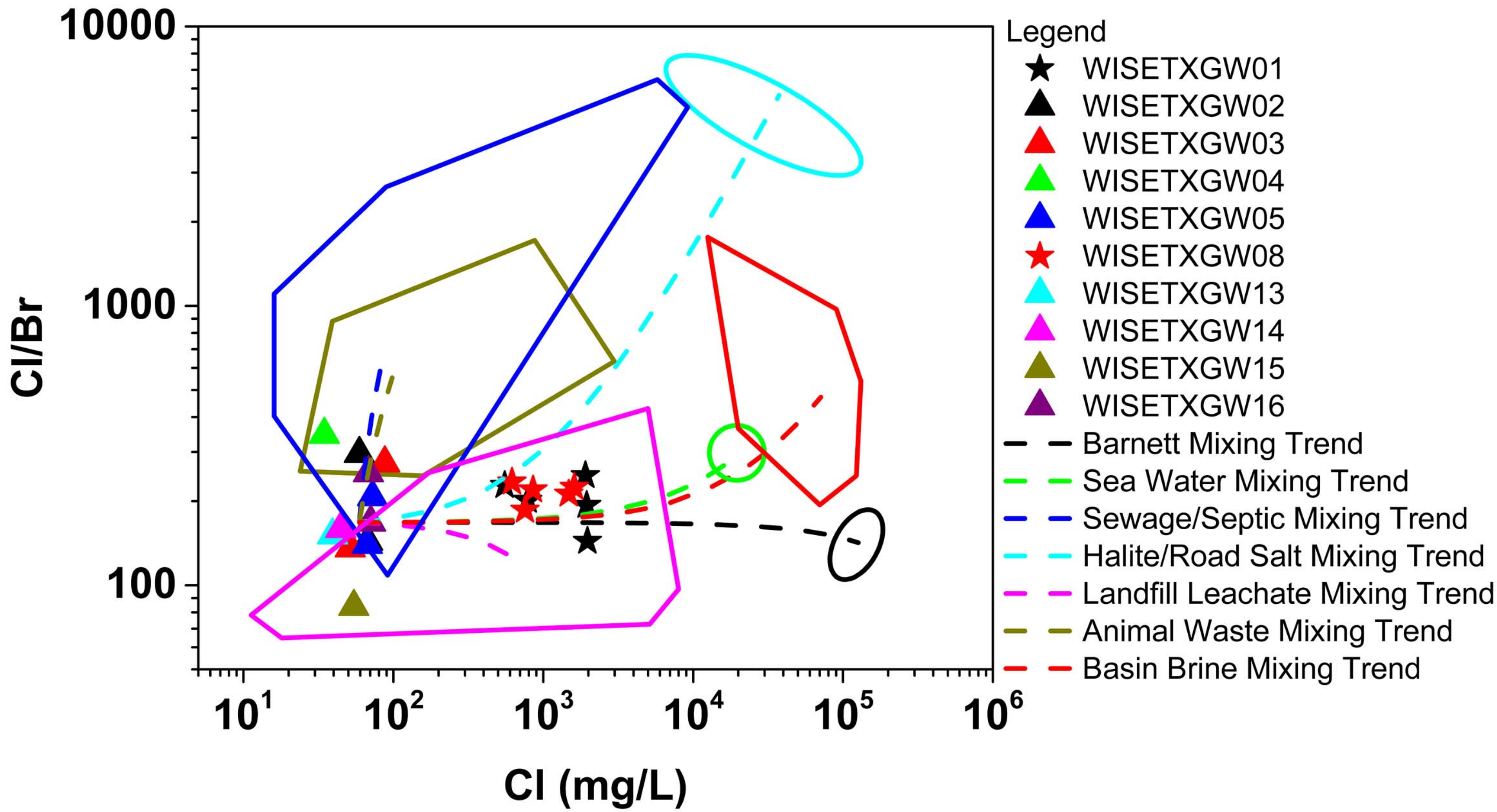


Figure 46. Mixing trends and source fields using chloride versus Cl/Br at Location B. Black outlined area = Barnett field, green outlined area = sea water field, blue outlined area = sewage/septic tank field, cyan outlined area = halite/road salt field, magenta outlined area = landfill leachate field, dark yellow outlined area = animal waste field, red outlined area = basin brines field. See text for discussion.

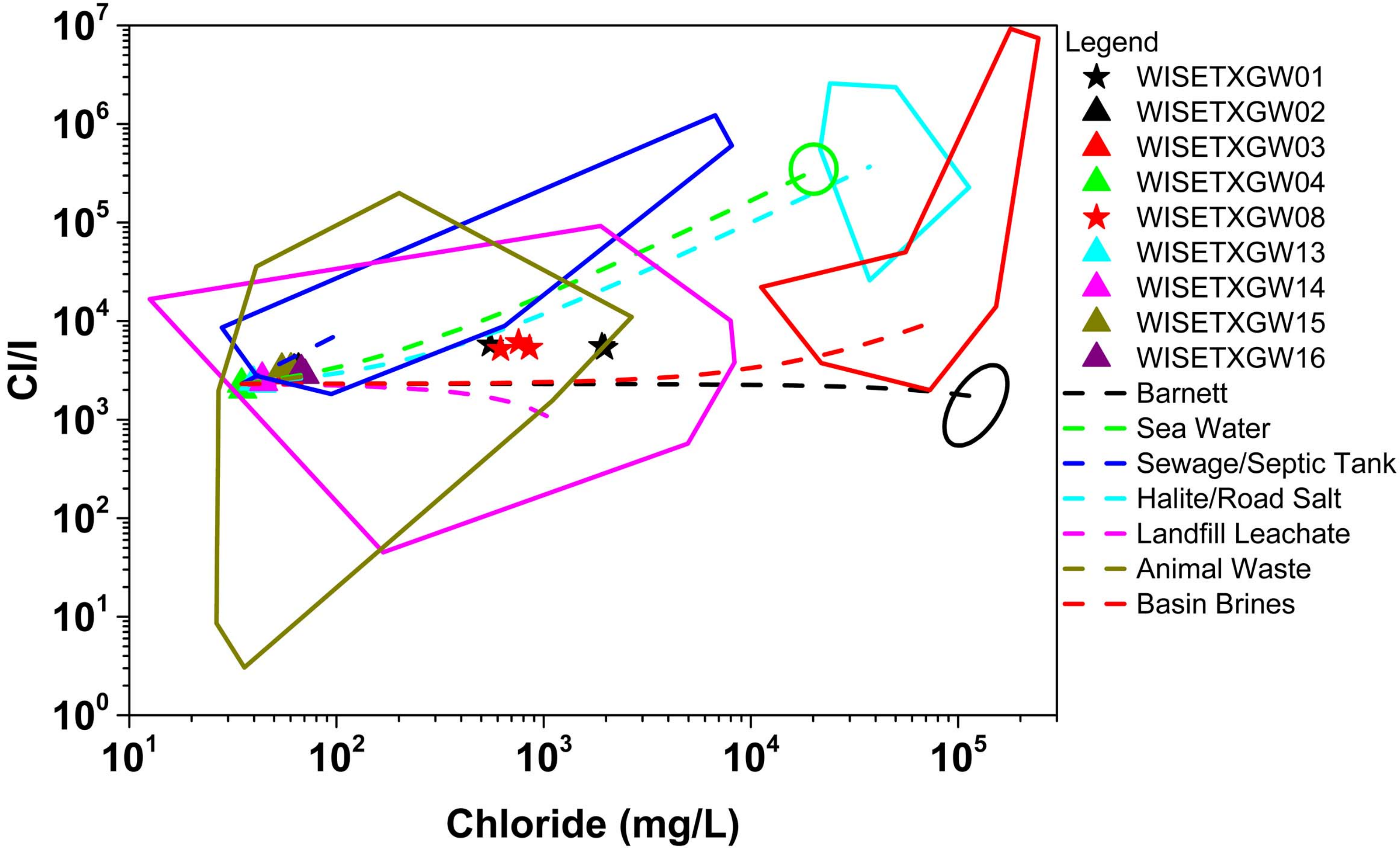


Figure 47. Mixing trends and source fields using chloride versus Cl/I at Location B. Black outlined area = Barnett field, green outlined area = sea water field, blue outlined area = sewage/septic tank field, cyan outlined area = halite/road salt field, magenta outlined area = landfill leachate field, dark yellow outlined area = animal waste field, red outlined area = basin brines field. See text for discussion.

leachate and animal waste would be potential sources of impact at Location B (Figure 47). As noted above, a landfill was identified close to Location B. Animal waste also is possible, because there are cattle and horses near Location B (see Appendix C). Because of the lack of site-specific data for these potential sources of contamination, as well as the lack of information regarding the local hydrology, it is difficult to delineate between the potential sources of contamination at Location B using these methods.

Another ratio plot that can be used is the K/Rb plot. Figure 48 is a plot of potassium versus potassium/rubidium ratio (K/Rb). This figure indicates that the K/Rb for WISETXGW01, WISETXGW05, and WISETXGW08 were intermediate between the site-specific background and Barnett water or seawater and could result from the mixing of these end members. Since no rubidium data were available for the other potential sources the K/Rb could not be compared with WISETXGW01, WISETXGW05, and WISETXGW08.

Isotopic data, such as the stable isotopes of water (δ^2H and δ^{18}O) and strontium isotopes (^{87}Sr/^{86}Sr), have been used in the past to help delineate sources that impact water (Cai et al., 2001; Ma et al.,2007; Chapman et al., 2012; Jørgensen et al., 2008; Szynkiewicz et al., 2008; Peterman et al., 2012; Warner et al., 2012). The stable isotope of water plot for Location B is shown on Figure 49. Figure 49A shows the data collected as part of the study for the site-specific background, potentially impacted wells, and the water from the Barnett Shale. At this scale, it is difficult to see the relationship of the site-specific background and the potentially impacted wells. Figure 49B is an enlargement of the region in Figure 49A shaded in yellow. What is apparent in Figure 49B is that the water isotopic composition of the site-specific background wells and the potentially impacted wells are very similar. Therefore, the stable isotopes of water are not useful in trying to delineate potential sources of impacts found at Location B. Warner et al. (2012) found that the δ^2H and δ^{18}O would need to be a minimum of 20% different to see a significant difference between sources.

The use of strontium isotopes can be a sensitive method to delineate sources of impacts, especially in cases where end-member fluids differ significantly in both concentration and isotope ratio (Peterman et al., 2012). Figure 50 shows hypothetical mixing curves between water from the Barnett Shale and the data collected at Location B. The mixing curves were calculated using the equation from Faure and Mensing (2005) and also used in Peterman et al. (2012):

$$\left(\frac{87}{86}\right) \quad = \frac{}{[\quad]} + \qquad (2)$$

where the (^{87}Sr/^{86}Sr)$_{mix}$ is the isotopic ratio in the mixture, [Sr]$_{mix}$ is the strontium concentration in the mixture, and a and b are constants calculated from the end-member isotopic ratios and concentrations (Faure and Mensing, 2005).

Fluid mixing is expected to be a dynamic rather than a static process, and strontium concentrations and isotope ratios should vary in time as mixing occurs. Figure 51 shows that the ^{87}Sr/^{86}Sr values have been consistent across each sampling round throughout the course of the study, with perhaps a slight decreasing trend, with the exception of WISETXGW13, which shows a marked increase between the December 2012 and May 2013 sampling rounds. An estimate of the uncertainty in the ^{87}Sr/^{86}Sr values is 1.6×10^{-5} based on six duplicate field samples collected over the course of this study. Variability in ^{87}Sr/^{86}Sr ratio observed values at the sampling locations ranged from 0 to 3.5×10^{-5}, with a median value 1.3×10^{-5}. The lack of change or the very slight decreases in strontium isotope ratios suggests that the

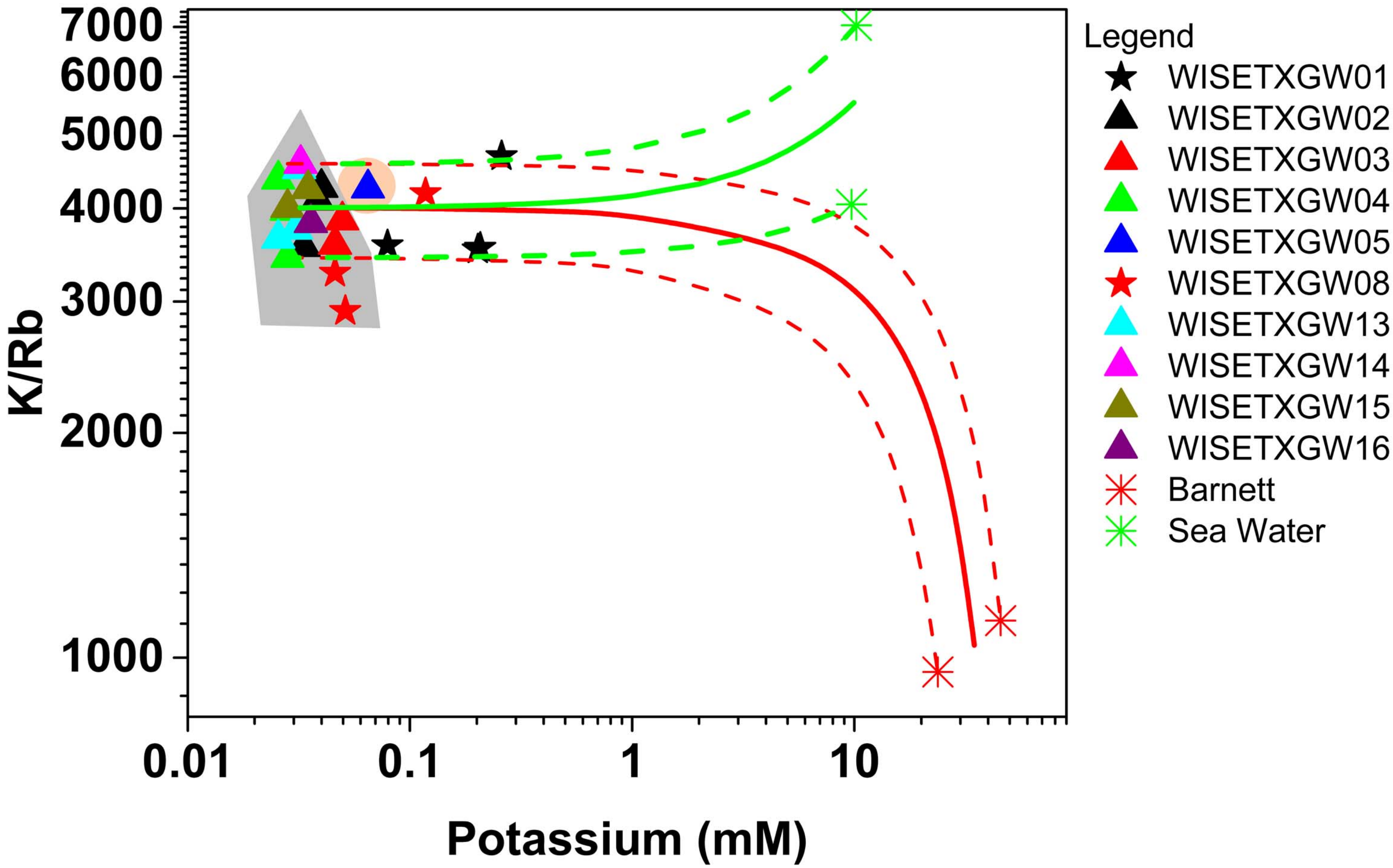


Figure 48. Mixing trends using potassium versus K/Rb at Location B. This figure suggests that WISETXGW01, WISETXGW05 and WISETXGW08 were brine impacted.

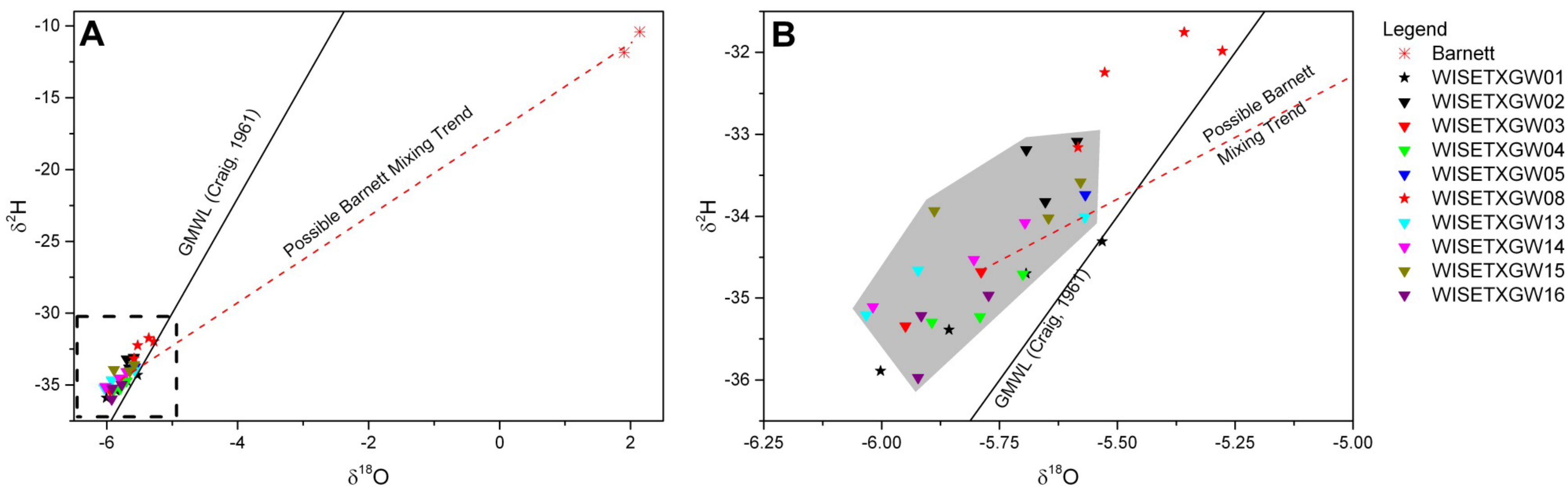


Figure 49. Plots showing the stable isotopes of water for Location B. (A) All data and (B) shows a more detailed view of the shaded area in A. The gray area in B outlines the site specific background and GMWL = global meteoric water line (Craig, 1961). See text for discussion.

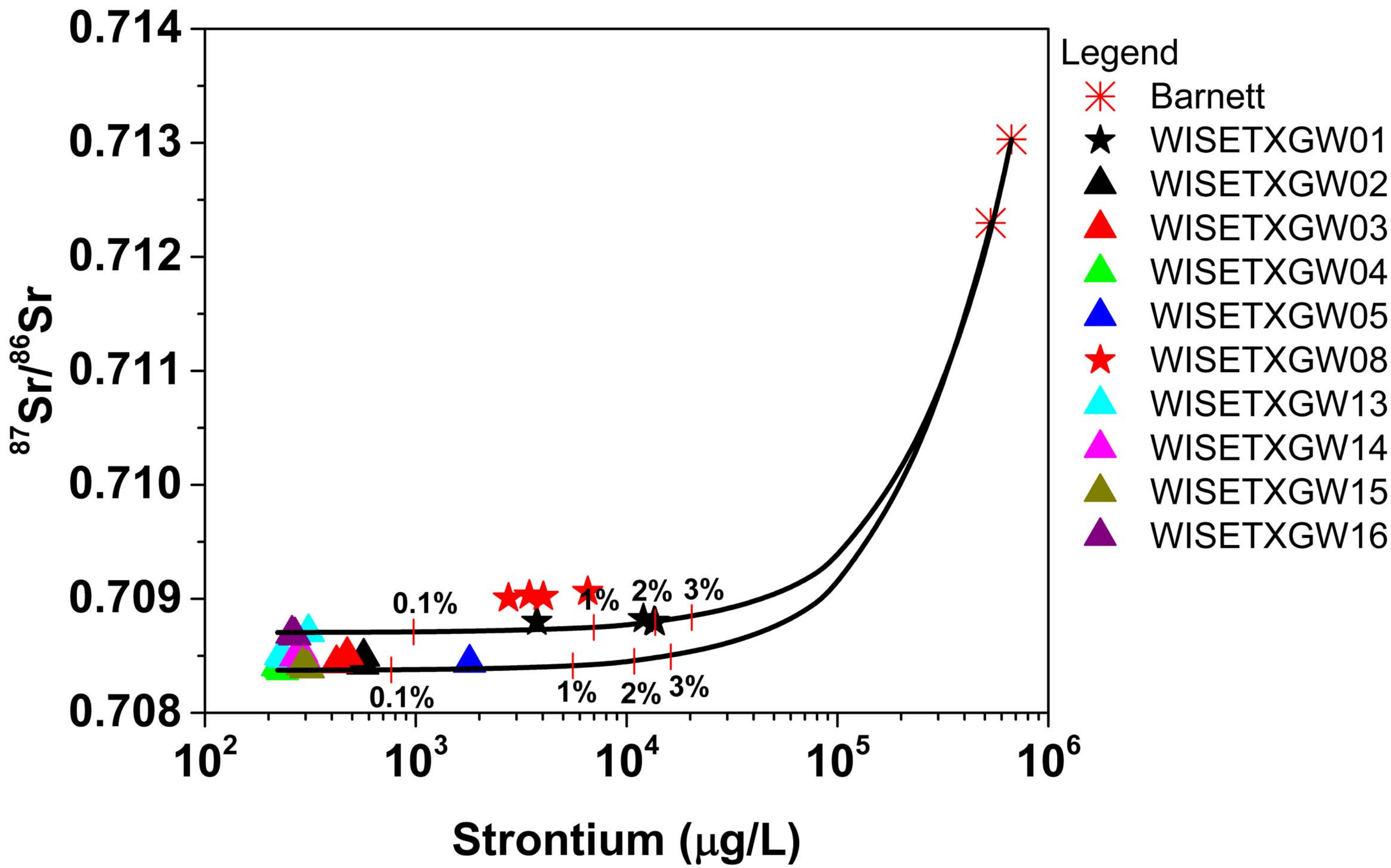


Figure 50. Plots of strontium and $^{87}Sr/^{86}Sr$ isotopic mixing curves. This plot suggests that all three potentially impacted wells (WISETXGW01, WISETXGW05, and WISETXGW08) could have been impacted by a brine source similar to water from the Barnett.

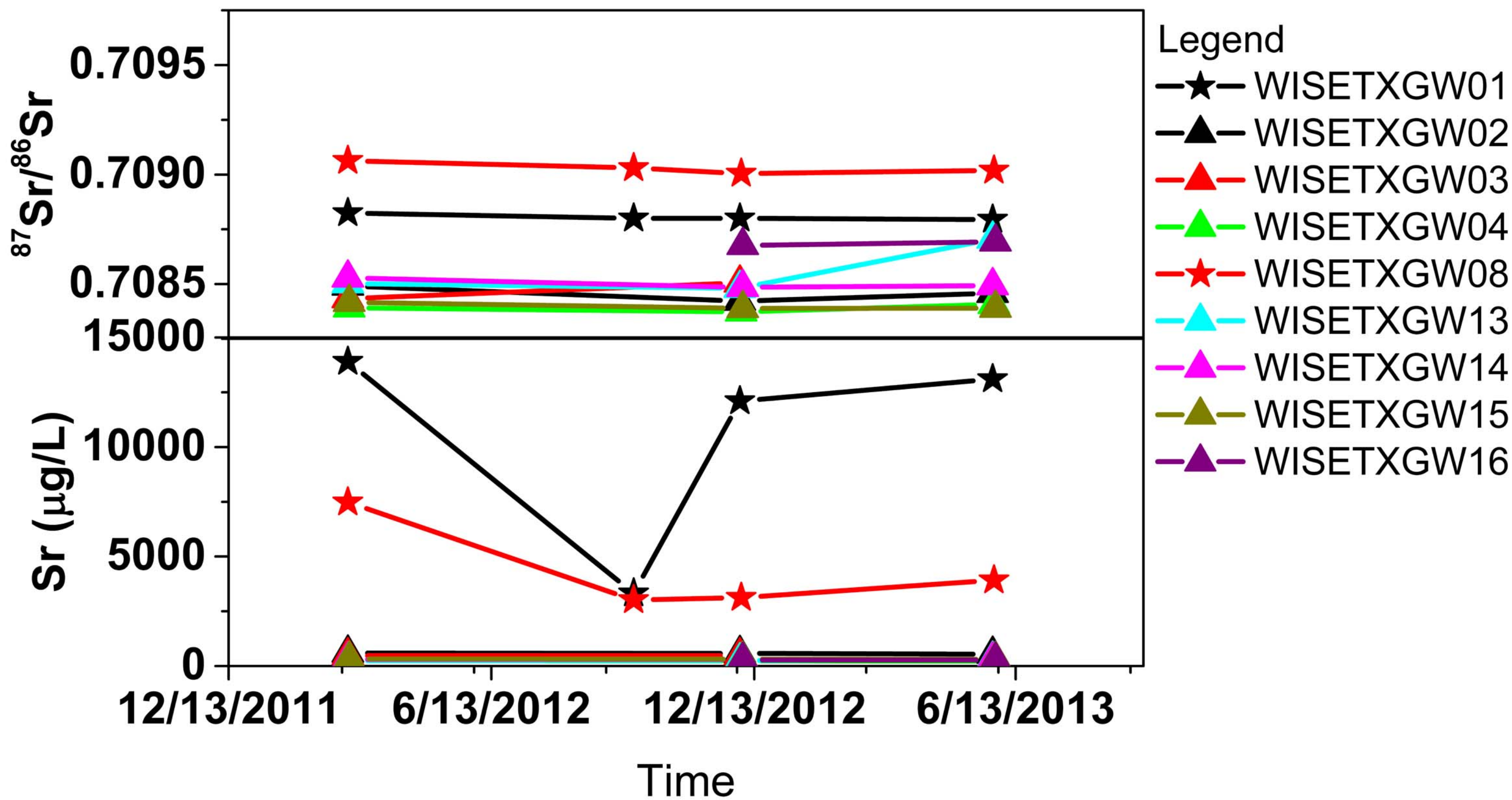


Figure 51. Plots of the temporal variations of $^{87}Sr/^{86}Sr$ and strontium concentrations. See text for discussion.

water is near equilibrium with surrounding aquifer materials. The lack of temporal variability could suggest that water from the Barnett Shale is not generally impacting the Trinity aquifer over the timescale of this study. Even though there was little temporal variability in the $^{87}Sr/^{86}Sr$ ratio, there was a slight difference in the ratios between the site-specific background and the potentially impacted wells (WISETXGW01 and WISETXGW08) consistently throughout the duration of the study (Figures 50 and 51). The strontium concentration from WISETXGW08 decreased with time, and the strontium concentration from WISTXGW01 was variable with time. However, there was a difference in strontium concentrations between the site-specific background and WISETXGW01 and WISETXGW08 as is shown on Figure 51. This difference is not likely due to natural variations in strontium concentrations in the Trinity aquifer, since the site-specific background strontium concentration are very similar in strontium concentration and do not appear to change during the duration of the study. Rather, this difference is likely attributed to mixing of unimpacted Trinity aquifer water with water from another source. Therefore, mixing curves were made as shown on Figure 50. Two mixing curves were constructed using the maximum $^{87}Sr/^{86}Sr$ ratio for the water from the Barnett Shale and the maximum $^{87}Sr/^{86}Sr$ ratio for the site-specific background. The other mixing curve was constructed using the minimum $^{87}Sr/^{86}Sr$ ratio for both. As shown on Figure 50, most of the data collected for WISETXGW01 lies on the mixing curve of the maximum $^{87}Sr/^{86}Sr$ ratio mixing curve, and the data collected for WISETXGW08 plotted just above the maximum $^{87}Sr/^{86}Sr$ ratio curve. With this limited data set for the water from the Barnett Shale, the maximum $^{87}Sr/^{86}Sr$ ratio mixing curve is consistent with a potential impact from this source. This is also consistent with studies of produced water impacting surface water in Montana (Peterman et al., 2012). The contribution of water from the Barnett Shale to the potentially impacted samples is discussed below.

Strontium isotopic data were not found for other potential sources of contamination, so this type of comparison could not be made for these sources. It is plausible that mixing relationships for these sources using $^{87}Sr/^{86}Sr$ ratios could be potentially made. Unlike for the other potential sources of contamination using $^{87}Sr/^{86}Sr$ ratios, it is plausible that water from the Barnett Shale mixing with unimpacted Trinity aquifer water could explain the impacts observed in WISETXGW01 and WISETXGW08. However, this is based solely on the data collected during this study. Nonetheless, one cannot definitively conclude that the Barnett Shale water is the source of the impact seen at Location B.

Correlation plots can also be used for source identification (Stoessell, 1997; Panno et al., 2006). These authors were able to use these types of plots to help distinguish waters consistent with water-rock interactions from other sources and delineated potential sources using conservative mixing of native water with water from another source. Plots of chloride versus bromide reveal that there are potentially three sources for the impacts seen in WISETXGW01 and WISETXGW08 (Figure 52). These potential sources are sea water, animal waste, and water from the Barnett Shale. It is very unlikely that sea water is the source of contamination at Location B in Wise County, because the nearest sea water source is a considerable distance away. Animal waste and water from the Barnett Shale are plausible candidates, because both can be found at or near Location B. Figure 52 would suggest that for WISETXGW05 that the plot of chloride versus bromide was not useful in distinguishing a potential source of the observed difference observed in this well. Using a data set of sources in Louisiana, Stoessel (1997) was able to show impacts on water from formation brines, and Panno et al. (2006) was able to use these relationships to help distinguish water impacted by other anthropogenic sources. However, based on the data collected as part of this study, a definitive source could not be determined using chloride versus bromide plots.

The correlation between chloride and calcium (Figure 53) indicates that there are four potential sources for the impacts observed in WISETXGW01 and WISETXGW08. Again, sea water, halite/road salt, and water from the Barnett Shale are suggested as potential sources. As was the case earlier, sea water can be eliminated as a potential source because of the distance from Location B to the nearest sea water source. Also halite is an unlikely source as was suggested previously. Using calcium allowed for the inclusion of sources of other formation brines in Texas (Cisco, Canyon, Strawn, Boonesville Bend Conglomerate, Viola, Simpson, and Ellenburger) and these sources were also found to be consistent with the observed impacts (Figure 53B). Therefore, impacts from all of these brine formation waters are plausible at Location B because penetrations through these strata could be a path of migration into the overlying Trinity aquifer (see Figure 3). Figure 53A shows that sewage/septic tanks or animal waste was a potential source for the observed differences observed in WISETXGW05. Brines did not appear to be a potential source in WISETXGW05 based on chloride versus calcium plots. Because of the lack of local hydrologic data and the lack of local source data, the source or sources of the impacts observed could not be definitively determined.

Plots of chloride and bicarbonate are shown on Figure 54. As is shown on Figure 54A, the potential sources would be formation brines, seawater, and halite/road salt. As has been already indicated sea water and halite/road salt are not likely sources. On Figure 54B, only the brine sources are plotted. Although WISETXGW01 and WISETXGW08 are generally slightly enriched with respect to bicarbonate, it would be difficult to rule out any of the brines as a potential source, because bicarbonate is not conservative and is subject to chemical reactions and biological activity. Using chloride versus bicarbonate plots (Figure 54A), brines did not appear to be a source on the observed impacts to WISETXGW05. This analysis suggests that landfill leachate or animal waste was the most likely source for the observed differences in WISETXGW05. Because of the lack of local hydrologic data and the lack of local source data, the source or sources of the impacts observed could not be definitively determined.

Figure 55 is a plot of chloride versus potassium. Although WISETXGW01 and WISTXGW08 in all cases were depleted with respect to other sources of potassium, the likely source would be brines, sea water, and halite/road salt. Potassium is not a conservative element and can undergo chemical changes and participate in chemical reactions in the environment, so the depletion of potassium in WISETXGW01 and WISETXGW08 is not unexpected. Again sea water and halite/road salt are very unlikely sources of the impacts observed in WISETXGW01 and WISETXGW08. Plots of chloride versus potassium indicated that all sources are potential sources for WISETXGW05 (Figure 55). This suggests that plots of chloride versus potassium were not useful for source delineation for the changes observed in WISETXGW05.

The only sources of potential impact to WISETXGW01 and WISETXGW08 based on chloride versus magnesium plots were formation brines and sea water (Figure 56A). Sea water is not a potential source, because of the distance between Location B and the nearest sea water source. Based on this plot the only potential sources for WISETXGW05 are sewage/septic tanks or animal waste (Figure 56A). Figure 56B is a plot showing several of the potential brine sources for Location B. The chloride versus magnesium plot however could not distinguish between the brine sources or indicate the most likely brine source.

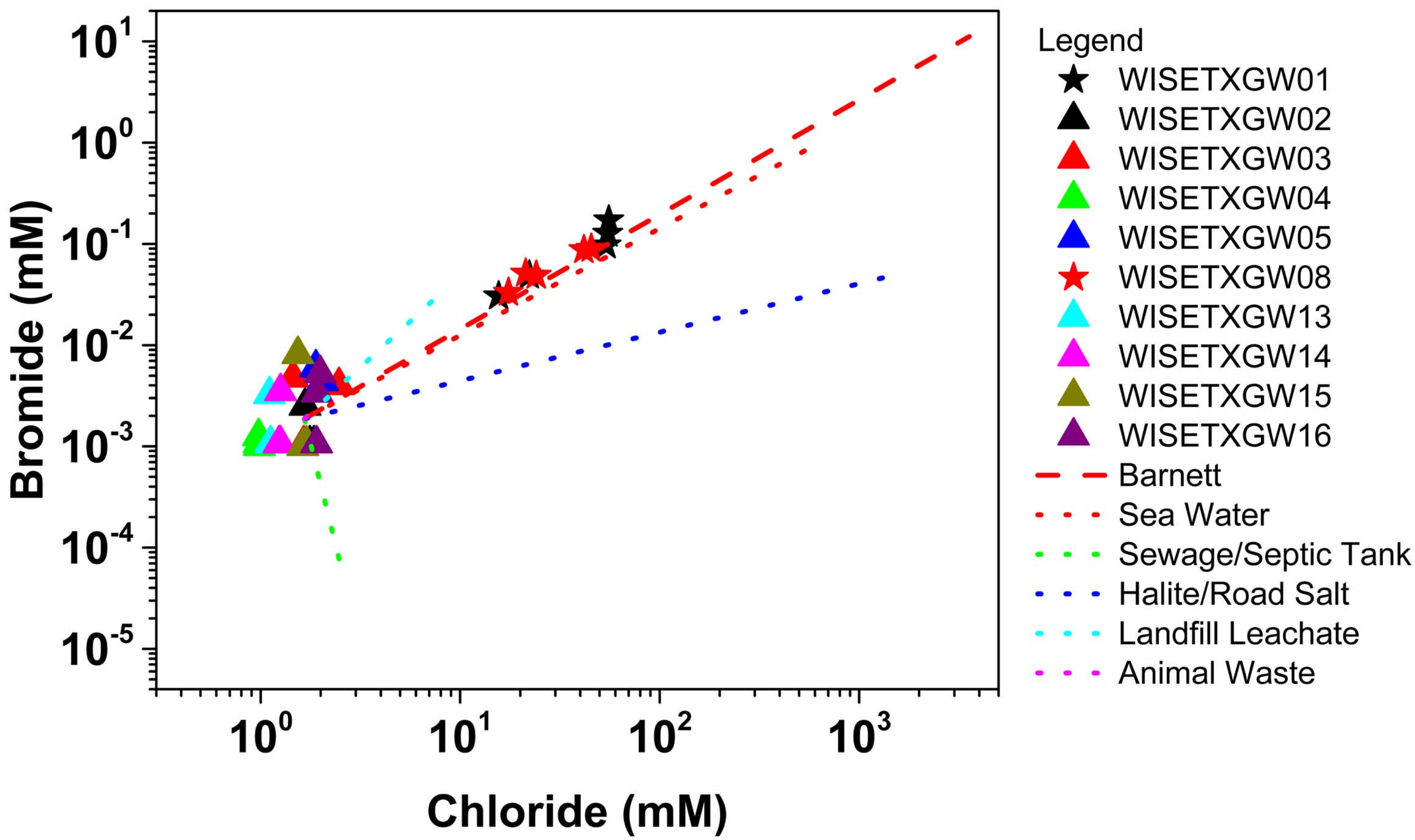


Figure 52. A cross plot of the conservative elements chloride and bromide in relationship to potential sources of contamination at Location B. This figure strongly suggests that WISETXGW01 and WISETXGW08 were impacted by a brine source.

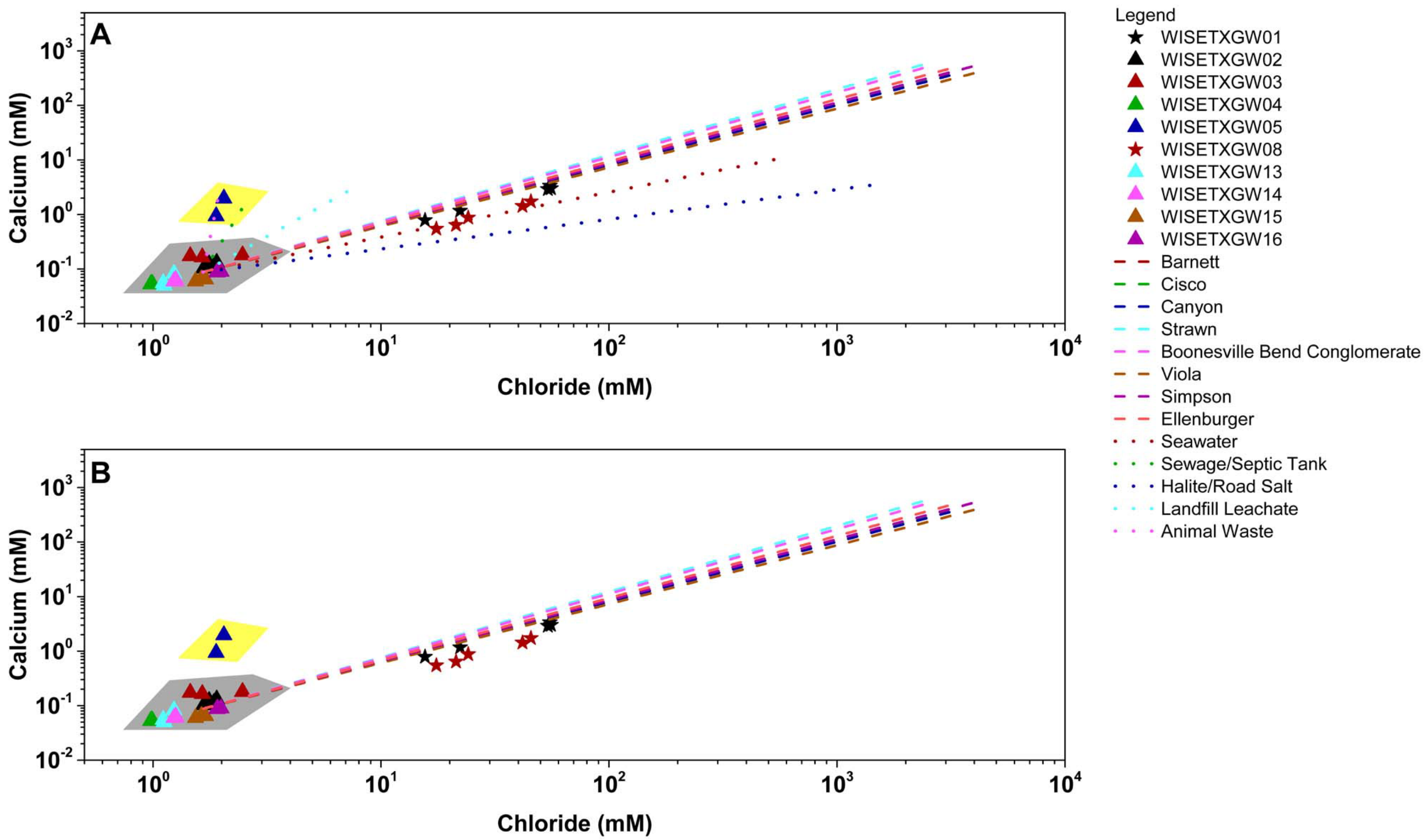


Figure 53. Plots of the mixing curves for chloride versus calcium using (A) all potential sources and (B) brine sources with the potentially impacted wells and the site-specific background wells. The gray shaded area is the limits of the site-specific background and the yellow shaded areas highlights WISETXGW05. This plot suggests that the potentially impacted wells WISETXGW01 and WISETXGW08 were likely impacted by a brine source. This plot suggests that the WISETXGW05 was potentially impacted by animal waste and sewage/septic tanks.

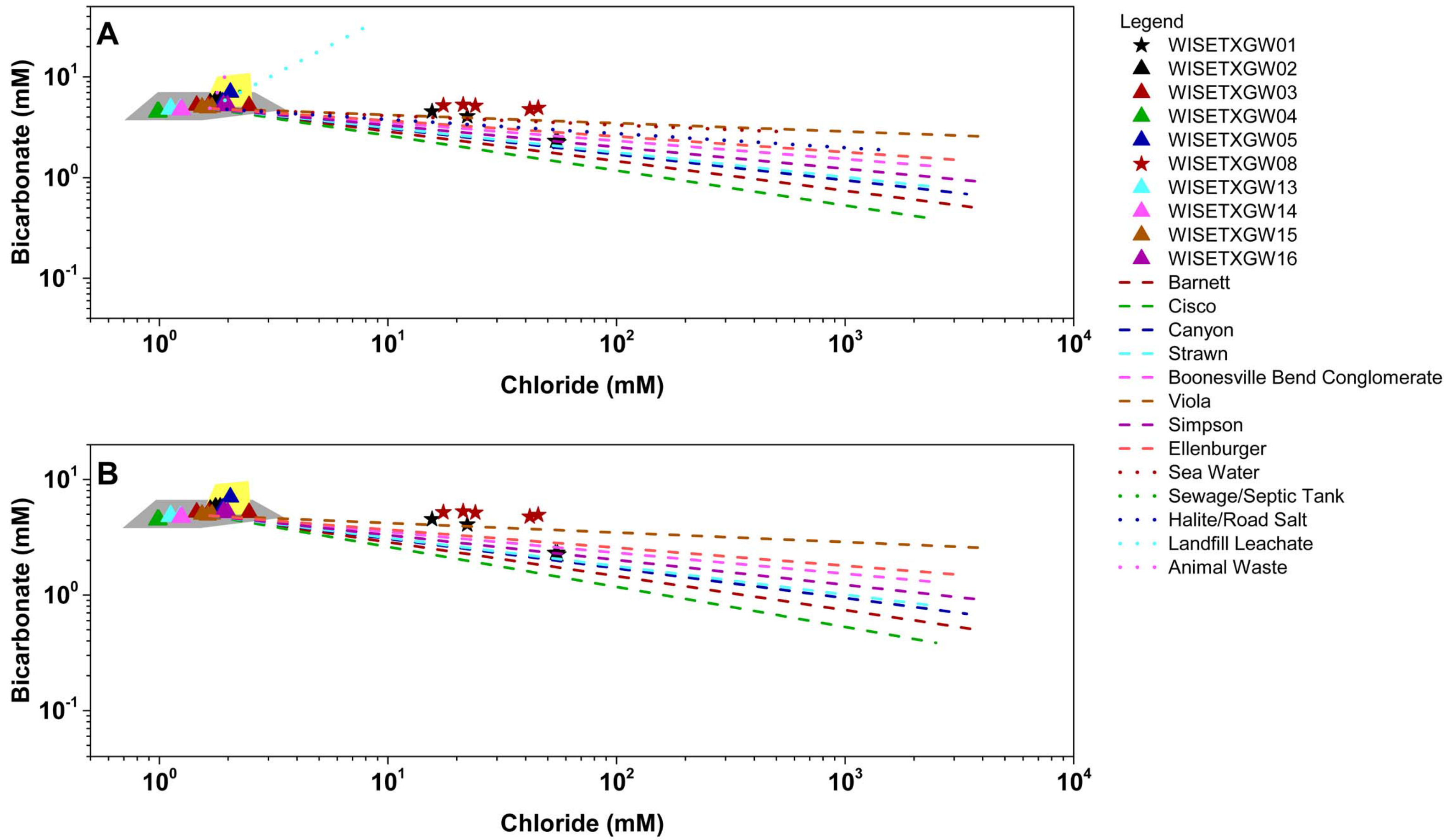


Figure 54. Plots of the mixing curves for chloride versus bicarbonate using (A) all potential sources and (B) brine sources with the potentially impacted wells and the site-specific background wells. The gray shaded area is the limits of the site-specific background and the yellow shaded areas highlights WISETXGW05. This plot suggests that the potentially impacted wells WISETXGW01 and WISETXGW08 were potentially impacted by brines. This plot suggests that the WISETXGW05 was potentially impacted by animal waste and landfill leachate.

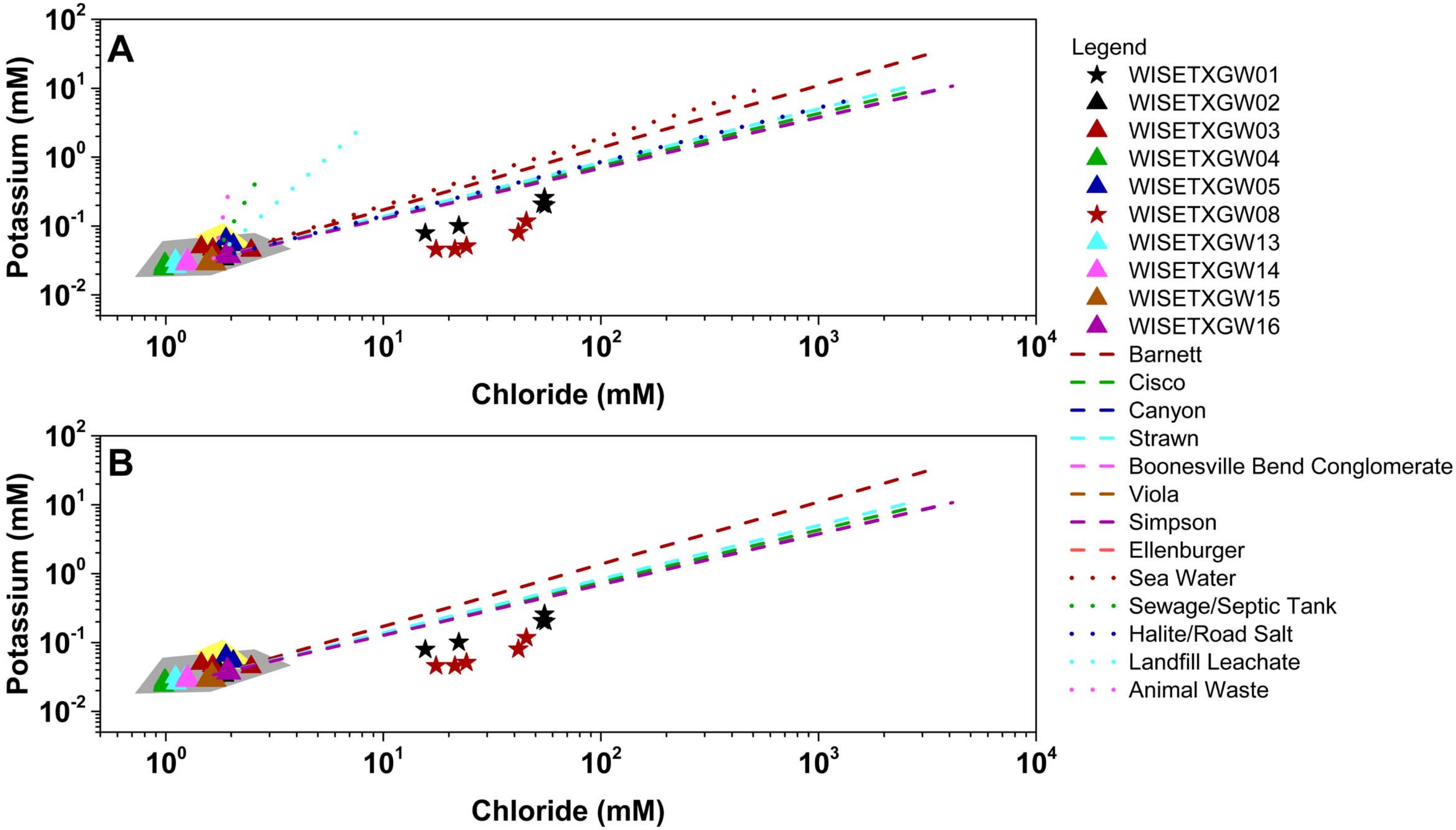


Figure 55. Plots of the mixing curves for chloride versus potassium using (A) all potential sources and (B) brine sources with the potentially impacted wells and the site-specific background wells. The gray shaded area is the limits of the site-specific background, and the yellow shaded areas highlights WISETXGW05. This plot suggests that the potentially impacted wells WISETXGW01 and WISETXGW08 were potentially impacted by brines.

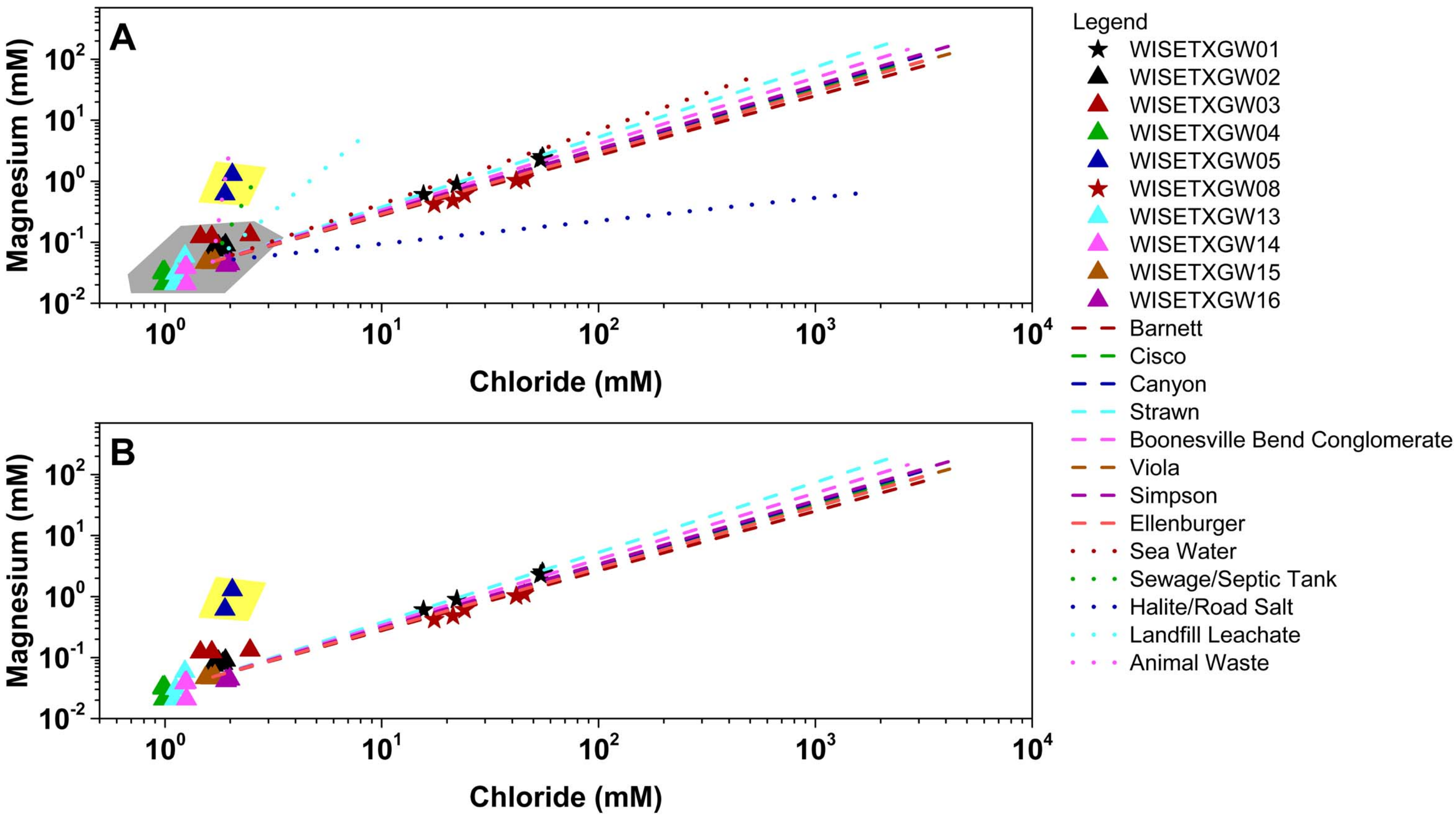


Figure 56. Plots of the mixing curves for chloride versus magnesium using (A) all potential sources and (B) brine sources with the potentially impacted wells and the site-specific background wells. The gray shaded area is the limits of the site-specific background, and the yellow shaded areas highlights WISETXGW05. The potentially impacted wells WISETXGW01 and WISETXGW08 were impacted by brines. This plot suggests that WISETXGW05 was potentially impacted by animal waste or sewage/septic tank.

Figure 57 is a plot of chloride versus sodium. Like potassium, WISETXGW01 and WISTXGW08 in all cases were depleted with respect to other sources of sodium, the likely source of which would be brines, sea water, and halite/road salt. Sodium, like potassium is not a conservative element and can undergo chemical changes and participate in chemical reactions in the environment, so the depletion of sodium in WISETXGW01 and WISETXGW08 is not unexpected. Again sea water and halite/road salt are very unlikely sources of the impacts observed in WISETXGW01 and WISETXGW08. Plots of chloride versus sodium indicated that all sources with the exception of halite/road salt and sea water are potential sources for WISETXGW05 (Figure 57).

For plots of chloride versus sulfate (Figures 58) the only potential sources identified for WISETXGW01, WISETXGW05, and WISETXGW08 were brine, sea water, and halite/road salt. For WISETXGW05, the samples were enriched with respect to sulfate as compared to the sources. Since sulfate is not conservative and is subject to chemical reactions and biological activity, this could mean that for WISETXGW05 that another potential source not identified is responsible to the observed differences.

Finally, Osborn et al. (2012) used plots of bromide versus boron in their analysis of Northern Appalachian brines. Bromide versus boron cross plots are plotted in Figure 59. WISETXGW01 and WISETXGW08 plot between halite/road salt and sea water/Barnett suggesting that these are potential sources of the observed impacts. WISETXGW05 using bromide versus boron was the same as the site-specific background and no further information could be ascertained from this plot. As was the case in the other cross plots, sea water and halite/road salt are likely not the source of the impacts to WISETXGW01 and WISETXGW08.

In addition to identifying potential sources of contamination, mixing curves can also be used to calculate relative percent contributions to an impacted well from a source (Faye et al., 2005; Freeman, 2007). As conservative elements, chloride and bromide were used in this analysis, because conservative elements typically do not have interactions with the surrounding media and biological activity typically does not affect the concentrations. Faye et al. (2005) used these binary mixing relationships to evaluate the salinization process resulting from the mixing of fresh water and salt water intrusion from a saline river source. Freeman (2007) was able to use these mixing relationships to help delineate freshwater contamination from two saline sources, salt dissolution brines, and formation brines. Figure 60 is an example of using this method to calculate the percent contribution of brine and landfill leachate sources to the potentially impacted wells at Location B using chloride and bromide. Both bromide and chloride are generally considered conservative elements. Figures 60A and 60C are plots showing the percent contribution of brine to the wells at Location B. In both cases, the potentially impacted wells have a greater contribution of brine than the site-specific background, which is to be expected. Visually they appear to have the same relative contribution of brine regardless of whether chloride or bromide is used. Figures 60B and 60D use the same method as previously described but calculate the percent contribution of landfill leachate to the wells in Location B. Unlike the brine calculations, where the brine had much higher concentrations of bromide and chloride than the potentially impacted wells, the potentially impacted wells had much greater concentrations than the landfill leachate. This causes the potentially impacted wells to have contributions of landfill leachate much greater than 100%, which is not possible. This could provide a check constraint to the mixing relationships discussed earlier. It is important to point out that these were literature values for other locations in the U.S. and may not reflect landfill leachate in Wise County.

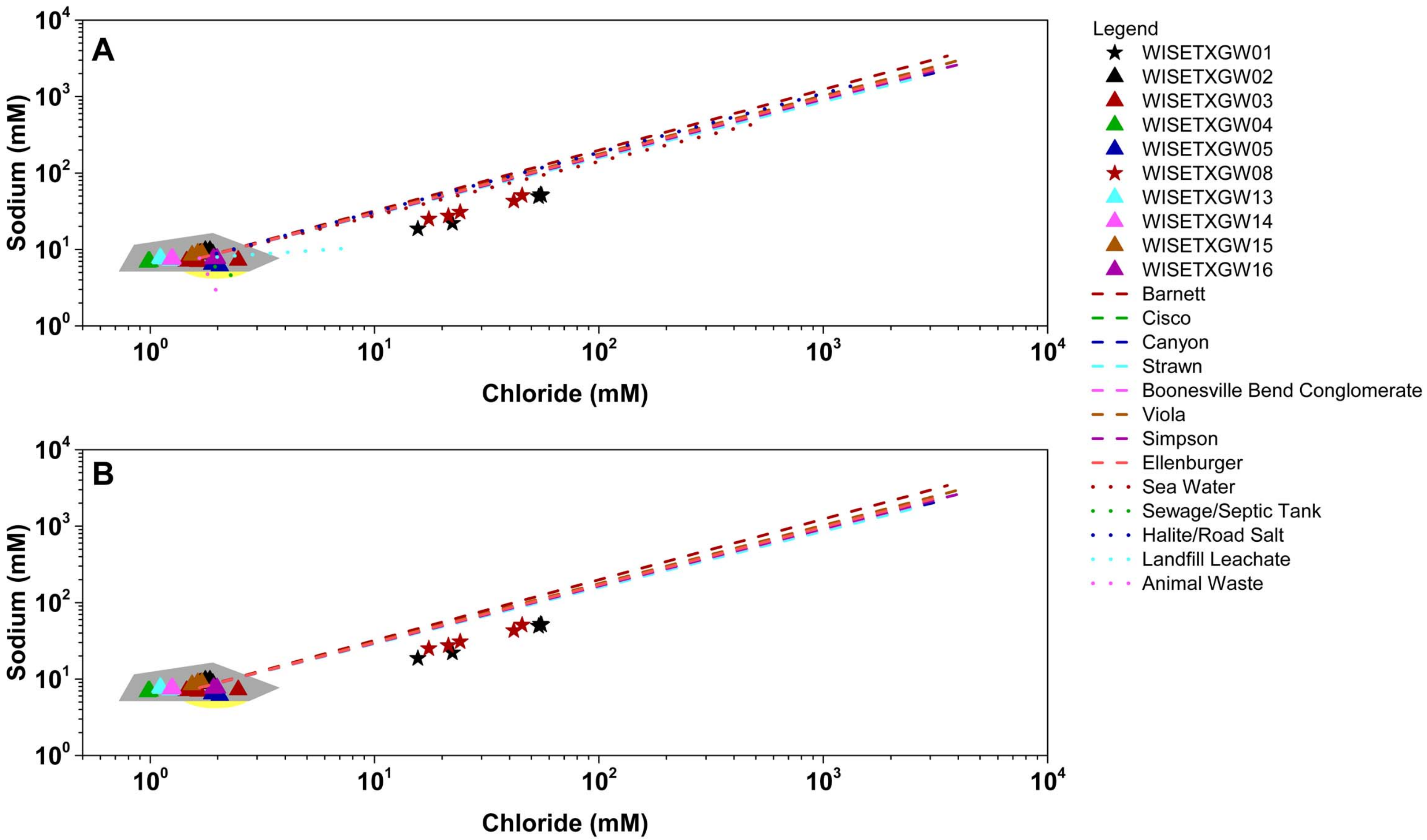


Figure 57. Plots of the mixing curves for chloride versus sodium using (A) all potential sources and (B) brine sources with the potentially impacted wells and the site-specific background wells. The gray shaded area is the limits of the site-specific background, and the yellow shaded areas highlights WISETXGW05. The potentially impacted wells WISETXGW01 and WISETXGW08 were possibly impacted by brines.

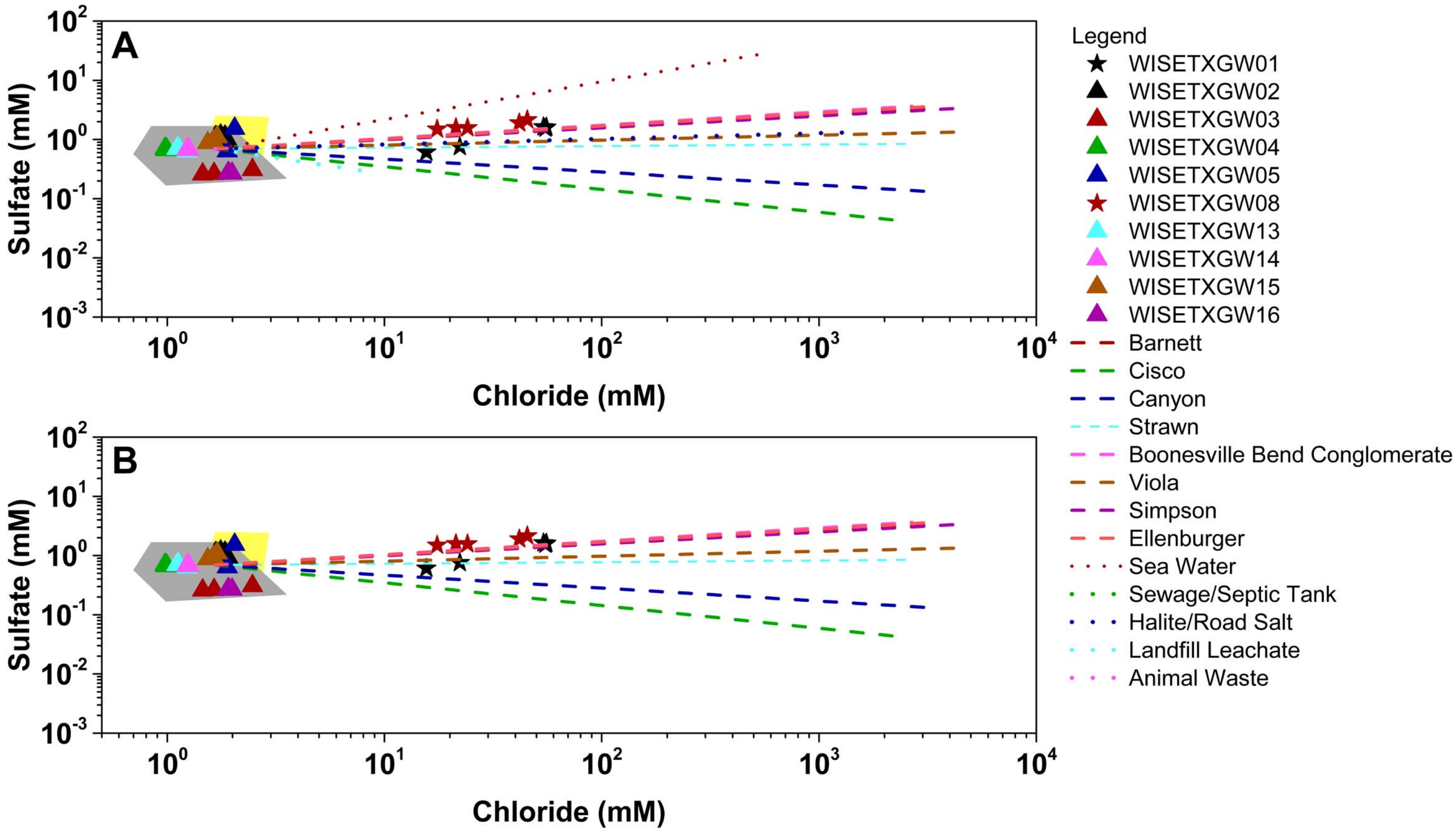


Figure 58. Plots of the mixing curves for chloride versus sulfate using (A) all potential sources and (B) brine sources with the potentially impacted wells and the site-specific background wells. The gray shaded area is the limits of the site-specific background, and the yellow shaded areas highlights WISETXGW05. The potentially impacted wells WISETXGW01 and WISETXGW08 were impacted by brines.

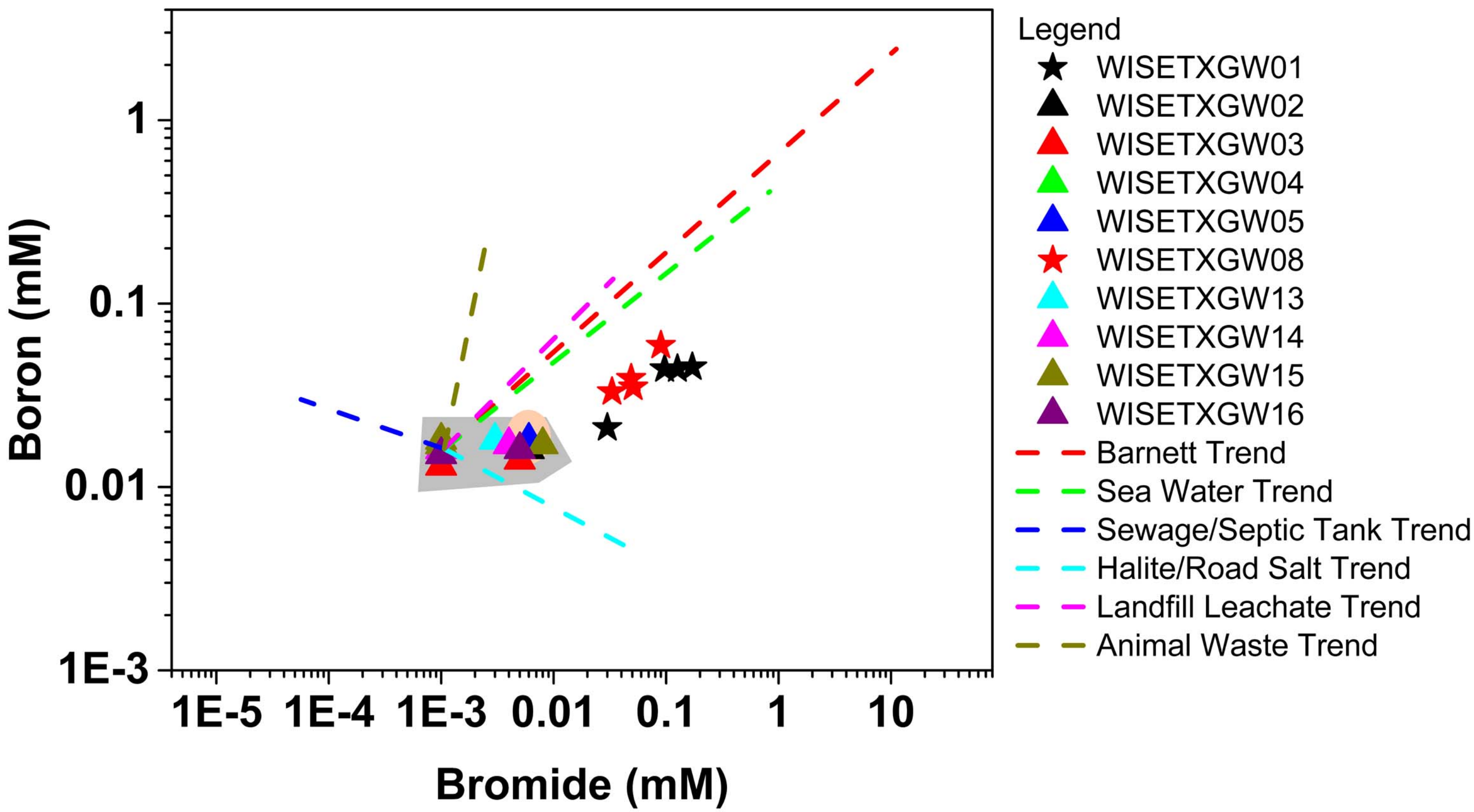


Figure 59. Plots of the mixing curves for bromide versus boron using (A) all potential sources and (B) brine sources with the potentially impacted wells and the site-specific background wells. The gray shaded area is the limits of the site-specific background, and the tan shaded areas highlights WISETXGW05. The potentially impacted wells WISETXGW01 and WISETXGW08 were impacted by brines.

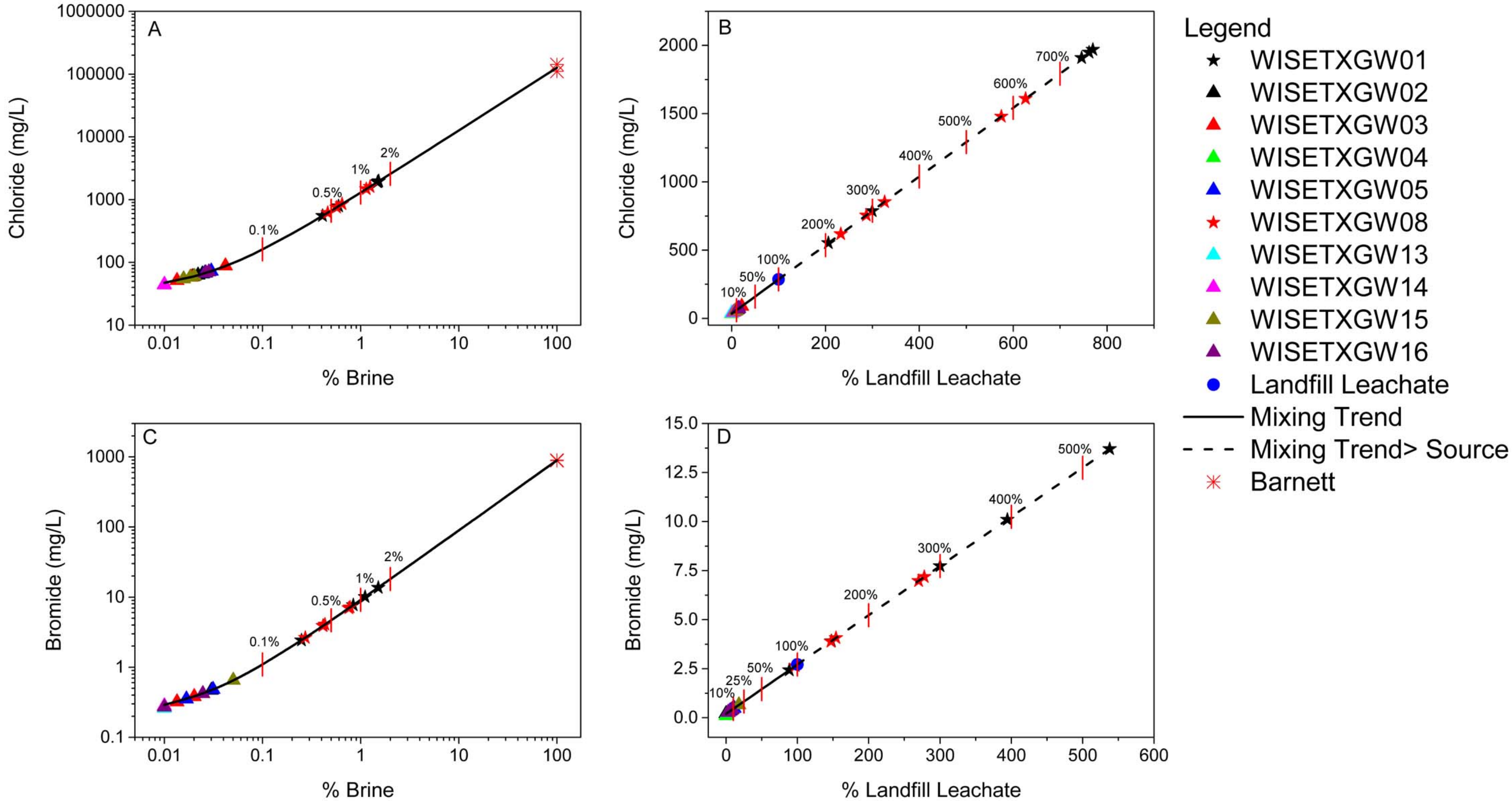


Figure 60. Examples of the use of mixing curves to calculate the relative contribution of the source waters to the wells in Location B using (A) chloride and Barnett Produced Water, (B) chloride and landfill leachate, (C) bromide and Barnett Produced Water, and (D) bromide and landfill leachate. What is apparent is that landfill leachate is an unlikely source of the impacts to WISETXGW01 and WISETXGW08.

A summary of the source delineation analysis above is listed in Table 15. Again, it should be noted that since site-specific data were not used for this source delineation analysis, the results are not a definitive assessment as to which sources of contamination may be responsible for the observed impacts at WISETXGW01 and WISETXGW08. However, based on the analysis conducted, the likely source for the impacts observed in WISETXGW01 and WISETXGW08 was from brine because brine was implicated in all of the analyses done. Although sea water and halite/road salt were also implicated (in 100% and 90% of the analyses, respectively), these can be eliminated based on distance to the source and use. The other two sources, animal waste and landfill leachate, which were implicated each in 20 % of the analysis are also not likely and will be discussed next. As can be seen in Table 15, WISETXGW05 is more difficult to eliminate potential sources based on the above analysis. This also will be discussed next.

Table 16 shows the actual calculated source contribution to the potentially impacted wells (WISETXGW01, WISETXGW05, and WISETXGW08) using collected data from the study and using conservative elements. Non conservative elements were not used because of their potential interactions and reactions that could alter their concentrations and give erroneous mixing results. Water from the Barnett Shale should not be inferred as the only potential brine source of contamination, but this is the only case in which all the conservative elements had the data necessary to perform the mixing calculations. Sea water is also not shown in Table 16, because of the unrealistic distance to the nearest sea water source from Location B.

The chloride mixing indicated that for WISETXGW01, WISETXGW05, and WISETXGW08 that the Barnett water yielded similar percentages (Table 16). For WISETXGW01 and WISETXGW08, using sewage/septic tanks, landfill leachate, and animal waste as the end members in the mixing calculations showed percentages of mixing that were not possible. For these sources, the mixing values would indicate that WISETXGW01 and WISETXGW08 were more suited as sources rather than the result of mixing. As would be expected from the analysis, halite/road salt water mixing with unimpacted Trinity aquifer water could reasonably be a source for the observed impacts to WISETXGW01 and WISETXGW08. However, as has been stated this is not a likely source for the observed impacts to WISETXGW01 and WISETXGW08. Based on the percentages resulting from the mixing of sewage/septic tanks and animal waste with background Trinity aquifer water, it is unlikely that these were the sources of the observed impacts to WISETXGW05, since these would require the water to be more than 50% of these sources (Table 16). If this were the case, then one would expect other parameters already discussed to also indicate an impact to WISETXGW05, which was not the case. Again, for reasons already stated, it is unlikely that halite/road salt would be the source of the observed impact to WISETXGW05. The only other potential source which could have caused the observed impacts to WISETXGW05 was landfill leachate (Table 16). The chloride mixing indicated that landfill leachate mixing with unimpacted Trinity aquifer water could be a potential source for the observed impacts to WISETXGW05. Because of the lack of local hydrologic information and the lack of source data for landfill leachate, a more definitive identification of the source of the potential impacts observed for WISETXGW05 could not be made.

The mixing of bromide from the different sources with unimpacted Trinity aquifer water for WISETXGW05 was similar to that of chloride (Table 16). Again, for bromide the only realistic potential sources of the observed impacts to WISETXGW05 would be from brine or landfill leachate. As was the case with chloride, additional work would need to be done to distinguish between these sources. Similar to WISETXGW05, the only potential sources for the observed impacts to WISETXGW01 and WISETXGW08 using bromide were brines and halite/road salt (Table 16). However, in the case of bromide, halite/road salt can be eliminated also because of the high percentages of halite/road salt that would be needed to obtain the observed concentrations in WISETXGW01 and WISTXGW08. If halite/road salt were the source, one would expect the chloride mixing percentages to be greater than what was observed. In addition, the previously stated reasons why halite/road salt is not the likely source would also be true for bromide mixing.

The last conservative element used in the mixing calculations was iodide (Table 16). There were no iodide data collected for WISETXGW05, so iodide mixing could not be performed for WISETXGW05. WISETXGW01 and WISETXGW08 iodide mixing showed similar results for most of the sources with the exception of landfill leachate (Table 16). In the case of landfill leachate, the iodide mixing would indicate that this was a potential source for the observed impacts to WISETXGW01 and WISETXGW08; however, if this were the case, other parameters used in the source delineation analysis should also have indicated that landfill leachate is a potential source of the impacts. The other parameters used in the source delineation analysis did not implicate landfill leachate, so landfill leachate was not a likely potential source of observed impacts to WISETXGW01 and WISETXGW08.

Based on the information presented in this section, there are several potential sources of the impacts seen at Location B in this study. Water from the Barnett Shale or other brine formation waters was indicated in most cases, especially for WISETXGW01 and WISETXGW08. Also, landfill leachates were suspected as a potential source of the contamination at Location B; however, only at WISETXGW05 was landfill leachate a realistic source for the observed impacts. Other potential contaminant sources were suggested, but were not likely based on the totality of the analysis at Location B. Because of the lack of monitoring well data and the limited literature data for the local potential source chemical composition, confirmation of the potential sources responsible for the observed impacts could not be made.

Table 15. Summary of source delineation analysis.

Well	Technique	Brine	Sea Water	Halite/Road Salt	Landfill Leachate	Sewage/Septic Tank	Animal Waste
WISETXGW01	Bromide vs. Boron	Yes	Yes	Yes	No	No	No
	Chloride vs. Magnesium	Yes	Yes	No	No	No	No
	Chloride vs. Bromide	Yes	Yes	Yes	No	No	Yes
	Chloride vs. Bicarbonate	Yes	Yes	Yes	No	No	No
	Chloride vs. Calcium	Yes	Yes	Yes	No	No	No
	Chloride vs. Potassium	Yes	Yes	Yes	No	No	No
	Chloride vs. Sodium	Yes	Yes	Yes	No	No	No
	Chloride vs. Sulfate	Yes	Yes	Yes	No	No	No
	Cl/Br	Yes	Yes	Yes	Yes	No	No
	Cl/I	Yes	Yes	Yes	Yes	No	Yes
	K/Rb	Yes	Yes	No Data[1]	No Data[1]	No Data[1]	No Data[1]
	Sr Isotope	Yes	No Data[1]	No Data[1]	No Data[1]	No Data[1]	No Data[1]
	Percentage Of Yes[2]	**100**	**100**	**90**	**20**	**0**	**20**
WISETXGW05	Bromide vs. Boron	No	No	No	No	No	No
	Chloride vs. Magnesium	No	No	No	No	Yes	Yes
	Chloride vs Bromide	No	No	No	No	No	No
	Chloride vs. Bicarbonate	No	No	No	Yes	No	Yes
	Chloride vs. Calcium	No	No	No	No	Yes	Yes
	Chloride vs. Potassium	Yes	Yes	Yes	Yes	Yes	Yes
	Chloride vs. Sodium	Yes	No	No	Yes	Yes	Yes
	Chloride vs. Sulfate	Yes	Yes	Yes	No	No	No
	Cl/Br	No	No	No	No	No	No

Table 15. Summary of source delineation analysis.

Well	Technique	Brine	Sea Water	Halite/Road Salt	Landfill Leachate	Sewage/Septic Tank	Animal Waste
	Cl/I	No Data[1]	No Data[1]	No Data[1]	No Data[1]	No Data[1]	No Data[1]
	K/Rb	Yes	Yes	No Data[1]	No Data[1]	No Data[1]	No Data[1]
	Sr Isotope	Yes	No Data[1]	No Data[1]	No Data[1]	No Data[1]	No Data[1]
	Percentage Of Yes[2]	**45**	**30**	**22**	**33**	**44**	**46**
WISETXGW08	Bromide vs. Boron	Yes	Yes	Yes	No	No	No
	Chloride vs. Magnesium	Yes	Yes	No	No	No	No
	Chloride vs. Bromide	Yes	Yes	Yes	No	No	Yes
	Chloride vs. Bicarbonate	Yes	Yes	Yes	No	No	No
	Chloride vs. Calcium	Yes	Yes	Yes	No	No	No
	Chloride vs. Potassium	Yes	Yes	Yes	No	No	No
	Chloride vs. Sodium	Yes	Yes	Yes	No	No	No
	Chloride vs. Sulfate	Yes	Yes	Yes	No	No	No
	Cl/Br	Yes	Yes	Yes	Yes	No	No
	Cl/I	Yes	Yes	Yes	Yes	No	Yes
	K/Rb	Yes	Yes	No Data[2]	No Data[2]	No Data[2]	No Data[2]
	Sr Isotope[1]	Yes	No Data[2]	No Data[2]	No Data[2]	No Data[2]	No Data[2]
	Percentage Of Yes[2]	**100**	**100**	**90**	**20**	**0**	**20**

[1] Although there was no data for the other sources, the analysis done for brine sources is consistent with brines as a source of the observed impacts (see Figure 50 and the discussion in the "Source Identification" section of this report).
[2] K/Rb and Sr isotope data were not found in the literature for these sources.
[3] If data was not available and where data was not available they used for the calculations of the percentage of yes in this table.

Table 16. Mixing percentages using conservative elements for the impacted wells WISETXGW01, WISETXGW05, and WISETXGW08 for the different sources. The mixing calculations used site-specific background and the listed sources as end members in the calculations.

Source	WISETXGW01 Range (%)	WISETXGW05 Range (%)	WISETXGW08 Range (%)
Chloride			
Barnett	0.4 - 1.5	0.3	0.5 - 1.2
Sewage/Septic Tank	937 - 3467	59 - 69	1056 - 2846
Halite/Road Salt	1.1 - 4.2	0.07 - 0.08	1.3 - 3.5
Landfill Leachate	206 - 770	13 - 15	232 - 627
Animal Waste	1507 - 5626	94 - 110	1698 - 4580
Bromide			
Barnett	0.2 - 1.5	0.02 - 0.03	0.3 - 0.8
Sewage/Septic Tank	13500 - 2230	280 - 2440	6980 - 2440
Halite/Road Salt	44 - 264	3 - 5	48 - 136
Landfill Leachate	89 - 536	6 - 11	97 - 278
Animal Waste	223000 - 1350000	1500 - 28000	244000 - 698000
Iodide			
Barnett	0.09 - 0.38	-----	0.11 - 0.16
Sewage/Septic Tank	11384 - 2613	-----	4674 - 3352
Halite/Road Salt	7.8 - 34	-----	10 - 14
Landfill Leachate	18 - 77	-----	23 - 32
Animal Waste	313 - 1363	-----	401 - 559

8. Summary of Case Study Results

The Wise County Retrospective Case Study was conducted at three locations in north-central Texas where both conventional and unconventional gas production is currently occurring and has occurred in the past. Currently, unconventional gas production occurs in the Mississippian-aged Barnett Shale. The Barnett Shale extends throughout the Bend Arch-Fort Worth Basin (formed during the Mississippian age 320 to 360 million years ago), which extends south from the Muenster Arch, near the Oklahoma border, to the Llano Uplift in Burnet County, and west from the Ouachita Thrust Front, near Dallas, to Taylor County. Gas production from the Barnett Shale depends upon recent advances in horizontal drilling and hydraulic fracturing technologies to enhance and create fracture porosity, permeability, and gas flow. Water-quality samples were collected from 16 domestic wells and four surface water bodies at three locations in Wise County (Locations A, B, and C). The study wells sampled in Wise County were screened primarily in the Trinity aquifer; the one exception was a well that was screened in an alluvial deposit.

Two primary water types are found in Wise County although other water types are occasionally identified: calcium-bicarbonate and sodium-bicarbonate. These water types divide Wise County into two distinct regions along a line running from the northeast to the southwest. Calcium-bicarbonate waters are located north of this line, with sodium-bicarbonate waters to the south. This water quality trend is consistent with the reported geology of the Trinity aquifer (the aquifer in the northern portion of the county comprised of the Paluxy and the Twin Mountains Formations and the aquifer in the southern portion of the county comprised of the Paluxy, Glen Rose, and Twin Mountains formations). Other water types presented in historical databases appear to be randomly distributed throughout Wise County, suggesting that there may be local-scale differences in ground water chemistry (or potentially, impacted wells are in these databases), suggesting water quality should be evaluated on a local scale, not using the countywide data.

Table 17 summarizes the potential ground water impacts identified during this study. It should be noted that there were limitations to the source delineation analysis that was conducted: for several of the potential sources of contamination, literature data were used for the composition of the source fluids, and the exclusion of potential sources in Table 17 is not definitive.

Table 17. Summary of the potential ground water impacts identified during this study.

Parameter	Study Location	Sample Type	Impacted / Total	Description[1]	Potential Sources
Chloride	B	Ground water	2/10[2]	Detections ranged from 34.6 to 1970 mg/L; Secondary MCL exceedances; Elevated concentrations compared to site-specific background	Brines
Specific Conductivity	B	Ground water	2/10[2]	Detections ranged from 712 to 6614 µS/cm; Elevated concentrations compared to site-specific background	Brines

Table 17. Summary of the potential ground water impacts identified during this study.

Parameter	Study Location	Sample Type	Impacted / Total	Description[1]	Potential Sources
Calcium	B	Ground water	3/10[3]	Detections ranged from 2.10 to 135 mg/L; Elevated concentrations compared to site-specific background	Brines; Landfill Leachate (WISETXGW05 only)
Potassium	B	Ground water	2/10[2]	Detections ranged from 0.93 to 10.1 mg/L; Elevated concentrations compared to site-specific background	Brines
Magnesium	B	Ground water	2/10[3]	Detections ranged from 0.75 to 61.4 mg/L; Elevated concentrations compared to site-specific background	Brines; Landfill Leachate (WISETXGW05 only)
Sodium	B	Ground water	2/10[2]	Detections ranged from 140 to 1200 mg/L; Elevated concentrations compared to site-specific background	Brines
Bromide	B	Ground water	2/10[2]	Detections ranged from 0.10 to 13.7 mg/L; Elevated concentrations compared to site-specific background	Brines
Iodide	B	Ground water	2/10[2]	Detections ranged from 15.1 to 368 µg/L; Elevated concentrations compared to site-specific background	Brines
Strontium	B	Ground water	3/10[3]	Detections ranged from 223 to 13900 µg/L; Elevated concentrations compared to site-specific background	Brines; Landfill Leachate (WISETXGW05 only)
Barium	B	Ground water	2/10[4]	Detections ranged from 7 to 132 µg/L; Elevated concentrations compared to site-specific background	Brines; Landfill Leachate (WISETXGW05 only)

[1] Based on data presented in the Site-Specific Focus Area- Location B section of the report. Detection ranges are actual ranges found in the study data for Location B.
[2] Sampling Locations: WISETXGW01 and WISETXGW08.
[3] Sampling Locations: WISETXGW01, WISETXGW05, and WISETXGW08.
[4] Sampling Locations: WISETXGW01 and WISETXGW05.

Water quality data (major anions and cations, SpC, barium, boron, bromide, and iodide) were evaluated to understand brine impacts on drinking water resources. Limited differences were seen at Location A when comparing current data with historical data on countywide and 3-mile radius scales. In general, Location C results were similar to those at Location A. Differences in parameters could be explained by local variations in ground water and do not suggest any specific source. However, at Location B, differences in several parameters (chloride, SpC, calcium, potassium, magnesium, sodium, bromide, iodide, and strontium) were observed, most notably chloride and SpC in comparative and time-trend analyses. Water quality data for wells WISETXGW01 and WISETXGW08 always exceeded the chloride SMCL. This information prompted the Texas Commission on Environmental Quality to notify local homeowners in the vicinity of Location B of chloride SMCL exceedances (Appendix D).

Dissolved gases were detected at study Locations A, B, and C, and most of the detections (64%) were of methane. The methane concentrations in ground water ranged from 0.0007 to 0.0242 mg/L, with a median concentration of 0.0016 mg/L. These low-level concentrations of methane could not be linked to any particular source, because the concentrations were generally too low for isotopic analysis. Methane concentrations are likely background methane concentrations that exist in the aquifer, based on a published report by Zhang et al. (1998). Zhang et al. (1998) reported that methane concentrations in the Trinity Aquifer south of Wise County ranged from 0.0144 to 0.0347 mg/L.

The extensive analysis of organic chemicals was conducted to evaluate the potential occurrence of chemicals generally documented as components of hydraulic fracturing fluids in ground water and surface water. Low-level detections of VOCs, SVOCs, and DROs in surface water were observed at some locations during some of the sampling rounds. When detected, concentrations of organic compounds did not exceed EPA’s drinking water standards, and there were no repeat detections of organic chemicals known to be associated with the hydraulic fracturing at any sampling location. Glycol ethers and GROs were not detected in any ground water or surface water samples.

Most of the trace elements (with exception of arsenic, iron, and manganese) were not detectable or were detected at very low concentrations. Similar results were seen in historical databases. Arsenic, iron, and manganese concentrations were similar to concentrations expected in the ground water, based on the historical information. SMCL exceedances for iron and manganese are likely due to local conditions in the aquifer, which again is supported by historical data.

The elevated concentrations of brine components in WISETXGW01 and WISETXGW08 compared with historical data indicates that a potential impact may have occurred at study Location B. This prompted a more detailed site-specific evaluation of Location B. Based on data from this study and site-specific background information, it was determined that two wells at Location B (WISETXGW01 and WISETXGW08) were potentially impacted by a brine source. Additionally, water quality results for samples from well WISETXGW05 were significantly different than the site-specific background data for a limited set of parameters. This too suggests that the well may have been impacted. Identifying the source(s) of contamination was problematic because of limited site-specific information on the composition of source fluids and by the very limited understanding of the local hydrology at study Location B. However, several sources of potential contamination were identified. These sources are formation brines, such as water from the Barnett Shale, water from the Boonesville Bend Conglomerate, and water from other formations based on USGS Produced Water database (WISETXGW01, WISETXGW05, and WISETXGW08); landfill leachate (WISETXGW05), based on limited literature data from the United States; and halite/road salt (WISETXGW01, WISETXGW05, and WISETXGW08), based on limited literature data from the United States. Landfill leachate was not indicated as a potential source for WISETXGW01 and WISETXGW08; and halite/road salt is a very unlikely source for the observed impacts at study Location B. The source of the brine contamination in WISETXGW01 and WISETXGW08 is not known; however, there are several potential pathways by which brine impacts could occur (no implied order of importance): brine migrating from underlying formations along current and historical well bores; brine migrating from underlying formations along natural fractures; leaks from the reserve pits and/or impoundments; and brine migrating from a nearby brine injection well.

Key observations or findings from this study are listed below.

- Comparisons of study data with historical data showed no apparent impacts on groundwater at two of the three study locations.
- In the third study location, three study wells were identified as impacted. Comparison of study data with historical data revealed two wells were impacted based on differences in several parameters, most notably chloride and specific conductivity. There were also differences noted in calcium, potassium, magnesium, sodium, bromide, iodide, and strontium. A more detailed investigation using site-specific background data indicated that a third well was also impacted.
- VOCs were detected in up to 6% of the study samples at concentrations below EPA drinking water standards. There were no detections of glycol ethers and no repeated detections in any sample of organic chemicals known to be associated with hydraulic fracturing. Consequently, the potential source(s) of the observed organic compounds could not be identified.
- Dissolved methane was detected in 64% of the study wells at concentrations ranging from 0.0007 to 0.0242 mg/L. Methane concentrations observed during the study were consistent with background methane concentrations in the Trinity aquifer south of Wise County (0.0144 to 0.0347 mg/L).
- Iron and manganese were detected at concentrations above the EPA's secondary maximum contamination level (SMCL). The iron, manganese, and arsenic levels detected in the study samples were consistent with naturally occurring sources and the historical ground water data.
- Chloride was detected in two study wells at concentrations that exceeded the chloride SMCL by a factor of 2.2 to 7.9 times.
- Based on the screening of potential sources of impacts, formation brines were the only source that was consistent with the observed impacts on two of the study wells. In the third impacted well, the screening indicated two potential sources exist for the impact observed, brines and landfill leachate. However, the evaluation of the potential source or sources of the impact was limited based on a lack of available site-specific data. Site-specific data were available only for formation brines, while literature data were used for other potential sources of impacts. This limited the capability of geochemical fingerprinting and determining a definitive source of the impacts.

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Appendix A
QA/QC Summary
Retrospective Case Study in Wise County, Texas

U.S. Environmental Protection Agency
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A.1. Introduction

This section describes general quality assurance (QA) and the results of quality control (QC) samples, including discussion of chain of custody, holding times, blank samples, field duplicate samples, laboratory QA/QC results, data usability, double lab comparisons, Performance Evaluation (PE) samples, Quality Assurance Project Plan (QAPP) additions and deviations, field QA/quality control (QC), application of data qualifiers, tentatively identified compounds (TICs), Audits of Data Quality (ADQ), and laboratory and field Technical System Audits (TSA).

All reported data met project requirements unless otherwise indicated by the application of data qualifiers. In some cases, data are rejected as unusable and not reported.

A.1.1. September 2011 Sampling Event

The September 2011 sampling event sampling and analytical activities were conducted under an approved QAPP titled "Hydraulic Fracturing Retrospective Case Study, Wise and Denton Co., TX" revision 0 approved on August 22, 2011. Deviations from this QAPP are described in Section A9. Three surface water (pond) samples and twelve domestic wells were sampled at three locations during this event. In Location A, four domestic wells and the three surface water samples were collected. In Location B, six domestic wells were sampled and in Location C, two domestic wells were sampled. A total of 305 samples were collected and delivered to 4 laboratories for analysis: Shaw Environmental, Ada, OK; EPA Office of Research and Development/National Risk Management Research Laboratory (ORD/NRMRL), Ada OK; EPA Region 8, Golden, CO; and EPA Region 3, Fort Meade, MD. Measurements were made for over 207 analytes per sample location. Of the 305 samples, 110 samples (36%) were Quality Control (QC) samples including blanks, field duplicates, matrix spikes and matrix spike duplicates.

A.1.2. March 2012 Sampling Event

The March 2012 sampling event sampling and analytical activities were conducted under an approved QAPP titled "Hydraulic Fracturing Retrospective Case Study, Wise and Denton Co., TX" revision 1 approved on February 27, 2012. Deviations from this QAPP are described in Section A9. Three surface water (pond) samples and fifteen domestic wells were sampled at three locations during this event. In Location A, three domestic wells and the three surface water samples were collected. In Location B, ten domestic wells were sampled and in Location C, two domestic wells were sampled. A total of 402 samples were collected and delivered to 5 laboratories for analysis: Shaw Environmental, Ada, OK; EPA ORD/NRMRL, Ada OK; EPA Region 8, Golden, CO; U.S. Geological Survey (USGS) , Denver, Co; and EPA Region 3, Fort Meade, MD. Measurements were made for over 212 analytes per sample location. Of the 402 samples, 132 samples (33%) were QC samples including blanks, field duplicates, matrix spikes and matrix spike duplicates.

A.1.3. September 2012 Sampling Event

The September 2012 sampling event sampling and analytical activities were conducted under an approved QAPP titled "Hydraulic Fracturing Retrospective Case Study, Wise, TX: September 2012 Produced Water Sampling" revision 3 approved on September 10, 2012. Deviations from this QAPP are described in Section A9. Two domestic wells and one production well were sampled at Location B. A total of 105 samples were collected and delivered to 4 laboratories for analysis: Shaw Environmental, Ada, OK; EPA ORD/NRMRL, Ada OK; USGS, Denver, CO; and EPA Superfund Analytical Services Contract Laboratory Program (CLP). Measurements were made for over 105 analytes per sample location. Of the 105 samples, 72 samples (69%) were QC samples including blanks, field duplicates, matrix spikes and matrix spike duplicates.

A.1.4. December 2012 Sampling Event

The December 2012 sampling event sampling and analytical activities were conducted under an approved QAPP titled "Hydraulic Fracturing Retrospective Case Study, Wise, TX: Analysis of Samples by the EPA Region VII Contract Laboratory for the September and December 2012 Sampling Events" revision 3 addendum 2 approved on February 25, 2013. Deviations from this QAPP are described in Section A9. One surface water (pond) samples and nine domestic wells were sampled at Location B. A total of 307 samples were collected and delivered to 6 laboratories for analysis: Shaw Environmental, Ada, OK; EPA ORD/NRMRL, Ada OK; EPA Region 8, Golden, CO; USGS, Denver, Co; Southwest Research Institute (SWRI), San Antonio, TX; and EPA Region 3, Fort Meade, MD. Measurements were made for over 216 analytes per sample location. Of the 307 samples, 147 samples (48%) were QC samples including blanks, field duplicates, matrix spikes and matrix spike duplicates.

A.1.5. May 2013 Sampling Event

The May 2013 sampling event sampling and analytical activities were conducted under an approved Quality Assurance Project Plan (QAPP) titled "Hydraulic Fracturing Retrospective Case Study, Wise Co., TX" revision 4 approved on May 6, 2013. Deviations from this QAPP are described in Section A9. One surface water (pond) sample, two production wells and eight domestic wells were sampled at Location B. A total of 198 samples were collected and delivered to 4 laboratories for analysis: CB&I, Ada, OK; EPA ORD/NRMRL, Ada OK; USGS, Denver, Co; and SWRI, San Antonio, TX. Note that the Shaw Environmental laboratory name changed to CB&I for the final round of sampling (same laboratory equipment, procedures, and staff). Measurements were made for over 115 analytes per sample location. Of the 198 samples, 88 samples (44%) were QC samples including blanks, field duplicates, matrix spikes and matrix spike duplicates.

A final version of the QAPP titled "Hydraulic Fracturing Retrospective Case Study, Wise Co., TX" revision 5 approved on September 13, 2013.

A.2. Chain of Custody

Sample types, bottle types, sample preservation methods analyte holding times, and laboratories receiving samples are listed in Table A1. Samples collected in the field were packed on ice into ice chests for shipment by overnight delivery with completed chain of custody (COC) documents and temperature blank containers. With few exceptions noted below, samples were received by the laboratories in good condition and all temperature blanks were less than 6 °C.

A.2.1. September 2011 Sampling

No problems noted.

A.2.2. March 2012 Sampling

For samples collected on March 5, 2012 and March 6, 2012, COCs were not signed by the Relinquisher. Also, COC seals were not placed on one cooler received from the field. The cooler without the custody seal was hand delivered to Shaw upon returning to the lab. This cooler was in the possession of EPA until delivery to the lab. There was no impact on data quality.

The COC associated with the samples that were sent to EPA Region 8 Laboratory incorrectly identifies the date of sampling for Field Blank 4 as 3/7/2012. The correct date for Field Blank 4 was 3/8/2012. The laboratory was notified and there was no impact on data quality.

A.2.3. September 2012 Sampling

No problems noted.

A.2.4. December 2012 Sampling

No problems noted.

A.2.5. May 2013 Sampling

No problems noted.

A.3. Holding Times.

Holding times are the length of time a sample can be stored after collection and prior to analysis without significantly affecting the analytical results. Holding times vary with the analyte, sample matrix, and analytical methodology. Sample holding times for the various analyses conducted in this investigation are listed in Table A1 and range from 7 days to 6 months. Generally, estimated analyte concentration for samples with holding time exceedances are considered as biased low.

A.3.1. September 2011 Sampling.

All samples analyzed for 2-butoxyethanol were beyond the 14 day limit by 1-3 days. In addition, the samples collected on September 21 and September 20 were analyzed for the three glycol analytes 1-2 days past the 14 day limit. All samples and analytes exceeding the holding times were qualified with an H qualifier.

The re-analysis of Br with RSKSOP-214v5 (FIA) was performed past the 28 day holding time for the samples. Samples were analyzed from 34 to 41 days after collection. The samples were qualified as exceeding the holding time (H qualifier).

A.3.2. March 2012 Sampling.

All samples met holding times. The original inductively coupled plasma mass spectrometry (ICP-MS) analysis of mercury (Hg) was within holding time, but the subsequent rejection of this data did not allow for Hg re-analysis using the CLP laboratory, so Hg was not re-analyzed by CLP. Therefore, no Hg data is available.

A.3.3. September 2012 Sampling.

All samples met holding times.

A.3.4. December 2012 Sampling.

All samples met holding times.

A.3.5. May 2013 Sampling.

All samples met holding times.

A.4. Blank Samples Collected During Sampling.

An extensive series of blank samples were collected during all sampling events, including field blanks, equipment blanks, and trip blanks (Table A2). These QC samples were intended to test for possible bias from potential sources of contamination during field sample collection, equipment cleaning, sample bottle transportation to and from the field, and laboratory procedures. The same source water was used for the preparation of all blank samples (Barnstead NANOpure Diamond UV water). Field blanks were collected to evaluate potential contamination from sample bottles and environmental sources. Equipment blanks were collected to determine if cleaning procedures or sample equipment (filters, fittings, tubing) potentially contributed to analyte detections. Trip blanks consisted of serum bottles or volatile organic compound (VOC) vials filled with NANOpure water and sealed in the laboratory. Trip blanks were used to evaluate whether VOC and dissolved gas serum bottles were contaminated during sample storage, sampling, or shipment to and from the field. All other analysis have associated field and equipment blanks (when needed), except for isotope ratio analyses for which no blank sampling schemes are appropriate. Sample bottle types, preservation, and holding times were applied to blank samples in the same way as they were applied to field samples (Table A1).

The following criteria are used for qualifying samples with potential blank contamination. Sample contamination is considered significant if analyte concentrations in blanks are above the method Quantitation Limit (QL) and if the analyte is present in an associated field sample at a level <10× the concentration in the blank. In cases where both the sample and its associated laboratory, equipment, field or trip blank are between the MDL and the QL, the sample data are reported as less than QL with a U qualifier. Blank samples are associated to field samples by dates of collection; for example, most sample shipments include both field samples and blank samples that are used for blank contamination assessments. See section of QAPP Additions and Deviations for additional information. Results of blanks analyses are reported in Tables A3-A11. The following sections describe instances where blank detections were noted and potential impacts on data quality and usability. As previously stated, the majority of these blanks were free from detections or were less than QL and in these cases the sample data are not affected and are not presented in the following sections.

A.4.1. September 2011 sampling.

Dissolved Organic Carbon in the equipment blanks on 9/20/2011 and 9/22/2011 had concentrations greater than QL. There was a potential impact to the data for one sample, WISETXGW05-092011, which was qualified with a “B” qualifier. All other samples on this date were either less than QL or 10× greater than the blank concentration so there was no impact on data quality. Nitrate + nitrite had an equipment blank that was rejected because of nitric acid being added as a preservative instead of sulfuric acid. Since all other blanks for nitrate + nitrite were less than QL it is not likely that contamination was present. Therefore no addition qualification was necessary and there was no impact to data quality.

In the case of acetate two field blanks and all equipment blanks contained concentrations of acetate greater than QL and the samples with detectable concentrations were approximately at the same concentration. Therefore the following samples were qualified with a “B” qualifier: WISETXGW03-092011, WISETXGW04-092011, WISETXGW05-092011, WISETXGW06-092011, WISETXGW07-092011, WISETXGW08-092011, WISETXGW09-092011, WISETXGW10-092011, WISETXSW01-092011, WISETXSW02-092011, WISETXSW02-092011 DUP, and WISETXSW03-092011. All other samples were less than QL and no addition qualification was necessary. The likely source of contamination was the preservative. The acetate data is not usable.

There was no blank contamination detected in the field blanks, equipment blanks and trip blanks for dissolved gases. It should be noted that the trip blank collected on 9/22/2011 was found to be contaminated by carry over during analysis from a previously ran standard and the data for this blank was rejected.

The field and equipment blanks for semi-volatile organic compounds (sVOC) analytes were less than QL with the exception of the following blank: Bis-(2-ethylhexyl) phthalate field blank collected on 9/19/2011. Samples had concentrations less than QL with the exception of WISETXGW06-092011 which was qualified with a "B" qualifier. The source of the contamination of this blank is unknown.

The following field and equipment blanks for gasoline range organics (GRO) were greater than QL: Field Blanks collected on 9/19/2011, 9/20/2011, and 9/21/2011; and Equipment Blanks collected on 9/19/2011 and 9/21/2011. All samples however, were less than QL and no qualifiers were needed. Diesel Range Organic (DRO) compounds had detectable concentrations above the QL for equipment blanks collected on 9/19/2011, 9/20/2011, and 9/22/2011. All groundwater samples were less than QL so no qualification was needed. In the case of surface waters, the data were greater than QL; however, the samples collected on 9/21/2011 did not need qualification because the blanks for this date were less than QL. The surface water sample collected for WISETXSW03-092011 on 9/22/2011 did not need qualification because the sample was greater than 10× the concentration in the equipment blank.

A.4.2. March 2012 sampling.

Equipment blanks collected on 3/5/2012, 3/6/2012, and 3/7/2012 all had detections for DOC greater than QL. All DOC samples less than 10 times the concentration in the respective blanks were qualified with a "B" qualifier. Affected samples are WISETXGW01-302012, WISETXGW02-302012, WISETXGW02-302012 DUP, WISETXGW03-302012, WISETXGW04-302012, WISETXGW05-302012, WISETXGW06-302012, WISETXGW08-302012, WISETXGW09-302012, WISETXGW10-302012, WISETXGW11-302012, WISETXGW13-302012, WISETXGW14-302012, WISETXGW15-302012, WISETXGW16-302012, WISETXSW01-302012, WISETXSW02-302012, WISETXSW02-302012 DUP, and WISETXSW03-302012.

The field blanks collected for formate on 3/5/2012, 3/7/2012, and 3/8/2012 all had detectable concentrations of formate greater than QL. The data associated with these blanks were qualified with a "B" qualifier if the sample data was detectable and less than 10 times the concentration in the blanks. The effected samples were the following: WISETXGW01-032012, WISETXGW02-032012, WISETXGW02-032012 DUP, WISETXGW03-032012, WISETXGW06-032012, WISETXGW07-032012, WISETXGW08-032012, WISETXGW09-032012, WISETXGW10-032012, WISETXGW11-032012, WISETXGW12-032012, WISETXGW13-032012, WISETXGW14-032012, and WISETXSW03-032012. A potential source of this contamination was the sample containers.

Glycols, sVOCs, DRO, and GRO had no detectable concentrations of the respective analytes in the field blanks greater than QL. Therefore, no qualification was needed.

A.4.3. September 2012 Sampling.

Field and equipment blanks had concentration greater than the QL for total Ni on 9/20/12. All samples less than 10 times the concentration in the blanks were qualified with a "B" qualifier. The effected samples were the following: WISETXGW01-092012, WISETXGW01-092012 DUP, and WISETXGW08-092012.

A.4.4. December 2012 Sampling.

Field Blank1-122012 and Equipment Blank1-122012 had concentrations of DOC greater than the QL. All other blanks were less than QL. The samples associated with Field Blank1-122012 were qualified with a "B" qualifier if the sample data was less than 10 times the concentration of the blank. The effected samples were WISETXGW13-122012 and WISETXGW13-122012 DUP.

Dissolved metals blank data indicated that with the exception of dissolved Ni all reported concentrations were less than QL. In the case of dissolved Ni only Equipment Blank 2-122012 had a Ni concentrations at the QL. The samples associated with this blank were qualified with a "B" qualifier if the concentrations in the samples were less than 10 times concentration in the blank. The effected samples were WISETXGW02-122012, WISETXGW03-122012, WISETXGW04-122012, and WISETXGW08-122012. The source of this contamination is not known.

Similarly the blank data for total metals were less than QL with the exceptions of Al, Ca, Ni, V, and Zn. Field Blank3-122012 for total Al had a concentration greater than QL. All associated samples less than 10 times the concentration in this blank were qualified with "B" qualifier. The only sample affected was WISETXGW15-122012. All field blanks and the pump equipment blank were greater than QL for total Ni. The likely source was lab contamination during analysis. All samples with the exception of WISETXGW01-122012 were qualified with a "B" qualifier because the reported concentrations were less than 10 times the concentration reported in the blank. It should be noted that the pump equipment blank is only associated with the sample, WISETXGW08-122012. The reason is that this was the only well that used a portable pump to sample. Similarly, all the blanks for total V with the exception of Field Blank1-122012 had concentrations greater than QL. All samples with the exception of WISETXGW13 Dup-122012 were qualified with a "B" qualifier. WISETXGW13-Dup122012 did not need qualification because the reported concentration was less than QL. Finally, for total Zn, Field Blank 1-122012 had a concentration at the QL. The associated samples were qualified with a "B" qualifier. The effected samples were WISETXGW01-122012, WISETXGW02-122012, WISETXGW03-122012, and WISETXGW16-122012. The likely source of contamination of the total metal samples is not known and could be from the sample containers, laboratory, or environmental sources.

All analytes in the VOC analysis, with the exception of acetone, had field, pump equipment, and trip blanks less than QL. Therefore, with the exception of acetone, no qualification was needed.

For acetone the field blanks, Field Blank 2-122012 and Field Blank 3-122012; Pump Equipment Blank 1-122012; and Trip Blank 3-122012 had acetone concentrations greater than QL. The pump equipment blank is only associated with the sample WISETXGW08-122012 and since this sample was less than 10 times the concentration in the blank sample it was qualified with a “B” qualifier. The samples associated with the field and trip blanks were qualified with a “B” qualifier if the sample was greater than the QL and less than 10 times the concentration in the blanks sample. The effected samples are as follows: WISETXGW08-122012, WISETXGW14-122012, WISETXGW16-122012, WISETXSW04-122012, and WISETXSW04-122012 DUP. The source of this contamination is not known. There was no known source of acetone at the sampling locations, but acetone is a common lab chemical.

A.4.5. May 2013 sampling event.

Dissolved metals field and equipment blanks were less than QL for all metals with the exceptions of Cu, Mo, Na, Ni, P, Pb, Sr, and Zn. Equipment Blank 1-052013 had dissolved Cu concentrations greater than QL. All samples associated with Equipment Blank 1-052013 that had concentrations <10× the concentration in the blank were qualified with a “B” qualifier. The affected samples were WISETXGW01-052013, WISETXGW02-052013, WISETXGW13-052013, WISETXGW14-052013. Dissolved Na Equipment blank 3-052013 and the Field Blank 3-052013 had concentrations greater than QL. However, all associated samples for these blanks were greater than 10 times the concentration found in the blanks and no qualification was needed. Field Blank 1-052013, had reported concentrations greater than QL for dissolved Ni. The associated samples that were less than 10 times the blank concentration were qualified with a “B” qualifier. WISETXGW02-052013, WISETXGW13-052013, and WISETXGW14-052013 were affected. In addition, Pump Equipment Blank 1-052013, also had a concentration of dissolved Ni greater than QL. The affected sample WISETXGW08-052013 was qualified with a “B” qualifier. For dissolved P, Equipment Blank 3-052013, had reported concentrations greater than QL. The only effected sample was WISETXGW15-052013, which was qualified with a “B” qualifier. Samples WISETXGW02-052013 and WISETXGW14-052013 were qualified with a “B” qualifier because of blank contamination in Equipment Blank 1-052013 for dissolved Pb. Equipment Blank 3-052013 for dissolved Sr had reported concentration greater than QL. No samples were affected since all samples were greater than 10 times concentration reported in this blank. Finally, the pump equipment blank, Pump Equipment Blank 1-052013 had reported concentration greater than QL for dissolved Mo and Zn. However, the lab blank associated with this blank also had detectable concentrations greater than QL so the Pump Equipment Blank 1-052013 and its associated sample WISETXGW08-052013 were qualified with a “B” qualifier.

All total metals had equipment, field and pump equipment blanks less than QL for all elements, except for the following: Mo, Ni, Th, V, and Zn. For total Mo, total Ni and total Zn, Pump Equipment Blank 1-052013,concentration was greater than QL. The affected sample

WISETXGW08-052013 was qualified with a "B" qualifier for each of these analytes. For total Th, Equipment Blank 1-052013, reported a concentration equal to the QL. All associated samples with this blank were less than QL so no qualification was needed. Total V had detectable concentrations greater than QL in all the blanks and samples with the exception of WISETXPW03-052013. The laboratory blanks also had detectable concentrations of total V. Therefore all blanks and samples with the one noted exception were qualified with a "B" qualifier.

All VOCs blanks with the exception of acetone were less than QL and needed no further qualification. For acetone all field blanks and the Pump Equipment Blank 1-122012 had detectable acetone concentrations greater than QL. The samples that were less than 10 times the concentration in the respective blanks were qualified with a "B" qualifier. The only samples that did not require this additional qualifier were WISETXPW02-052013 and WISETXPW03-052013. The source of this contamination is not known. There was no known source of acetone at the sampling locations, but acetone is a common laboratory chemical.

A.5. Field Duplicate Samples.

Field duplicate samples were collected to measure the reproducibility and precision of field sampling and analytical procedures. The relative percent difference (RPD) was calculated to compare concentration differences between the primary (sample 1) and duplicate sample (sample 2) using the following equation:

$$\text{RPD}\,(\%) = \left(\frac{2 \times (\text{sample 1} - \text{sample 2})}{(\text{sample 1} + \text{sample 2})} \right) \times 100\,.$$

RPD were calculated when the constituents in both the primary sample and duplicate sample were greater than 5 times the method QLs. Constituents are qualified if RPDs are >30%. Tables A12- A22 provide duplicate data.

A.5.1. September 2011 sampling event.

All duplicates meet the requirements of RPD <30%.

A.5.2. March 2012 Sampling Event.

All duplicates meet the requirements of RPD <30%.

A.5.3. September 2012 Sampling Event.

All duplicates meet the requirements of RPD <30%.

A.5.4. December 2012 Sampling Event.

In the case of dissolved Al, Fe, Pb and V the duplicates were greater than 30% and the data was qualified with a “*” qualifier.

The total Al RPD was greater than 30% and the data for WISETXSW04 was qualified with a “*” qualifier.

A.5.5. May 2013 Sampling Event.

Dissolved Al and dissolved Si for WISETXSW04-052013 had duplicates with RPD greater than 30%, so data for this sample was qualified with a “*” qualifier.

A.6. Laboratory QA/QC Results and Data Usability Summary.

The QA/QC requirements for laboratory analyses conducted as part of this case study are provided in the QAPPs. Table A23 summarizes laboratory QA/QC results identified during sample analysis, such as laboratory duplicate analysis, laboratory blank analysis, matrix spike results, calibration and continuing calibration checks, as well as field QC. Impacts on data quality of any issues noted in the QA/QC results are also presented in Table A23. Data qualifiers are listed in Table A24. Many of the specific QA/QC observations noted in the Audit of Data Quality are summarized in Table A23.

The majority of the reported data met project requirements. Data that did not meet QA/QC requirements specified in the QAPP are indicated by application of data qualifiers in the final data summaries. Data determined to be unusable were rejected and qualified with an “R.” Depending on the data qualifier, data usability is affected to varying degrees. For example, data qualified with a “B” would not be appropriate to use when the sample concentration is below the blank concentration. But as the sample data increase in concentration and approach 10x the blank concentration, they may be more appropriate to use. Data with a “J” flag is usable with the understanding that it is an approximate concentration, but the analyte is positively identified. A “J+” or “J-” qualifier indicates a potential positive or negative bias, respectively. An “H” qualifier, for exceeding sample holding time, is considered a negative bias. A “*” indicates that the data are less precise than project requirements. Each case is evaluated to determine the extent that data are usable or not (see Table A23).

A.7. Double-lab Comparisons.

Double laboratory comparisons were not performed for Wise County samples.

A.8. Performance Evaluation Samples.

A series of PE samples were analyzed by the laboratories conducting critical analyses to support the effort at the Wise County Retrospective Case Study. The PE samples were analyzed as part of the normal QA/QC standard operating procedures and in the case of certified labs as part of the certification process and to maintain certification for that laboratory. Results of the PE tests are presented in Tables A25 to A27. These tables show the results of 1354 tests; 98.6% of the reported values fell within the acceptance range. For the ORD/NRML Laboratory a total of 95 tests were performed with 96.9% of the reported values fell within acceptable range. Similarly, at the Shaw Environmental Laboratory, a total of 835 tests were performed with 98.7% of the reported values falling within the acceptable range. The EPA Region 8 Laboratory had a total of 424 tests performed with 98.8% of the reported values falling within the acceptable range. These PE sample results help demonstrate the high quality of analytical data reported here. Analytes not falling within the acceptable range were checked and corrective action was undertaken to ensure data quality in future analysis.

A.9. QAPP Additions and Deviations.

A.9.1. September 2011 Sampling Event.

The September 2011 sampling was conducted under an approved QAPP titled "Hydraulic Fracturing Retrospective Case Study, Wise and Denton Co., TX" revision 0 approved on August 22, 2011. One deviation in the QAPP was that water levels could not be obtained in any of the wells and therefore, water level measurements could not be taken. The reason for this was that the well construction did not allow access for these measurements to be taken. No impacts to data quality would be expected. Subsequent revisions to the QAPP addressed this issue. For WISETXGW01, the flow of the water coming from the well could not be controlled since most of the plumbing had been removed and the homeowner did not want any modification to the existing plumbing. Therefore this well was sampled at the flow rate of the well pump and not at the flow rate stated in the QAPP. Impact to data quality is unknown. Another deviation involved the reanalysis of Br using Flow Injection Analysis (FIA) by RSKSOP-214v5, a modified version of Standard Methods 4500-Br. This was necessary due to the high chloride interference using the method in the QAPP, RSKSOP-276v3. No impacts to data quality since removing the chloride interference would allow for better detection of bromide. An additional deviation from planned analyses described in the QAPP was that all of the ICP-MS metals data were not reported from the July 2011 sampling event. These data were not reported because of concerns about the data quality. Instead, ICP-OES data were reported for the ICP-MS metals As, Cd, Cr, Cu, Ni, Pb, and Se. ICP-MS data were collected for the March 2012 and May 2013 sampling events. In general, the ICP-OES trace metal data cannot be compared with the subsequent ICP-MS data due to the large differences in QLs and MDLs for the ICP-OES and ICP-MS methods, respectively; therefore, trace metal evaluations only consider data collected during the later sampling events if ICP-MS data is available. Information about the concentrations of As, Cd, Cr, Cu, Ni, Pb, and Se from the ICP-OES is considered to be for screening level evaluation.

A.9.2. March 2012 Sampling Event.

The March 2012 sampling was conducted under an approved QAPP titled “Hydraulic Fracturing Retrospective Case Study, Wise and Denton Co., TX” revision 1 approved on February 27, 2012. Dissolved and total metal analysis was originally conducted by Shaw Environmental however; the data reported for dissolved and total metals was from the CLP lab. The reason for the reanalysis of the dissolved and total metals samples follows. Audits of Data Quality on the original ICP-MS results found that the laboratory did not analyze interference check solutions (ICSs) as described in EPA Method 6020A. These ICSs would have enabled the laboratory to evaluate the analytical method’s ability to appropriately handle known potential interferences and other matrix effects. In ICP-MS analysis, the ICS is used to verify that the interference levels are corrected by the data system within quality control limits. Because of the importance of this missing quality control check, it was necessary to reject the ICP-MS data from the original analysis. Audits of Data Quality on the original inductively coupled plasma optical emission spectrometry (ICP-OES) data found that the laboratory did not analyze matrix spikes for a number of metals and cations as well as the frequency of calibration checks was less than required. Since samples were already being submitted for ICP-MS analysis, it was determined that re-analysis for the metals was ICP-OES was desirable to in an attempt to eliminate or reduce the number of qualified data. The samples were analyzed through the EPA Superfund Analytical Services EPA CLP). Samples were sent for analysis under the EPA CLP Inorganic Statement of Work ISMO1.3, Exhibit D – Part B, “Analytical Methods for Inductively Coupled Plasma – Mass Spectrometry” with some minor requested modifications. This QAPP deviation was subsequently covered in an addendum to the original QAPP entitled “Hydraulic Fracturing Retrospective Case Study, Wise, TX: Reanalysis of Samples for Metals by the EPA Superfund Analytical Services CLP for the March 2012 Sampling Event”, revision 3, addendum approved on December 20, 2012. It should also be noted that the reanalysis did not include Hg analysis for either dissolved or total metals since the 28 day holding time had expired prior to samples being received by the CLP laboratory. In addition, for many of the metals the CLP did not have the desired MDLs or QLs which also was a limitation to this data set.

A.9.3. September 2012 Sampling Event.

The September 2012 sampling was conducted under an approved QAPP titled “Hydraulic Fracturing Retrospective Case Study, Wise, TX: September 2012 Produced Water Sampling” revision 3 approved on September 10, 2012. This was an opportunistic sampling event in which production water from a Barnett Shale gas well adjacent to Location B study site was sampled. In addition, a limited sampling of select domestic wells of interest was sampled at this location. In all, two domestic wells and a production well were sampled. A deviation to the QAPP was how the production well was sampled. The actual sampling method used by the consultant was slightly different than what was described prior to the actual sampling. An accurate description of the sampling method was provided in subsequent revisions of this QAPP.

An additional deviation to this QAPP was that the dissolved and total metal samples were analyzed by SWRI. This was through the Region 7 contract with ARDL, Inc. SwRI is a subcontractor to ARDL, Inc. It was decided that due to improved QLs provided by this laboratory that samples would be sent to this laboratory for analysis. However, at the time of the sampling the contract was not yet in place. Since metals have a 6 month holding time with the exception of Hg (28 days) that the samples would be held and then shipped to SWRI. Mercury analysis was not performed on these samples because the holding time was already exceeded at the time of shipment. This deviation to the QAPP was documented in the subsequent addendum to the QAPP titled "Hydraulic Fracturing Retrospective Case Study, Wise, TX: Analysis of Samples by the EPA Region VII Contract Laboratory for the September and December 2012 Sampling Events" revision 3 addendum 2 approved on February 25, 2013.

A.9.4. December 2012 Sampling Event.

The December 2012 sampling was conducted under approved QAPPs titled "Hydraulic Fracturing Retrospective Case Study, Wise, TX: Analysis of Samples by the EPA Region VII Contract Laboratory for the September and December 2012 Sampling Events" revision 3 addendum 2 approved on February 25, 2013 and "Hydraulic Fracturing Retrospective Case Study, Wise, TX: September 2012 Produced Water Sampling" revision 3 approved on September 10, 2012. The sampling method for the well WISETXGW08 was different than what was in the QAPP. This deviation occurred because the pump in this domestic well failed just prior to sampling. The pump was pulled from the well prior to sampling by the homeowner. The contractor for the Texas Railroad Commission obtained a portable pump which was lowered in to the well so the water could be sampled. No impact to data quality was expected.

A.9.5. May 2013 Sampling Event.

The May 2013 sampling was conducted under an approved QAPP titled "Hydraulic Fracturing Retrospective Case Study, Wise Co., TX" revision 4 approved on May 6, 2013. There were no deviations from the QAPP for this event.

A.10. Field QA/QC.

A YSI Model 556 flow-cell was used to measure temperature, specific conductance, pH, oxidation-reduction potential, and dissolved oxygen. YSI electrodes were calibrated in the morning of each sampling day. Performance checks were conducted after initial calibration, mid-day and at the end of each day. The YSI 5580 Confidence Solution was used to conduct the performance checks for specific conductance, oxidation/reduction potential (ORP) and pH. NIST-traceable buffer solutions (4.00, 7.00 and 10.01) were used for pH calibration. YSI ORP standard was used for calibration of redox potential measurements. YSI conductivity standard was used for calibration of specific conductance measurements. Dissolved oxygen sensors were calibrated with air. Table A28 provides the results of initial, mid-day and end-of-the-day performance checks. Prior to field deployment, the electrode assembly and meter had checked to ensure that it was in good working order. In all cases performance checks were within acceptance limits (Table A28) checks.

Field Parameters at this case study location consisted of turbidity, alkalinity, total dissolved sulfide species (ΣH_2S), and ferrous iron. Because field measurements of ferrous iron and dissolved sulfide sometimes required dilution and because all sample preparations and measurements were made in an uncontrolled environment (i.e., the field), concentration data for these parameters are qualified in all cases as estimated. The turbidity was measured using a HACH 2100Q Portable Turbimeter and was calibrated using HACH 2100Q StablCal Calibration Set. The HACH 2100Q StablCal Calibration Set consists of the 20 NTU, 100 NTU, and 800 NTU standards with a 10 NTU calibration verification standard. For alkalinity measurements a HACH Model AL-DT Digital Titrator was used. The total dissolved sulfide species and ferrous iron measurements were collected using a HACH DR890 Portable Colorimeter. The equipment for measuring alkalinity, total dissolved sulfide species and ferrous iron measurements accuracy was verified in the lab prior to field deployment using known standards. In the field a blank sample was measured to ensure no cross contamination occurred. This was also the case for turbidity, however a 10 NTU standard was also used to verify the calibration. These checks were performed after initial calibration, mid-day and end-of-day.

A.11. Data Qualifers.

Data qualifiers and their definitions are listed in Table A24. Many factors can impact the quality of data reported for environmental samples, including factors related to sample collection in the field, transport of samples to laboratories, and the analyses conducted by various laboratories. The list of qualifiers in Table A24 is based on the Data Qualifier Definitions presented in the EPA CLP National Functional Guidelines for Superfund Organic Methods Data Review (USEPA/540/R-01, 2008), and the EPA CLP National Functional Guidelines for Superfund Inorganic Methods Data Review (USEPA/540/R/10/011, 2010) with the addition of data qualifiers H and B which are necessary for communicating issues that occur during analysis in laboratories not bound by the CLP statement of work. The R qualifier is used in cases where it was determined that data needed to be rejected. Data rejection can occur for many reasons, which must be explained in QA/QC narratives (Table A23). Conditions regarding the application of qualifiers include:

- If the analyte was not detected, it was reported as <QL and qualified with U.
- If the analyte was between MDL and QL, it was qualified with J.

- If the analyte concentration was less than the Quantitation Limit (<QL), then the B qualifier was not applied.
- If both an analyte and an associated blank concentration are between the MDL and QL, then the sample results were reported as <QL and qualified with U.
- For samples associated with high matrix dpike recoveries, the J+ qualifier was not applied if the analyte was less than the Quantitation Limit (<QL).
- For samples associated with low matrix spike recoveries, the J- qualifier was applied to the analyte with low recovery regardless of analyte concentration (< or > QL).

A.12. Tentatively Identified Compounds (TICs).

The Region 8 laboratory reported tentatively identified compounds (TICs) from sVOC analyses. Several sVOC TICs were identified in samples and blanks (Tables A29). To be identified as a TIC, a peak had to have an area at least 10% as large as the area of the nearest internal standard and a match quality greater than 80. The TIC match quality is based on the number and ratio of the major fragmentation ions. A perfect match has a value of 99. Although the TIC report is essentially a qualitative report, an estimated concentration is calculated based on a response factor of 1.00 and the area of the nearest internal standard. The search for TICs includes the whole chromatogram from approximately 3.0 to 41.0 minutes for sVOCs. TICs are compounds that can be detected, but, without the analysis of standards, cannot be confirmed or reliably quantified. Oftentimes TICs are representative of a class of compounds rather than indicating a specific compound. Only the top TIC is reported for each peak.

A.13. Audits of Data Quality (ADQ).

An ADQ was performed for each sampling event per EPA's NRMRL standard operating procedure (SOP), *Performing Audits of Data Quality (ADQs)*, to verify that requirements of the QAPP were properly implemented for the analysis of critical analytes for samples submitted to laboratories identified in the QAPP associated with this project. The ADQ was performed by a QA support contractor, Neptune and Company, Inc. and reviewed by NRMRL QA staff. NRMRL QA staff provided the ADQ results to the project Principal Investigators (PIs) for response and assisted in the implementation of corrective actions. The ADQ process is an important element of Category I (highest of four levels in ORD) Quality Assurance Projects, which this study has operated under for all aspects of groundwater collection and analysis.

Complete data packages were provided to the auditors for all sampling events. A complete data package consists of the following: sample information, method information, data summary, laboratory reports, raw data including QC results, and data qualifiers. The QAPP was used to identify data quality indicator requirements and goals, and a checklist was prepared based on the types of data collected. The data packages were reviewed against the checklist by tracing a representative set of the data in detail from raw data and instrument readouts through data transcription or transference through data manipulation (either manually or electronically by commercial or customized software) through data reduction to summary data, data calculations, and final reported data. All calibration and QA/QC data were reviewed for all available data packages. Auditors also reviewed the data summary spreadsheet prepared by the PI to determine if data had been accurately transcribed from lab summary reports and appropriately qualified based on laboratory and field QC results.

The critical analytes (September 2011, March 2012, September 2012, and December 2012 sampling events), as identified in the QAPP, are GRO; DRO; sVOCs; VOCs (also known as VOAs) including naphthalene and alcohols isopropyl alcohol, tert butyl alcohol; Dissolved Gases (Methane, ethane, propane, and butane); trace elements (As, Se, Sr, Ba, and B); major cations (Ca, Mg, Na, K); and major anions chloride , nitrate + nitrite, sulfate). Also included in the ADQ were glycols and all other metals analyzed. For the May 2013 sampling event, DRO, GRO, and sVOCs are no longer considered critical because these were not detected in wells during previous samplings. The non-conformances identified in an ADQ can consist of the following categories: finding (a deficiency that has or may have a significant effect on the quality of the reported results; a corrective action response is required), or observation (a deficiency that does not have a significant effect on the quality of the reported results; a corrective action response is required). The ADQ for the September 2011 sampling event noted a series of 2 findings and 14 observations; the March 2012 sampling event had 5 findings and 21 observations; the March 2012 CLP metals analysis ADQ had 2 findings and 5 observations; the September 2012 sampling event had no findings and 10 observations; the December 2012 sampling event had no findings and 19 observations; and the May 2013 sampling event had no findings and 12 observations. The ADQ findings and observations that had an impact on data quality and usability are included to Table A23 along with the corrective actions taken and data qualifications. All findings and observations were resolved through corrective actions.

A.14. Laboratory Technical Systems Audits (TSA).

Laboratory Technical Systems Audits (TSAs) were conducted early in the project to allow for identification and correction of any issues that may affect data quality. Laboratory TSAs focused on the critical target analytes. Detailed checklists, based on the procedures and requirements specified in this QAPP, related SOPs, and EPA Methods were prepared and used during these TSAs. These audits were conducted with contract support from Neptune and Co., with oversight by NRMRL QA Staff.

For assessments that identify deficiencies requiring corrective action, the audited party provided a written response to each finding and observation to the PI and QA Manager, which included a plan for corrective action and a schedule. The PI is responsible for ensuring that audit findings are resolved. The QA Manager reviewed the written response to determine their appropriateness. If the audited party was other than the PI, then the PI also reviewed and concurred with the corrective actions. The QA Manager tracked implementation and completion of corrective actions. After all corrective actions were implemented and confirmed to be completed; the QA Manager sent documentation to the PI and his supervisor that the audit was closed. Audit reports and responses shall be maintained by the PI in the project file and the QA Manager in the QA files, including QLOG.

Laboratory TSAs focused on the critical target analytes and were conducted on-site at ORD/NRMRL Laboratory and Shaw Environmental [both laboratories are located at the Robert S. Kerr Research Center (RSKERC), Ada, OK] and at the EPA Region 8 Laboratory (Golden, CO) which analyzed for sVOC, DRO and GRO analyses. These TSAs took place immediately following the first sampling event in July, 2011 at the Killdeer Case Study.

At the conclusion of a TSA, a debriefing took place between the auditor and the PI as well as the audited party to discuss the assessment results. Assessment results were documented in reports to the PI, the PIs first-line manager, and the Technical Research Lead for Case Studies. If any serious problems were identified that require immediate action, the QAM would verbally convey these problems at the time of the audit to the PI.

The PI was responsible for responding to the reports as well ensuring that corrective actions were implemented in a timely manner to ensure that quality impacts to project results are minimal.

All final audit reports were sent to the Technical Research Lead for Case Studies, first-line manager of the PI and copied to the PI. Audit reports were prepared by the QA Manager or the QA support contractor, Neptune and Co. Those prepared by Neptune and Co. were reviewed and approved by the QAM prior to release. Specific actions were identified in the reports. A summary of the audits and corrective actions are given in Tables A30- A33.

A.14.1. EPA Region 8 Laboratory.

A TSA audit was conducted on July 26, 2011 for the EPA Region 8 Laboratory. The TSA was conducted at the laboratory's facility in Golden, CO. This audit was conducted on the DRO, GRO and sVOC methods. In general the TSA found that the EPA Region 8 laboratory was following good QA practices. The QAPP and SOP specifications were followed in the majority of the cases, with some relatively minor differences. Two observations were noted and there were no findings identified. The observations recommended documenting changes in the approved QAPP. The observations were resolved. There was not impact to data quality. A summary of the audits and corrective actions are given in Tables A30.

A.14.2. EPA Robert S. Kerr Environmental Research Center (RSKERC) Laboratories.

A TSA audit was conducted on July 28, 2011 for the RSKERC laboratories in Ada, OK. The TSA was conducted on the ORD/NRMRL laboratory and the Shaw Environmental laboratory. This audit was conducted on the ORDNRMRL laboratory methods for the anions. For the Shaw Environmental laboratory the TSA audit was conducted on the following methods: VOCs (target compounds isopropyl alcohol, t-butyl alcohol and naphthalene), dissolved gases (methane, ethane, propane, and butane), major cations (Ca, Mg, Na, and K) and metals (As, Se, Sr, Ba and B). In general, this TSA found that the EPA RSKERC laboratories are following good QA practices. The QAPP and SOP specifications were followed in the majority of the cases, with some relatively minor differences. Two observations were noted and there were no findings. Observations were resolved through corrective actions. There was no impact to data quality. A summary of the audits and corrective actions are given in Tables A31.

A.14.3. Southwest Research Institute Laboratories.

A TSA audit was conducted on November 27, 2012 for the Southwest Research Institute Laboratories. This audit was for data collected for the ICP-OES and ICP-MS analysis for dissolved and total metals as well as for the volatile organic compound analysis and mercury using cold vapor method. In general the TSA found that the SwRI laboratory was following good QA practices. The QAPP and SOP specifications were followed in the majority of the cases, with some relatively minor differences. Two observations were noted and there were no findings. Observations were resolved through corrective actions. There was no impact to data quality. A summary of the audits and corrective actions are given in Tables A32.

A.15. Field TSAs.

TSAs were conducted on both field and laboratory activities. Detailed checklists, based on the procedures and requirements specified in the QAPP, SOPs, and EPA Methods were prepared and used during these TSAs. One field TSA was done. This field TSA took place during the first sampling event in September 2011. The review and reporting requirements are the same as was discussed in the previous section. The results of the audit and the corrective actions are included in Table A33.

The sample collection, documentation, field measurements (and calibration), and sample handling including sample custody (and COC) operations were generally performed according to the QAPP. EPA was first to collect their samples, followed but the collection of Texas Railroad Commission samples. The field parameters were measured using a calibrated YSI 556 MSP and Hach kits depending upon the parameter, as described in the QAPP. Filtered samples also required first collecting an unfiltered sample as described in the QAPP. New filter and new piece of tubing were used for each sample each sample location. Field QC samples were also collected.

Documentation that was reviewed during the TSA for sampling conducted on the monitoring wells the day prior indicates the QAPP procedures were also followed. Field parameters were measured while purging, the purge rate and time documented. The monitoring wells were sampled after purging the wells, while monitoring for field parameters (e.g., pH, ORP, specific conductance, dissolved oxygen, and temperature).

Two observations were noted and there were no findings. Observations were resolved through corrective actions. A summary of the audits and corrective actions are given in Tables A33. All observations were resolved through corrective actions. There was no impact to the sample data quality.

Appendix A Tables

Table A1. Sample containers, preservation, and holding times for groundwater samples from Wise County, TX.

Sample Type	Analysis Method (Lab Method)	Sample Bottles/ # of bottles[1]	Preservation/ Storage	Holding Time(s)	Sampling Rounds[2]
Dissolved gases	Shaw Environmental: No EPA Method (RSKSOP-194v4 &-175v5)	60 mL serum bottles/2	No headspace TSP[3], pH >10; refrigerate ≤6 ºC[4]	14 days	1, 2, 4
Dissolved Metals (Filtered)	Shaw Environmental: EPA Methods 200.7 & 6020A (RSKSOP-213v4 & -257v2 or -332v0)	125 mL plastic bottle/1	HNO_3, pH <2	6 months (Hg 28 days)	1, 2
Dissolved Metals (Filtered)	CLP; EPA CLP Inorganic Statement of Work (SOW) ISM01.3, Exhibit D – Part B	125 mL plastic bottle/1	HNO_3, pH <2	6 months (No Hg)	2
Dissolved Metals (Filtered)	EPA Region 7 RASP Contract Southwest Research Institute: EPA Methods 200.7 & 6020A	1 L plastic bottle/1	HNO_3, pH <2	6 months	3, 4, 5
Dissolved Hg (Filtered)	EPA Region 7 RASP Contract Southwest Research Institute: EPA Method 7470A	1 L plastic bottle/1	HNO_3, pH <2	28 days	3, 4, 5
Total Metals (Unfiltered)	Shaw Environmental: Analysis- EPA Methods 200.7 & 6020A (RSKSOP-213v4 & -257v2 or -332v0); and Digestion- EPA Method 3015A (RSKSOP-179v3)	125 mL plastic bottle/1	HNO_3, pH <2	6 months	1, 2
Total Metals (Unfiltered)	CLP; EPA CLP Inorganic Statement of Work (SOW) ISM01.3, Exhibit D – Part B	125 mL plastic bottle/1	HNO_3, pH <2	6 months (No Hg)	2
Total Metals (Unfiltered)	EPA Region 7 RASP Contract Southwest Research Institute: EPA Methods 200.7 & 6020A	1 L plastic bottle/1	HNO_3, pH <2	6 months	3, 4, 5

Table A1. Sample containers, preservation, and holding times for groundwater samples from Wise County, TX.

Sample Type	Analysis Method (Lab Method)	Sample Bottles/ # of bottles[1]	Preservation/ Storage	Holding Time(s)	Sampling Rounds[2]
Total Metals (Unfiltered)	EPA Region 7 RASP Contract Southwest Research Institute: EPA Method 7470A	1 L plastic bottle/1	HNO_3, pH <2	6 months	3, 4, 5
Sulfate (SO_4), Chloride (Cl), Fluoride (F), Bromide (Br)	ORD/NRMRL (Ada): EPA Method 6500 (RSKSOP-276v3)	60 mL plastic bottle/1	Refrigerate ≤6ºC	28 days	1, 2, 3, 4, 5
Br	ORD/NRMRL (Ada): No EPA Method (RSKSOP-214v5)	60 mL plastic bottle/1	Refrigerate ≤6ºC	28 days	1, 3
Br	ORD/NRMRL (Ada): EPA Method 6500 (RSKSOP-288v3)	60 mL plastic bottle/1	Refrigerate ≤6ºC	28 days	2, 3, 4, 5
Iodide (I)	ORD/NRMRL (Ada): No EPA Method (RSKSOP-223v2)	60 mL plastic bottle/1	Refrigerate ≤6ºC	28 days	3, 4, 5
Nitrate+Nitrite (NO_3+NO_2)	ORD/NRMRL (Ada): EPA Method 353.1 (RSKSOP-214v5)	60 mL plastic bottle/1	H_2SO_4, pH <2; refrigerate ≤6ºC	28 days	1, 2, 3, 4, 5

Table A1. Sample containers, preservation, and holding times for groundwater samples from Wise County, TX.

Sample Type	Analysis Method (Lab Method)	Sample Bottles/ # of bottles[1]	Preservation/ Storage	Holding Time(s)	Sampling Rounds[2]
Ammonia (NH_3)	ORD/NRMRL (Ada): EPA Method 350.1 (RSKSOP-214v5)	60 mL plastic bottle/1	H_2SO_4, pH <2; refrigerate ≤6ºC	28 days	1, 2, 3, 4, 5
Dissolved Inorganic Carbon (DIC)	ORD/NRMRL (Ada): EPA Method 9060A (RSKSOP-330v0)	40 mL clear glass VOA vial/2	Refrigerate ≤6ºC	14 days	1, 2, 3, 4, 5
Dissolved Organic Carbon (DOC)	ORD/NRMRL (Ada): EPA Method 9060A (RSKSOP-330v0)	40 mL clear glass VOA vial/2	Refrigerate ≤6ºC	28 days	1, 2, 3
Volatile Organic Compounds (VOC)	Shaw Environmental: EPA Method 5021A + 8260C (RSKSOP-299v1)	40 mL amber glass VOA vial/2	No headspace TSP[3], pH >10; refrigerate ≤6ºC	14 days	1, 2
Volatile Organic Compounds (VOC)	EPA Region 7 RASP Contract Southwest Research Institute: EPA Method 8260B	40 mL amber glass VOA vial/4	No headspace; HCl , pH <2; refrigerate ≤6ºC	14 days	4, 5
Low Molecular Weight Acids	Shaw Environmental: No EPA Method (RSKSOP-112v6)	40 mL amber glass VOA vial/2	TSP[3], pH >10; refrigerate ≤6ºC	30 days	1, 2, 4

Table A1. Sample containers, preservation, and holding times for groundwater samples from Wise County, TX.

Sample Type	Analysis Method (Lab Method)	Sample Bottles/ # of bottles[1]	Preservation/ Storage	Holding Time(s)	Sampling Rounds[2]
Semi-volatile organic compounds (sVOC)	EPA Region 8: EPA Method 8270D (ORGM-515 r1.1)	1 L amber glass bottle/2	Refrigerate ≤6ºC	7 days extraction, 30 days after extraction	1, 2, 4
Diesel Range Organics (DRO)	EPA Region 8: EPA Method 8015D (ORGM-508 r1.0)	1L amber glass bottle/2	HCL, pH <2; refrigerate ≤6ºC	7 days extraction, 40 days after extraction	1, 2, 4
Gasoline Range Organics (GRO)	EPA Region 8: EPA Method 8015D (ORGM-506 r1.0)	40 mL amber VOA vial/2	No headspace HCL, pH <2; refrigerate ≤6ºC	14 days	1, 2, 4
Glycols	EPA Region 3: No EPA Method (R3 Method[5])	40 mL amber VOA vial/2	Refrigerate ≤6ºC	14 days	1, 2, 4
$^{87}Sr/^{86}Sr$ Isotope Analysis	USGS: No EPA Method (Thermal ionization mass spectrometry)	500 mL plastic bottle/2	Refrigerate ≤6ºC	6 months	2, 3, 4, 5
O, H stable isotopes of water	Shaw Environmental: No EPA Method (RSKSOP-334v0)	20 ml glass VOA vial/1	Refrigerate ≤6ºC	Stable	2, 3, 4, 5

[1] Spare bottles made available for laboratory QC samples and for replacement of compromised samples (broken bottle, QC failures, etc.). [2] Sampling rounds occurred in September 2011, March 2012, and September 2012, December 2012, and May 2013. [3] Trisodium phosphate. [4] Above freezing point of water.

Table A2. Field QC samples for groundwater analysis.

QC Sample	Purpose	Method	Frequency	Acceptance Criteria[1]/ Corrective Actions
Trip Blanks (VOCs and Dissolved Gases only	Assess Contamination during transportation.	Fill bottles with reagent water and preserve, take to field and return without opening.	One in an ice chest with VOA and dissolved gas samples.	<QL Samples are flagged when the analyte concentration was >QL, but <10X the concentration found in the blank.
Equipment Blanks	Assess contamination from field equipment, sampling procedures, decontamination procedures, sample container, preservative, and shipping.	Apply only to samples collected via equipment, such as filtered samples: Reagent water is filtered and collected into bottles and preserved same as filtered samples.	One per day of sampling.	
Field Blanks[1]	Assess contamination introduced from sample container with applicable preservation.	In the field, reagent water is collected into sample containers with preservatives.	One per day of sampling.	
Temperature Blanks	Measure temperature of samples in the cooler.	Water sample that is transported in cooler to lab.	One per cooler.	The temperature was recorded by the receiving lab upon receipt.[2]
Field Duplicates	Represent precision of field sampling, analysis, and site heterogeneity.	One or more samples collected immediately after original sample.	One in every 10 samples, or if <10 samples collected for a water typed (ground or surface), collect a duplicate for one sample.	RPD<30% for results > 5X the QL. Affected data were flagged as needed.

[1]Blank samples were not required for isotope ratio measurements, including $^{18}O/^{16}O$, H^2/H, and $^{13}C/^{12}C$. [2]The PI was notified if the samples arrived with no ice and/or if the temperature recorded from the temperature blank was >6°C.

Table A3. DOC, DIC, ammonia and anion blanks.

Sample ID	Date Collected	DOC	DIC	NO_3 + NO_2	NH_3	Br	Cl	SO_4^{2}	F	I
Units		mg/L	mg/L	mg N/L	mg N/L	mg/L	mg/L	mg/L	mg/L	µg/L
September 2011										
Field Blank	9/19/2011	0.07	<0.50	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	NA
Field Blank	9/20/2011	0.15	<0.50	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	NA
Field Blank	9/21/2011	<0.50	<0.50	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	NA
Field Blank	9/22/2011	0.19	<0.50	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	NA
Equipment Blank	9/19/2011	0.08	<0.50	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	NA
Equipment Blank	9/20/3011	0.51	<0.50	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	NA
Equipment Blank	9/21/2011	0.09	<0.50	<0.10	<0.10	0.10	<1.00	<1.00	<0.20	NA
Equipment Blank	9/22/2011	0.61	<0.50	R	<0.10	<1.00	<1.00	<1.00	<0.20	NA
MDL		0.07	0.02	0.01	0.01	0.06	0.11	0.05	0.03	NA
QL		0.50	0.50	0.10	0.10	1.00	1.00	1.00	0.20	NA
Detections in Samples		7/17	17/17	13/17	12/17	9/17	17/17	17/17	13/17	NA
Concentration min		0.77	17.3	0.02	0.10	0.17	4.62	11.5	0.09	NA
Concentration max		7.05	111	0.20	1.79	6.98	1480	214	0.27	NA
March 2012										
Field Blank	3/5/2012	<0.25	<0.10	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	NA
Field Blank	3/6/2012	<0.25	<0.10	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	NA
Field Blank	3/7/2012	<0.25	<0.10	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	NA
Field Blank	3/8/2012	<0.25	<0.10	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	NA
Equipment Blank	3/5/2012	0.92	<0.10	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	NA
Equipment Blank	3/6/2012	0.86	<0.10	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	NA
Equipment Blank	3/7/2012	0.62	<0.10	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	NA
Equipment Blank	3/8/2012	<0.25	<0.10	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	NA
MDL		0.07	0.02	0.01	0.01	0.16	0.11	0.05	0.03	NA

Table A3. DOC, DIC, ammonia and anion blanks.

Sample ID	Date Collected	DOC	DIC	NO_3 + NO_2	NH_3	Br	Cl	SO_4^{2}	F	I
Units		mg/L	mg/L	mg N/L	mg N/L	mg/L	mg/L	mg/L	mg/L	µg/L
QL		0.25	0.50	0.10	0.10	1.00	1.00	1.00	0.20	NA
Detections in Samples		20/20	20/20	3/20	16/20	11/20	20/20	20/20	18/20	NA
Concentration min		0.26	22.1	0.28	0.03	0.13	4.56	13.7	0.06	NA
Concentration max		6.33	105	0.28	3.62	10.1	1950	224	0.38	NA
September 2012										
Field Blank	9/20/2012	<0.50	<1	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	<10.0
Equipment Blank	9/20/2012	<0.50	<1	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	<10.0
MDL		0.01	0.04	0.01	0.01	0.17	0.13	0.16	0.04	2.22
QL		0.50	1.00	0.10	0.10	1.00	1.00	1.00	0.20	10.0
Detections in Samples		4/4	4/4	1/4	4/4	4/4	4/4	4/4	3/4	4/4
Concentration min		0.77	27.2	0.47	0.51	2.43	553	58.7	0.14	95.8
Concentration max		45.7	64.8	0.47	286	886	143400	285	0.34	57800
December 2012										
Equipment Blank 1-122012	12/3/2012	0.69	<1.00	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	<10.0
Equipment Blank 2-122012	12/4/2012	<0.50	<1.00	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	<10.0
Equipment Blank 3-122012	12/5/2012	<0.50	<1.00	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	<10.0
Field Blank 1-122012	12/3/2012	0.69	<1.00	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	<10.0
Field Blank 2-122012	12/4/2012	<0.50	<1.00	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	<10.0
Field Blank 3-122012	12/5/2012	<0.50	<1.00	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	<10.0
Pump Equipment Blank 1-122012	12/4/2012	<0.50	<1.00	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	<10.0
MDL		0.01	0.04	0.01	0.01	0.17	0.13	0.16	0.05	2.22
QL		0.50	1.00	0.10	0.10	1.00	1.00	1.00	0.20	10.0
Detections in Samples		5/12	12/12	7/12	12/12	3/12	12/12	12/12	7/12	12/12
Concentration min		0.57	29.5	0.01	0. 07	0.65	7.34	6.86	0.05	15.1

Table A3. DOC, DIC, ammonia and anion blanks.

Sample ID	Date Collected	DOC	DIC	NO_3 + NO_2	NH_3	Br	Cl	SO_4^{2}	F	I
Units		mg/L	mg/L	mg N/L	mg N/L	mg/L	mg/L	mg/L	mg/L	µg/L
Concentration max		22.5	70.5	0.30	3.51	7.73	1910	157	0.15	343
May 2013										
Equipment Blank 1-052013	5/28/2013	0.31	<1.00	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	<10
Equipment Blank 2-052013	5/29/2013	0.63	<1.00	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	<10
Equipment Blank 3-052013	5/30/2013	0.22	<1.00	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	<10
Field Blank 1-052013	5/28/2013	0.09	<1.00	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	<10
Field Blank 2-052013	5/29/2013	0.11	<1.00	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	<10
Field Blank 3-052013	5/30/2013	<0.50	<1.00	<0.10	<0.10	<1.00	<1.00	<1.00	<0.20	<10
Pump Equipment Blank 1-052013	5/29/2013	0.43	<1.00	0.01	<0.10	<1.00	<1.00	<1.00	<0.20	<10
MDL		0.05	0.09	0.01	0.02	0.17	0.13	0.16	0.05	2.22
QL		0.50	1.00	0.10	0.10	1.00	1.00	1.00	0.20	10.0
Detections in Samples		13/13	13/13	10/13	13/13	5/13	13/13	13/13	9/13	13/13
Concentration min		0.29	17.8	0.01	0.56	0.42	3.14	0.18	0.05	11.0
Concentration max		236	70.4	0.11	314	903	110100	358	0.14	126000

NA= Not analyzed

Table A4. Dissolved Metal Blanks.

Sample ID	Date Collected	Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011													
Field Blank	9/19/2011	<14	<494	<20	<333	<4	<10	<0.29	<4	<4	<7	<20	<67
Field Blank	9/20/2011	<14	<494	<20	<333	<4	<10	<0.29	<4	<4	<7	<20	<67
Field Blank	9/21/2011	<14	<494	<20	<333	<4	<10	<0.29	<4	<4	<7	<20	<67
Field Blank	9/22/2011	<14	<494	<20	<333	<4	<10	<0.29	<4	<4	<7	<20	<67
Equipment Blank	9/19/2011	<14	<494	<20	<333	<4	<10	<0.29	<4	<4	<7	<20	<67
Equipment Blank	9/20/3011	<14	<494	<20	<333	<4	<10	<0.29	<4	<4	<7	<20	<67
Equipment Blank	9/21/3011	<14	<494	<20	<333	<4	<10	<0.29	<4	<4	<7	<20	<67
Equipment Blank	9/22/2011	<14	<494	<20	<333	<4	<10	<0.29	<4	<4	<7	<20	<67
MDL		4	148	6	100	1	3	0.09	1	1	2	6	20
QL		14	494	20	333	4	10	0.29	4	4	7	20	67
Detections in Samples		0/17	0/17	0/17	10/17	17/17	0/17	17/17	0/17	0/17	0/17	2/17	7/17
Concentration min		<14	<494	<20	107	9	<10	1.07	<4	<4	<7	7	27
Concentration max		<14	<494	<20	603	134	<10	135	<4	<4	<7	10	154
March 2012													
Field Blank	3/5/2012	<10	<200	0.50	<100	<200	<5	<5.00	<1.0	<50	<2.0	<2.0	<100
Field Blank	3/6/2012	<10	<200	<1.0	<100	<200	<5	<5.00	<1.0	<50	<2.0	<2.0	<100
Field Blank	3/7/2012	<10	<200	0.49	<100	<200	<5	<5.00	<1.0	<50	<2.0	<2.0	25
Field Blank	3/8/2012	<10	<200	<1.0	<100	<200	<5	<5.00	<1.0	<50	<2.0	<2.0	<100
Equipment Blank	3/5/2012	<10	<200	0.49	<100	<200	<5	<5.00	<1.0	<50	<2.0	<2.0	<100
Equipment Blank	3/6/2012	<10	<200	0.64	<100	<200	<5	<5.00	<1.0	<50	<2.0	<2.0	<100
Equipment Blank	3/7/2012	<10	<200	0.62	<100	<200	<5	<5.00	<1.0	<50	<2.0	<2.0	<100
Equipment Blank	3/8/2012	<10	<200	0.57	<100	<200	<5	<5.00	<1.0	<50	<2.0	<2.0	<100

Table A4. Dissolved Metal Blanks.

Sample ID	Date Collected	Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MDL		2	44	0.44	41	47	1	1.50	0.22	12	0.43	0.46	25
QL		10	200	1.0	100	200	5	5.00	1.0	50	2.0	2.0	100
Detections in Samples		0/20	8/20	14/20	16/20	6/20	0/20	20/20	0/20	0/20	0/20	5/20	6/20
Concentration min		<10	46	1.0	78	48	<5	1.18	<1.0	<50	<2.0	0.66	29
Concentration max		<10	123	5.1	642	141	<5	152	<1.0	<50	<2.0	8.5	403
September 2012													
Field Blank	9/20/2012	<10	<20	<0.2	<40	<5	<5	<0.10	<0.20	<5	<2.0	<0.5	<100
Equipment Blank	9/20/2012	<10	<20	<0.2	<40	0.5	<5	<0.10	<0.20	<5	<2.0	<0.5	<100
MDL		3	5	0.2	5	0.4	0.1	0.004	0.20	2	0.3	0.1	40
QL		10	20	0.2	40	5	5	0.10	0.20	5	2	0.5	100
Detections in Samples		0/4	0/4	3/4	4/4	4/4	0/4	4/4	0/4	1/4	3/4	4/4	3/4
Concentration min		<10	<20	0.5	222	7.6	<5	25.7	<0.20	37	0.5	0.4	108
Concentration max		<50	<20000	0.7	27100	12300	<25	21200	<40	37	91	70	46600
December 2012													
Equipment Blank 1-122012	12/3/2012	<10	<20	<0.2	<40	<5	<5	<0.1	<0.20	<5	<2.0	0.26	<100
Equipment Blank 2-122012	12/4/2012	<10	<20	<0.2	<40	<5	<5	<0.1	<0.20	<5	<2.0	0.26	<100
Equipment Blank 3-122012	12/5/2012	<10	<20	<0.2	<40	<5	<5	0.02	<0.20	<5	<2.0	0.13	<100
Field Blank 1-122012	12/3/2012	3	<20	<0.2	<40	<5	<5	0.02	<0.20	2	<2.0	<0.5	<100
Field Blank 2-122012	12/4/2012	<10	<20	<0.2	<40	<5	<5	<0.1	<0.20	<5	<2.0	<0.5	<100
Field Blank 3-122012	12/5/2012	<10	<20	<0.2	<40	<5	<5	<0.1	<0.20	<5	<2.0	<0.5	<100
Pump Equipment Blank 1-122012	12/4/2012	<10	<20	<0.2	<40	<5	<5	<0.1	<0.20	<5	<2.0	<0.5	<100
MDL		3	3	0.2	13	0.4	0.2	0.02	0.20	2	0.3	0.1	40
QL		10	20	0.2	40	5	5	0.1	0.20	5	2.0	0.5	100

Table A4. Dissolved Metal Blanks.

Sample ID	Date Collected	Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Detections in Samples		0/12	2/12	12/12	12/12	12/12	0/12	12/12	0/12	2/12	6/12	7/12	3/12
Concentration min		<10	97	0.3	45	7.4	<5	2.0	<0.20	2	2.1	0.6	228
Concentration max		<10	172	3.0	479	474	<5	117	<0.20	3	3.1	2.2	1500
May 2013													
Equipment Blank 1-052013	5/28/2013	<10	<20	<0.2	<40	<5	<5	<0.1	<0.2	<5	<2	3.8	<100
Equipment Blank 2-052013	5/29/2013	<10	<20	<0.2	<40	<5	<5	<0.1	<0.2	<5	<2	<0.5	<100
Equipment Blank 3-052013	5/30/2013	<10	<20	<0.2	<40	<5	<5	<0.1	<0.2	<5	<2	<0.5	<100
Field Blank 1-052013	5/28/2013	<10	<20	<0.2	<40	<5	<5	<0.1	<0.2	<5	<2	<0.5	<100
Field Blank 2-052013	5/29/2013	<10	<20	<0.2	<40	<5	<5	<0.1	<0.2	<5	<2	<0.5	<100
Field Blank 3-052013	5/30/2013	<10	<20	<0.2	<40	<5	<5	<0.1	<0.2	<5	<2	<0.5	<100
Pump Equipment Blank 1-052013	5/29/2013	<10	<20	<0.2	<40	<5	<5	<0.1	<0.2	<5	<2	0.4	<100
MDL		0.6	4	0.04	4	0.1	0.1	0.01	0.1	1	0.3	0.2	13
QL		10	20	0.2	40	5	5	0.1	0.2	5	2	0.5	100
Detections in Samples		0/13	3/13	13/13	12/13	13/13	0/13	13/13	0/13	0/13	0/13	13/13	6/13
Concentration min		<10	21	0.4	49	12	<5	1.7	<0.2	<5	<2	0.3	135
Concentration max		<100	477	3.8	25800	8510	<50	16200	<20	<50	<200	54	93200

Table A4. Dissolved Metal Blanks.

Sample ID	Date Collected	Hg	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb
Units		µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	mg/L	µg/L	mg/L	µg/L	mg/L	µg/L
September 2011													
Field Blank	9/19/2011	NA	<0.35	NA	<0.10	<14	<17	<1.71	<84	<0.06	<17	<0.46	R
Field Blank	9/20/2011	NA	<0.35	NA	<0.10	<14	<17	<1.71	<84	<0.06	<17	<0.46	R
Field Blank	9/21/2011	NA	<0.35	NA	<0.10	<14	<17	<1.71	<84	<0.06	<17	<0.46	R
Field Blank	9/22/2011	NA	<0.35	NA	<0.10	<14	<17	<1.71	<84	<0.06	<17	<0.46	R
Equipment Blank	9/19/2011	NA	<0.35	NA	<0.10	<14	<17	<1.71	<84	<0.06	<17	<0.46	R
Equipment Blank	9/20/3011	NA	<0.35	NA	<0.10	<14	<17	<1.71	<84	<0.06	<17	<0.46	R
Equipment Blank	9/21/3011	NA	<0.35	NA	<0.10	<14	<17	<1.71	<84	<0.06	<17	<0.46	R
Equipment Blank	9/22/2011	NA	<0.35	NA	<0.10	<14	<17	<1.71	<84	<0.06	<17	<0.46	R
MDL			0.11		0.03	4	5	0.51	25	0.02	5	0.14	
QL			0.35		0.10	14	17	1.71	84	0.06	17	0.46	
Detections in Samples			17/17		17/17	15/17	0/17	17/17	0/17	2/17	0/17	17/17	
Concentration min			0.50		0.32	5	<17	10.5	<84	0.03	<17	4.15	
Concentration max			6.51		60.6	63	<17	990	<84	0.03	<17	71.2	
March 2012													
Field Blank	3/5/2012	NA	<5.00	NA	<5.00	<15	<20	<5.00	<1.0	NA	<1.0	<0.50	<60
Field Blank	3/6/2012	NA	<5.00	NA	<5.00	<15	<20	<5.00	<1.0	NA	<1.0	<0.50	<60
Field Blank	3/7/2012	NA	<5.00	NA	<5.00	<15	<20	<5.00	0.42	NA	<1.0	<0.50	<60
Field Blank	3/8/2012	NA	<5.00	NA	<5.00	<15	<20	<5.00	0.27	NA	<1.0	<0.50	<60
Equipment Blank	3/5/2012	NA	<5.00	NA	<5.00	<15	<20	<5.00	<1.0	NA	<1.0	<0.50	<60
Equipment Blank	3/6/2012	NA	<5.00	NA	<5.00	<15	<20	<5.00	<1.0	NA	<1.0	<0.50	<60
Equipment Blank	3/7/2012	NA	<5.00	NA	<5.00	<15	<20	<5.00	<1.0	NA	<1.0	<0.50	<60
Equipment Blank	3/8/2012	NA	<5.00	NA	<5.00	<15	<20	<5.00	<1.0	NA	<1.0	<0.50	<60

Table A4. Dissolved Metal Blanks.

Sample ID	Date Collected	Hg	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb
Units		µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	mg/L	µg/L	mg/L	µg/L	mg/L	µg/L
MDL			1.01		1.01	4	9	1.04	0.22		0.20	0.22	15
QL			5.00		5.00	15	20	5.00	1.0		1.0	0.50	60
Detections in Samples			19/20		16/20	18/20	0/20	20/20	9/20		4/20	20/20	0/20
Concentration min			1.09		1.01	4	<20	6.39	0.24		0.22	5.31	<60
Concentration max			10.1		64.8	93	<20	1200	0.90		0.64	80.6	<60
September 2012													
Field Blank	9/20/2012	NA	<0.5	<10	<0.05	<5	<0.5	<0.25	<0.20	<0.05	<0.20	NA	<0.20
Equipment Blank	9/20/2012	NA	<0.5	<10	<0.05	0.2	<0.5	<0.25	<0.20	<0.05	<0.20	NA	<0.20
MDL			0.1	1	0.01	0.2	0.1	0.01	0.1	0.01	0.1		0.1
QL			0.5	10	0.05	5	0.5	0.25	0.2	0.05	0.2		0.2
Detections in Samples			4/4	4/4	4/4	4/4	4/4	4/4	4/4	4/4	0/4		1/4
Concentration min			1.8	56	11.7	13	0.6	428	1.2	0.04	<0.20		0.12
Concentration max			1780	30100	2410	3400	43	60100	771	87	<40		0.12
December 2012													
Equipment Blank 1-122012	12/3/2012	<0.2	<0.5	<10	<0.05	<5	<0.5	<0.25	<0.20	<0.05	<0.20	NA	<0.20
Equipment Blank 2-122012	12/4/2012	<0.2	<0.5	<10	<0.05	<5	<0.5	<0.25	0.20	<0.05	<0.20	NA	<0.20
Equipment Blank 3-122012	12/5/2012	<0.2	<0.5	<10	<0.05	<5	<0.5	<0.25	<0.20	<0.05	<0.20	NA	<0.20
Field Blank 1-122012	12/3/2012	<0.2	<0.5	<10	0.01	<5	<0.5	<0.25	0.14	<0.05	<0.20	NA	<0.20
Field Blank 2-122012	12/4/2012	<0.2	<0.5	<10	<0.05	<5	<0.5	<0.25	<0.20	<0.05	<0.20	NA	<0.20
Field Blank 3-122012	12/5/2012	<0.2	<0.5	<10	<0.05	<5	<0.5	<0.25	<0.20	<0.05	<0.20	NA	<0.20
Pump Equipment Blank 1-122012	12/4/2012	<0.2	<0.5	<10	<0.05	<5	<0.5	<0.25	<0.20	<0.05	<0.20	NA	<0.20
MDL		0.01	0.1	1	0.01	0.3	0.05	0.01	0.10	0.01	0.05		0.10

Table A4. Dissolved Metal Blanks.

Sample ID	Date Collected	Hg	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb
Units		µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	mg/L	µg/L	mg/L	µg/L	mg/L	µg/L
QL		0.2	0.5	10	0.05	5	0.5	0.25	0.20	0.05	0.20		0.20
Detections in Samples		0/12	12/12	10/12	12/12	12/12	11/12	12/12	10/12	4/12	9/12		3/12
Concentration min		<0.2	1.0	29	0.75	4.0	0.50	4.35	0.11	0.04	0.07		0.11
Concentration max		<0.2	18.6	152	55.7	280	0.85	1130	5.60	0.97	1.0		0.14
May 2013													
Equipment Blank 1-052013	5/28/2013	<0.2	<0.5	<10	<0.05	<5	<0.5	<0.25	<0.2	<0.05	0.46	NA	<0.2
Equipment Blank 2-052013	5/29/2013	<0.2	<0.5	<10	<0.05	<5	<0.5	<0.25	<0.2	<0.05	<0.20	NA	<0.2
Equipment Blank 3-052013	5/30/2013	<0.2	<0.5	<10	<0.05	<5	<0.5	4.18	<0.2	0.06	<0.20	NA	<0.2
Field Blank 1-052013	5/28/2013	<0.2	<0.5	<10	<0.05	<5	<0.5	<0.25	0.3	<0.05	<0.20	NA	<0.2
Field Blank 2-052013	5/29/2013	<0.2	<0.5	<10	<0.05	<5	<0.5	<0.25	<0.2	<0.05	<0.20	NA	<0.2
Field Blank 3-052013	5/30/2013	<0.2	<0.5	<10	<0.05	<5	<0.5	1.33	<0.2	<0.05	<0.20	NA	<0.2
Pump Equipment Blank 1-052013	5/29/2013	<0.2	<0.5	<10	<0.05	<5	8.4	<0.25	0.2	<0.05	<0.20	NA	<0.2
MDL		0.01	0.05	0.4	0.01	0.2	0.15	0.01	0.2	0.01	0.05		0.1
QL		0.2	0.5	10	0.05	5	0.5	0.25	0.2	0.05	0.20		0.2
Detections in Samples		0/13	12/13	10/13	13/13	9/13	13/13	13/13	10/13	8/13	9/13		0/13
Concentration min		<0.2	1.0	31	0.12	5	0.5	1.15	0.2	0.05	0.10		<0.2
Concentration max		<0.2	928	25900	1860	2560	102	96400	682	145	353		<20

NA. Not Analyzed

R. Data Rejected

Table A4. Dissolved Metal Blanks.

Sample ID	Date Collected	Se	Si	Sr	Th	Ti	Tl	U	V	Zn
Units		µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011										
Field Blank	9/19/2011	<30	<0.43	<4	NA	<7	<17	<50	<10	<50
Field Blank	9/20/2011	<30	<0.43	<4	NA	<7	<17	<50	<10	<50
Field Blank	9/21/2011	<30	<0.43	<4	NA	<7	<17	<50	<10	<50
Field Blank	9/22/2011	<30	<0.43	<4	NA	<7	<17	<50	<10	<50
Equipment Blank	9/19/2011	<30	<0.43	<4	NA	<7	<17	<50	<10	<50
Equipment Blank	9/20/3011	<30	<0.43	<4	NA	<7	<17	<50	<10	<50
Equipment Blank	9/21/3011	<30	<0.43	<4	NA	<7	<17	<50	<10	<50
Equipment Blank	9/22/2011	<30	<0.43	<4	NA	<7	<17	<50	<10	<50
MDL		9	0.13	1		2	5	15	3	15
QL		30	0.43	4		7	17	50	10	50
Detections in Samples		0/17	17/17	17/17		1/17	0/17	5/17	0/17	4/17
Concentration min		<30	4.32	49		2	<17	16	<10	18
Concentration max		<30	18.2	6720		2	<17	21	<10	341
March 2012										
Field Blank	3/5/2012	R	<0.10	<10	NA	<10	<1.0	<1.0	<5.0	NA
Field Blank	3/6/2012	R	<0.10	<10	NA	<10	<1.0	<1.0	<5.0	NA
Field Blank	3/7/2012	R	<0.10	<10	NA	<10	<1.0	<1.0	<5.0	NA
Field Blank	3/8/2012	R	<0.10	<10	NA	<10	<1.0	<1.0	<5.0	NA
Equipment Blank	3/5/2012	R	<0.10	<10	NA	<10	<1.0	<1.0	<5.0	NA
Equipment Blank	3/6/2012	R	<0.10	<10	NA	<10	<1.0	<1.0	<5.0	NA
Equipment Blank	3/7/2012	R	<0.10	<10	NA	<10	<1.0	<1.0	<5.0	NA
Equipment Blank	3/8/2012	R	<0.10	<10	NA	<10	<1.0	<1.0	<5.0	NA

Table A4. Dissolved Metal Blanks.

Sample ID	Date Collected	Se	Si	Sr	Th	Ti	Tl	U	V	Zn
Units		µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MDL			0.04	5		4	0.20	0.19	1.10	
QL			0.10	10		10	1.0	1.0	5.0	
Detections in Samples			20/20	20/20		10/20	0/20	5/20	1/20	
Concentration min			0.13	52		5	<1.0	0.55	1.4	
Concentration max			10.7	13900		12	<1.0	2	1.4	
September 2012										
Field Blank	9/20/2012	<2	<0.1	<5	<0.20	<5	<0.20	<0.20	<0.20	<5
Equipment Blank	9/20/2012	<2	<0.1	<5	<0.20	<5	<0.20	<0.20	<0.20	<5
MDL		0.6	0.01	0.1	0.1	1	0.1	0.2	0.02	1
QL		2	0.1	5	0.2	5	0.2	0.2	0.20	5
Detections in Samples		0/4	4/4	4/4	0/4	0/4	0/4	0/4	4/4	4/4
Concentration min		<2	5.1	3020	<0.20	<5	<0.20	<0.20	0.05	1
Concentration max		<400	15	752000	<40	<25	<40	<40	14	291
December 2012										
Equipment Blank 1-122012	12/3/2012	<2	<0.1	<2.0	<0.20	<5	<0.20	<0.20	<0.2	4
Equipment Blank 2-122012	12/4/2012	<2	<0.1	<2.0	<0.20	<5	<0.20	<0.20	<0.2	<5
Equipment Blank 3-122012	12/5/2012	<2	<0.1	<2.0	<0.20	<5	<0.20	<0.20	<0.2	<5
Field Blank 1-122012	12/3/2012	<2	0.01	<2.0	<0.20	<5	<0.20	<0.20	<0.2	<5
Field Blank 2-122012	12/4/2012	<2	<0.1	<2.0	<0.20	<5	<0.20	<0.20	<0.2	<5
Field Blank 3-122012	12/5/2012	<2	<0.1	<2.0	<0.20	<5	<0.20	<0.20	<0.2	<5
Pump Equipment Blank 1-122012	12/4/2012	<2	<0.1	<2.0	<0.20	<5	<0.20	<0.20	<0.2	<5
MDL		0.6	0.01	0.2	0.05	1	0.05	0.15	0.02	3
QL		2	0.1	2.0	0.20	5	0.20	0.20	0.2	5

Table A4. Dissolved Metal Blanks.

Sample ID	Date Collected	Se	Si	Sr	Th	Ti	Tl	U	V	Zn
Units		µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Detections in Samples		1/12	12/12	12/12	1/12	2/12	0/12	3/12	12/12	7/12
Concentration min		0.6	2.6	233	0.24	11	<0.20	0.18	0.02	3
Concentration max		0.6	7.1	12100	0.24	15	<0.20	1.1	2.30	13
May 2013										
Equipment Blank 1-052013	5/28/2013	<2	<0.1	<2	<0.2	<5	<0.20	<0.20	<0.2	<5
Equipment Blank 2-052013	5/29/2013	<2	<0.1	<2	<0.2	0.5	<0.20	<0.20	<0.2	<5
Equipment Blank 3-052013	5/30/2013	0.5	<0.1	2.3	<0.2	<5	<0.20	<0.20	<0.2	<5
Field Blank 1-052013	5/28/2013	<2	<0.1	0.1	<0.2	<5	<0.20	<0.20	<0.2	<5
Field Blank 2-052013	5/29/2013	<2	<0.1	<2	<0.2	<5	<0.20	<0.20	<0.2	<5
Field Blank 3-052013	5/30/2013	<2	<0.1	0.2	<0.2	<5	<0.20	<0.20	<0.2	<5
Pump Equipment Blank 1-052013	5/29/2013	<2	<0.1	0.2	<0.2	<5	<0.20	<0.20	0.07	8
MDL		0.4	0.01	0.1	0.1	0.2	0.05	0.05	0.02	0.5
QL		2	0.1	2	0.2	5	0.20	0.20	0.2	5
Detections in Samples		5/13	13/13	13/13	0/13	0/13	0/13	5/13	9/13	5/13
Concentration min		0.4	0.34	26	<0.2	<5	<0.20	0.06	0.02	6
Concentration max		1.1	38	584000	<20	<50	<20	0.53	2.3	119

NA. Not Analyzed

R. Data Rejected

Table A5. Total Metal Blanks.

Sample ID	Date Collected	Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011													
Field Blank	9/19/2011	<16	<548	<22	<370	<4	<11	<0.32	<4	<4	<8	<22	<74
Field Blank	9/20/2011	<16	<548	<22	<370	<4	<11	<0.32	<4	<4	<8	8	<74
Field Blank	9/21/2011	<16	<548	<22	<370	<4	<11	<0.32	<4	<4	<8	<22	23
Field Blank	9/22/2011	<16	<548	<22	<370	<4	<11	<0.32	<4	<4	<8	<22	<74
Equipment Blank	9/19/2011	<16	<548	<22	<370	<4	<11	<0.32	<4	<4	<8	<22	<74
Equipment Blank	9/20/3011	<16	<548	<22	<370	<4	<11	<0.32	<4	<4	<8	<22	<74
Equipment Blank	9/21/3011	<16	<548	<22	<370	<4	<11	<0.32	<4	<4	<8	<22	<74
Equipment Blank	9/22/2011	<16	<548	<22	<370	<4	<11	<0.32	<4	<4	<8	<22	<74
MDL		4	164	7	111	1	3	0.10	1	1	2	7	22
QL		16	548	22	370	4	11	0.32	4	4	8	22	74
Detections in Samples		0/17	1/17	0/17	9/17	17/17	0/17	17/17	0/17	0/17	0/17	2/17	7/17
Concentration min		<16	1360	<22	112	9	<11	1.13	<4	<4	<8	10	48
Concentration max		<16	1360	<22	596	133	<11	138	<4	<4	<8	10	589
March 2012													
Field Blank	3/5/2012	<10	<200	0.84	<100	<200	<5	<5.00	<1.0	<50	<2.0	<2.0	<100
Field Blank	3/6/2012	<10	<200	0.70	<100	<200	<5	<5.00	<1.0	<50	<2.0	<2.0	<100
Field Blank	3/7/2012	<10	<200	0.71	<100	<200	<5	<5.00	<1.0	<50	<2.0	<2.0	<100
Field Blank	3/8/2012	<10	<200	0.54	<100	<200	<5	<5.00	<1.0	<50	<2.0	<2.0	<100
MDL		2	44	0.44	41	47	1	1.50	0.22	12	0.43	0.46	25
QL		10	200	1.0	100	200	5	5.00	1.0	50	2.0	2.0	100
Detections in Samples		0/20	10/20	15/20	16/20	7/20	0/20	20/20	0/20	0/20	1/20	6/20	10/20
Concentration min		<10	46	1.0	75	48	<5	1.2	<1.0	<50	0.54	2.3	34
Concentration max		<10	400	4.8	644	144	<5	143	<1.0	<50	0.54	9	1380

Table A5. Total Metal Blanks.

Sample ID	Date Collected	Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2012													
Field Blank	9/20/2012	<10	<20	<0.2	<20	0.3	<3	0.04	<0.20	2	<2.0	<0.5	<50
Equipment Blank	9/20/2012	<10	<20	<0.2	<20	<3	<3	0.01	<0.20	3	<2.0	<0.5	<50
MDL		2	5	0.2	3	0.1	0.1	0.010	0.2	1	0.3	0.1	20
QL		10	20	0.2	20	3	3	0.05	0.2	3	2	0.5	50
Detections in Samples		0/4	0/4	3/4	4/4	4/4	0/4	4/4	0/4	1/4	0/4	1/4	4/4
Concentration min		<10	<20	0.7	249	8.7	<3	28.6	<0.20	22	<2.0	0.68	66
Concentration max		<100	<20000	0.9	27500	11800	<15	20400	<40	22	<400	0.68	41800
December 2012													
Field Blank 1-122012	12/3/2012	<10	<20	<0.2	<20	<3	<3	0.02	<0.20	<3	<2.0	<0.5	<50
Field Blank 2-122012	12/4/2012	<10	<20	<0.2	<20	<3	<3	<0.05	<0.20	<3	<2.0	0.15	<50
Field Blank 3-122012	12/5/2012	<10	22	<0.2	<20	<3	<3	0.21	<0.20	<3	<2.0	0.20	<50
Pump Equipment Blank 1-122012	12/4/2012	<10	<20	<0.2	<20	<3	<3	0.01	<0.20	<3	<2.0	<0.5	<50
MDL		2	3	0.2	7	0.2	0.1	0.01	0.20	1	0.3	0.1	20
QL		10	20	0.2	20	3	3	0.05	0.20	3	2.0	0.5	50
Detections in Samples		0/12	4/12	12/12	12/12	12/12	0/12	12/12	0/12	2/12	0/12	11/12	6/12
Concentration min		<10	32	0.4	68	7.7	<3	2.0	<0.20	2	<2.0	0.52	31
Concentration max		<10	976	3.5	490	481	<3	116	<0.20	2	<2.0	3.7	1950
May 2013													
Equipment Blank 1-052013	5/28/2013	<10	<20	<0.2	<20	<3	<3	<0.05	<0.2	<3	<2	<0.5	<50
Equipment Blank 2-052013	5/29/2013	0.6	<20	<0.2	<20	<3	<3	<0.05	<0.2	<3	<2	<0.5	<50
Equipment Blank 3-052013	5/30/2013	<10	<20	<0.2	<20	<3	<3	<0.05	<0.2	<3	<2	<0.5	<50
Field Blank 1-052013	5/28/2013	<10	<20	<0.2	<20	<3	<3	<0.05	<0.2	<3	<2	<0.5	<50
Field Blank 2-052013	5/29/2013	<10	<20	<0.2	<20	<3	<3	<0.05	<0.2	<3	<2	<0.5	<50

Table A5. Total Metal Blanks.

Sample ID	Date Collected	Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Field Blank 3-052013	5/30/2013	<10	<20	<0.2	<20	<3	<3	<0.05	<0.2	<3	<2	<0.5	<50
Pump Equipment Blank 1-052013	5/29/2013	<10	<20	<0.2	<20	<3	<3	<0.05	<0.2	<3	<2	0.5	<50
MDL		0.6	4	0.04	2	0.2	0.1	0.01	0.1	0.4	0.3	0.2	7
QL		10	20	0.2	20	3	3	0.05	0.2	3	2	0.5	50
Detections in Samples		0/13	6/13	13/13	13/13	13/13	0/13	13/13	2/13	0/13	1/13	13/13	8/13
Concentration min		<10	97	0.5	60.6	12	<3	1.8	0.3	<3	9	0.3	114
Concentration max		<50	1170	13	25300	9430	<50	15900	0.5	<50	9	47	60900

Table A5. Total Metal Blanks.

Sample ID	Date Collected	Hg	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb
Units		µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	mg/L	µg/L	mg/L	µg/L	mg/L	µg/L
September 2011													
Field Blank	9/19/2011	NA	<0.39	NA	<0.11	<16	<19	<1.90	<93	<0.07	<19	<0.51	R
Field Blank	9/20/2011	NA	<0.39	NA	<0.11	<16	<19	<1.90	<93	<0.07	<19	<0.51	R
Field Blank	9/21/2011	NA	<0.39	NA	<0.11	<16	<19	<1.90	<93	<0.07	<19	<0.51	R
Field Blank	9/22/2011	NA	<0.39	NA	<0.11	<16	<19	<1.90	<93	<0.07	<19	<0.51	R
Equipment Blank	9/19/2011	NA	<0.39	NA	<0.11	<16	<19	<1.90	<93	<0.07	<19	<0.51	R
Equipment Blank	9/20/3011	NA	<0.39	NA	<0.11	<16	<19	<1.90	<93	<0.07	<19	<0.51	R
Equipment Blank	9/21/3011	NA	<0.39	NA	<0.11	<16	<19	<1.90	<93	<0.07	<19	<0.51	R
Equipment Blank	9/22/2011	NA	<0.39	NA	<0.11	<16	<19	<1.90	<93	<0.07	<19	<0.51	R
MDL			0.12		0.03	4	6	0.57	28	0.02	6	0.15	
QL			0.39		0.11	16	19	1.90	93	0.07	19	0.51	
Detections in Samples			17/17		17/17	15/17	0/17	17/17	0/17	2/17	0/17	17/17	
Concentration min			0.54		0.34	7	<19	11.1	<93	0.04	<19	3.57	
Concentration max			7.01		61	63	<19	1040	<93	0.04	<19	68.3	
March 2012													
Field Blank	3/5/2012	NA	<5.00	NA	<5.00	<15	<20	<5.00	<1.0	NA	<1.0	<0.50	<60
Field Blank	3/6/2012	NA	<5.00	NA	<5.00	<15	<20	<5.00	<1.0	NA	<1.0	<0.50	<60
Field Blank	3/7/2012	NA	<5.00	NA	<5.00	<15	<20	<5.00	<1.0	NA	<1.0	<0.50	<60
Field Blank	3/8/2012	NA	<5.00	NA	<5.00	<15	<20	<5.00	<1.0	NA	<1.0	<0.50	<60
MDL			1.01	NA	1.01	4	9	1.04	0.22		0.20	0.22	15
QL			5.00	NA	5.00	15	20	5.00	1.0		1.0	0.50	60
Detections in Samples			19/20	NA	15/20	18/20	0/20	20/20	8/20		0/20	20/20	0/20
Concentration min			1.07	NA	1.02	4	<20	5.93	0.28		<1.0	5.06	<60
Concentration max			9.25	NA	61	88	<20	1190	0.89		<1.0	83.9	<60

Table A5. Total Metal Blanks.

Sample ID	Date Collected	Hg	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb
Units		µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	mg/L	µg/L	mg/L	µg/L	mg/L	µg/L
September 2012													
Field Blank	9/20/2012	NA	<0.3	<5	<0.03	0.2	<0.5	<0.13	0.30	<0.03	<0.20	NA	<0.20
Equipment Blank	9/20/2012	NA	<0.3	<5	<0.03	0.3	<0.5	<0.13	0.90	<0.03	<0.20	NA	<0.20
MDL			0.1	1	0.01	0.2	0.1	0.01	0.1	0.01	0.1		0.10
QL			0.3	5	0.03	3	0.5	0.13	0.2	0.03	0.2		0.2
Detections in Samples			4/4	4/4	4/4	4/4	3/4	4/4	4/4	4/4	1/4		1/4
Concentration min			2.1	64	13	20	0.7	458	1.3	0.02	0.3		0.12
Concentration max			1640	25000	2330	3430	1.2	59900	716	3.77	0.3		0.12
December 2012													
Field Blank 1-122012	12/3/2012	<0.2	<0.3	<5	<0.03	<3	0.11	<0.13	0.36	<0.03	<0.20	NA	<0.20
Field Blank 2-122012	12/4/2012	<0.2	<0.3	<5	<0.03	<3	<0.5	<0.13	0.24	<0.03	<0.20	NA	<0.20
Field Blank 3-122012	12/5/2012	<0.2	<0.3	<5	<0.03	0.47	<0.5	<0.13	0.48	<0.03	0.08	NA	<0.20
Pump Equipment Blank 1-122012	12/4/2012	<0.2	<0.3	<5	<0.03	<3	<0.5	<0.13	0.20	<0.03	<0.20	NA	<0.20
MDL		0.01	0.1	1	0.01	0.2	0.05	0.01	0.10	0.01	0.05		0.10
QL		0.2	0.3	5	0.03	3	0.5	0.13	0.20	0.03	0.20		0.20
Detections in Samples		1/12	12/12	10/12	12/12	12/12	11/12	12/12	12/12	3/12	10/12		3/12
Concentration min		0.01	1.0	29	0.79	3.8	0.51	4.29	0.38	0.04	0.14		0.12
Concentration max		0.01	18.7	154	56.8	299	0.90	1160	6.3	0.22	1.7		0.14
May 2013													
Equipment Blank 1-052013	5/28/2013	<0.2	<0.3	<5	<0.03	<3	<0.5	<0.13	<0.2	<0.03	<0.20	NA	<0.2
Equipment Blank 2-052013	5/29/2013	<0.2	<0.3	<5	<0.03	<3	<0.5	<0.13	<0.2	<0.03	<0.20	NA	<0.2
Equipment Blank 3-052013	5/30/2013	0.02	<0.3	<5	<0.03	<3	<0.5	<0.13	<0.2	<0.03	<0.20	NA	<0.2
Field Blank 1-052013	5/28/2013	<0.2	<0.3	<5	<0.03	<3	<0.5	<0.13	<0.2	<0.03	<0.20	NA	<0.2
Field Blank 2-052013	5/29/2013	<0.2	<0.3	<5	<0.03	<3	<0.5	<0.13	<0.2	<0.03	<0.20	NA	<0.2

Table A5. Total Metal Blanks.

Sample ID	Date Collected	Hg	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb
Units		µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	mg/L	µg/L	mg/L	µg/L	mg/L	µg/L
Field Blank 3-052013	5/30/2013	<0.2	<0.3	<5	<0.03	<3	<0.5	<0.13	<0.2	<0.03	<0.20	NA	<0.2
Pump Equipment Blank 1-052013	5/29/2013	<0.2	<0.3	<5	<0.03	<3	19	<0.13	0.4	<0.03	<0.20	NA	<0.2
MDL		0.01	0.02	0.2	0.01	0.1	0.15	0.01	0.2	0.01	0.05		0.4
QL		0.2	0.3	5	0.03	3	0.5	0.13	0.2	0.03	0.20		2
Detections in Samples		2/13	11/13	10/13	13/13	13/13	12/13	13/13	10/13	3/13	9/13		1/13
Concentration min		0.02	1.0	30	0.14	3.5	0.6	1.05	0.2	0.18	0.22		0.4
Concentration max		0.15	891	25000	1860	2650	1.6	48100	73.5	268	1960		0.4

NA. Not Analyzed

R. Data Rejected

Table A5. Total Metal Blanks.

Sample ID	Date Collected	Se	Si	Sr	Th	Ti	Tl	U	V	Zn
Units		µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011										
Field Blank	9/19/2011	<33	<0.48	<4	NA	<8	<19	<56	<11	<56
Field Blank	9/20/2011	<33	<0.48	<4	NA	<8	<19	<56	<11	<56
Field Blank	9/21/2011	<33	<0.48	<4	NA	<8	<19	<56	<11	<56
Field Blank	9/22/2011	<33	0.16	<4	NA	<8	<19	<56	<11	<56
Equipment Blank	9/19/2011	<33	<0.48	<4	NA	<8	<19	<56	<11	<56
Equipment Blank	9/20/3011	<33	<0.48	<4	NA	<8	<19	<56	<11	<56
Equipment Blank	9/21/3011	<33	<0.48	<4	NA	<8	<19	<56	<11	<56
Equipment Blank	9/22/2011	<33	<0.48	<4	NA	<8	<19	<56	<11	<56
MDL		10	0.14	1		2	6	17	3	17
QL		33	0.48	4		8	19	56	11	56
Detections in Samples		0/17	17/17	17/17		1/17	0/17	3/17	1/17	3/17
Concentration min		<33	3.97	51		52	<19	19	4	41
Concentration max		<33	17.0	6690		52	<19	24	4	356
March 2012										
Field Blank	3/5/2012	R	<0.10	<10	NA	<10	<1.0	<1.0	<5.0	NA
Field Blank	3/6/2012	R	<0.10	<10	NA	<10	<1.0	<1.0	<5.0	NA
Field Blank	3/7/2012	R	<0.10	<10	NA	<10	<1.0	<1.0	<5.0	NA
Field Blank	3/8/2012	R	<0.10	<10	NA	<10	<1.0	<1.0	<5.0	NA
MDL			0.04	5		4	0.20	0.19	1.10	
QL			0.10	10		10	1.0	1.0	5.0	
Detections in Samples			20/20	20/20		10/20	0/20	5/20	1/20	
Concentration min			0.2	54		5	<1.0	0.51	1.4	
Concentration max			11.4	12900		12	<1.0	2	1.4	

Table A5. Total Metal Blanks.

Sample ID	Date Collected	Se	Si	Sr	Th	Ti	Tl	U	V	Zn
Units		µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2012										
Field Blank	9/20/2012	<2	<0.1	<3	<0.20	<3	<0.20	<0.20	<0.20	<3
Equipment Blank	9/20/2012	<2	<0.1	<3	0.065	<3	<0.20	<0.20	<0.20	<3
MDL		0.6	0.01	0.1	0.1	1	0.1	0.2	0.02	1
QL		2	0.1	3	0.2	3	0.2	0.2	0.20	3
Detections in Samples		0/4	4/4	4/4	0/4	0/4	1/4	0/4	3/4	4/4
Concentration min		<2	5.7	3250	<0.20	<3	17	<0.20	0.21	1
Concentration max		<400	14	689000	<40	<500	17	<40	17.2	312
December 2012										
Field Blank 1-122012	12/3/2012	<2	0.02	<2.0	0.05	<3	<0.20	<0.20	<0.2	3
Field Blank 2-122012	12/4/2012	<2	0.01	<2.0	<0.20	<3	<0.20	<0.20	0.37	<3
Field Blank 3-122012	12/5/2012	<2	0.05	<2.0	<0.20	<3	<0.20	<0.20	0.42	2
Pump Equipment Blank 1-122012	12/4/2012	<2	0.02	<2.0	<0.20	<3	<0.20	<0.20	0.23	<3
MDL		0.6	0.01	0.2	0.05	1	0.05	0.15	0.02	1
QL		2	0.05	2.0	0.20	3	0.20	0.20	0.2	3
Detections in Samples		2/12	12/12	12/12	2/12	2/12	0/12	3/12	12/12	9/12
Concentration min		0.7	2.7	242	0.09	7	<0.20	0.16	0.21	2
Concentration max		0.8	7.3	13200	0.12	7	<0.20	1.2	3.0	21
May 2013										
Equipment Blank 1-052013	5/28/2013	<2	<0.05	<2	0.2	<3	<0.20	<0.20	0.23	1
Equipment Blank 2-052013	5/29/2013	<2	<0.05	<2	<0.2	<3	<0.20	<0.20	0.23	<3
Equipment Blank 3-052013	5/30/2013	<2	<0.05	<2	<0.2	<3	<0.20	<0.20	0.48	0.4
Field Blank 1-052013	5/28/2013	<2	<0.05	<2	<0.2	<3	<0.20	<0.20	0.22	1
Field Blank 2-052013	5/29/2013	<2	<0.05	<2	<0.2	<3	<0.20	<0.20	0.24	<3

Table A5. Total Metal Blanks.

Sample ID	Date Collected	Se	Si	Sr	Th	Ti	Tl	U	V	Zn
Units		µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Field Blank 3-052013	5/30/2013	<2	<0.05	<2	<0.2	<3	<0.20	<0.20	0.50	<3
Pump Equipment Blank 1-052013	5/29/2013	<2	<0.05	<2	<0.2	<3	<0.20	<0.20	0.46	11
MDL		0.4	0.01	0.1	0.1	0.4	0.05	0.05	0.02	0.4
QL		2	0.05	2	0.2	3	0.20	0.20	0.2	3
Detections in Samples		0/13	13/13	13/13	4/13	4/13	1/13	5/13	12/13	12/13
Concentration min		<2	0.47	30.1	0.1	3	0.97	0.06	0.40	1
Concentration max		<100	19	60400	0.5	27	0.97	0.58	2.80	191

NA. Not Analyzed

Table A6. VOC Blanks.

Sample ID	Date Collected	ethanol (64 17 5)	isopropanol (67 63 0)	acrylonitrile (107 13 1)	styrene (100 42 5)	acetone (67 64 1)	tert butyl Alcohol (75 65 0)	methyl tert butyl ether (1634 04 4)	diisopropyl ether (108 20 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
Field Blank	9/20/2011	<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
Field Blank	9/19/2011	<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
Field Blank	9/21/2011	<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
Field Blank	9/22/2011	<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
Equipment Blank	9/20/2011	<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
Equipment Blank	9/19/2011	<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
Equipment Blank	9/21/2011	<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
Equipment Blank	9/22/2011	<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
Trip Blank	9/20/2011	<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
Trip Blank	9/19/2011	<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
Trip Blank	9/21/2011	<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
Trip Blank	9/22/2011	<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
Trip Blank	9/22/2011	<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
MDL		12.4	6.4	NA	NA	0.63	2.8	0.41	0.12
QL		100	25.0	NA	NA	1.0	5.0	1.0	1.0

Table A6. VOC Blanks.

Sample ID	Date Collected	ethanol (64 17 5)	isopropanol (67 63 0)	acrylonitrile (107 13 1)	styrene (100 42 5)	acetone (67 64 1)	tert butyl Alcohol (75 65 0)	methyl tert butyl ether (1634 04 4)	diisopropyl ether (108 20 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Detections in Samples		0/17	0/17	NA	NA	0/17	0/17	0/17	0/17
Concentration min		<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
Concentration max		<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
March 2012									
Field Blank	3/5/2012	<100	<25.0	<25.0	<0.5	<1.0	<5.0	<1.0	<1.0
Field Blank	3/6/2012	<100	<25.0	<25.0	<0.5	<1.0	<5.0	<1.0	<1.0
Field Blank	3/7/2012	<100	<25.0	<25.0	<0.5	<1.0	<5.0	<1.0	<1.0
Field Blank	3/8/2012	<100	<25.0	<25.0	<0.5	<1.0	<5.0	<1.0	<1.0
Trip Blank	3/5/2012	<100	<25.0	<25.0	<0.5	<1.0	<5.0	<1.0	<1.0
Trip Blank	3/6/2012	<100	<25.0	<25.0	<0.5	<1.0	<5.0	<1.0	<1.0
Trip Blank	3/7/2012	<100	<25.0	<25.0	<0.5	<1.0	<5.0	<1.0	<1.0
MDL		12.4	6.4	6.8	0.16	0.63	2.81	0.41	0.12
QL		100	25.0	25.0	0.5	1.0	5.0	1.0	1.0
Detections in Samples		0/20	0/20	0/20	0/20	0/20	0/20	0/20	0/20
Concentration min		<100	<25.0	<25.0	<0.5	<1.0	<5.0	<1.0	<1.0
Concentration max		<100	<25.0	<25.0	<0.5	<1.0	<5.0	<1.0	<1.0

Table A6. VOC Blanks.

Sample ID	Date Collected	ethanol (64 17 5)	isopropanol (67 63 0)	acrylonitrile (107 13 1)	styrene (100 42 5)	acetone (67 64 1)	tert butyl Alcohol (75 65 0)	methyl tert butyl ether (1634 04 4)	diisopropyl ether (108 20 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2012									
Field Blank	9/20/12	NA	NA	NA	NA	NA	NA	NA	NA
Trip Blank	9/20/12	NA	NA	NA	NA	NA	NA	NA	NA
MDL									
QL									
Detections in Samples									
Concentration min									
Concentration max									
December 2012									
Field Blank 1-122012	12/3/12	<100	<10	<1	NA	<1	<10	<0.5	<0.5
Field Blank 2-122012	12/4/12	<100	<10	<1	NA	11	<10	<0.5	<0.5
Field Blank 3-122012	12/5/12	<100	<10	<1	NA	14	<10	<0.5	<0.5
Pump Equipment Blank 1-122012	12/4/12	<100	<10	<1	NA	12	<10	<0.5	<0.5
Trip Blank 1-122012	12/3/12	<100	<10	<1	NA	<1	<10	<0.5	<0.5
Trip Blank 2-122012	12/4/12	<100	<10	<1	NA	<1	<10	<0.5	<0.5
Trip Blank 3-122012	12/5/12	<100	<10	<1	NA	11	<10	<0.5	<0.5

Table A6. VOC Blanks.

Sample ID	Date Collected	ethanol (64 17 5)	isopropanol (67 63 0)	acrylonitrile (107 13 1)	styrene (100 42 5)	acetone (67 64 1)	tert butyl Alcohol (75 65 0)	methyl tert butyl ether (1634 04 4)	diisopropyl ether (108 20 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MDL		63	7	0.07		0.28	5	0.07	0.11
QL		100	10	1		1	10	0.5	0.5
Detections in Samples		0/12	0/12	0/12		5/12	1/12	1/12	0/12
Concentration min		<100	<10	<1		8.7	38	0.56	<0.5
Concentration max		<100	<10	<1		23	38	0.56	<0.5
May 2013									
Field Blank 1-052013	5/28/2013	<100	<10	<1	<0.5	1.7	<10	<0.5	<0.5
Field Blank 2-052013	5/29/2013	<100	<10	<1	<0.5	2.8	<10	<0.5	<0.5
Field Blank 3-052013	5/30/2013	<100	<10	<1	<0.5	2.5	<10	<0.5	<0.5
Pump Equipment Blank 1-052013	5/29/2013	<100	<10	<1	<0.5	2.8	<10	<0.5	<0.5
Trip Blank 1-052013	5/29/2013	<100	<10	<1	<0.5	0.89	<10	<0.5	<0.5
Trip Blank 2-052013	5/30/2013	<100	<10	<1	<0.5	0.8	<10	<0.5	<0.5
MDL		63	7	0.07	0.05	0.28	5	0.07	0.11
QL		100	10	1	0.5	1	10	0.5	0.5
Detections in Samples		1/13	2/13	0/13	0/13	13/13	0/13	0/13	0/13
Concentration min		2200	170	<1	<0.5	1.7	<10	<0.5	<0.5

Table A6. VOC Blanks.

Sample ID	Date Collected	ethanol (64 17 5)	isopropanol (67 63 0)	acrylonitrile (107 13 1)	styrene (100 42 5)	acetone (67 64 1)	tert butyl Alcohol (75 65 0)	methyl tert butyl ether (1634 04 4)	diisopropyl ether (108 20 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Concentration max		2200	360	<200	<100	880	<200	<100	<100

Table A6. VOC Blanks

Sample ID	Date Collected	ethyl tert butyl ether (637 92 3)	tert amyl methyl ether (994 05 8)	vinyl chloride (75 01 4)	1,1 dichloroethene (75 35 4)	carbon disulfide (75 15 0)	methylene chloride (75 09 2)	trans 1,2 dichloroethene (156 60 5)	1,1 dichloroethane (75 34 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
Field Blank	9/20/2011	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Field Blank	9/19/2011	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Field Blank	9/21/2011	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Field Blank	9/22/2011	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Equipment Blank	9/20/2011	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Equipment Blank	9/19/2011	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Equipment Blank	9/21/2011	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Equipment Blank	9/22/2011	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Trip Blank	9/20/2011	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Trip Blank	9/19/2011	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Trip Blank	9/21/2011	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Trip Blank	9/22/2011	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Trip Blank	9/22/2011	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
MDL		0.17	0.15	0.18		0.07	0.14	0.11	0.08
QL		1.0	1.0	0.5		0.5	1.0	0.5	0.5

Table A6. VOC Blanks

Sample ID	Date Collected	ethyl tert butyl ether (637 92 3)	tert amyl methyl ether (994 05 8)	vinyl chloride (75 01 4)	1,1 dichloroethene (75 35 4)	carbon disulfide (75 15 0)	methylene chloride (75 09 2)	trans 1,2 dichloroethene (156 60 5)	1,1 dichloroethane (75 34 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Detections in Samples		0/17	0/17	0/17		0/17	0/17	0/17	0/17
Concentration min		<1.0	<1.0	<0.5		<0.5	<1.0	<0.5	<0.5
Concentration max		<1.0	<1.0	<0.5		<0.5	<1.0	<0.5	<0.5
March 2012									
Field Blank	3/5/2012	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Field Blank	3/6/2012	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Field Blank	3/7/2012	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Field Blank	3/8/2012	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Trip Blank	3/5/2012	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Trip Blank	3/6/2012	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Trip Blank	3/7/2012	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
MDL		0.17	0.15	0.18		0.07	0.14	0.11	0.08
QL		1.0	1.0	0.5		0.5	1.0	0.5	0.5
Detections in Samples		0/20	0/20	0/20	R	0/20	0/20	0/20	0/20
Concentration min		<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
Concentration max		<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5

Table A6. VOC Blanks

Sample ID	Date Collected	ethyl tert butyl ether (637 92 3)	tert amyl methyl ether (994 05 8)	vinyl chloride (75 01 4)	1,1 dichloroethene (75 35 4)	carbon disulfide (75 15 0)	methylene chloride (75 09 2)	trans 1,2 dichloroethene (156 60 5)	1,1 dichloroethane (75 34 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2012									
Field Blank	9/20/12	NA	NA	NA	NA	NA	NA	NA	NA
Trip Blank	9/20/12	NA	NA	NA	NA	NA	NA	NA	NA
MDL									
QL									
Detections in Samples									
Concentration min									
Concentration max									
December 2012									
Field Blank 1-122012	12/3/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank 2-122012	12/4/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank 3-122012	12/5/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pump Equipment Blank 1-122012	12/4/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank 1-122012	12/3/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank 2-122012	12/4/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank 3-122012	12/5/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Table A6. VOC Blanks

Sample ID	Date Collected	ethyl tert butyl ether (637 92 3)	tert amyl methyl ether (994 05 8)	vinyl chloride (75 01 4)	1,1 dichloroethene (75 35 4)	carbon disulfide (75 15 0)	methylene chloride (75 09 2)	trans 1,2 dichloroethene (156 60 5)	1,1 dichloroethane (75 34 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MDL		0.09	0.11	0.14	0.09	0.1	0.1	0.07	0.06
QL		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Detections in Samples		1/12	1/12	0/12	0/12	0/12	0/12	0/12	0/12
Concentration min		1.9	0.076	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Concentration max		1.9	0.076	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
May 2013									
Field Blank 1-052013	5/28/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank 2-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank 3-052013	5/30/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pump Equipment Blank 1-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank 1-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank 2-052013	5/30/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MDL		0.09	0.11	0.14	0.09	0.1	0.1	0.07	0.06
QL		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Detections in Samples		0/13	0/13	0/13	0/13	0/13	0/13	0/13	0/13
Concentration min		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Table A6. VOC Blanks

Sample ID	Date Collected	ethyl tert butyl ether (637 92 3)	tert amyl methyl ether (994 05 8)	vinyl chloride (75 01 4)	1,1 dichloroethene (75 35 4)	carbon disulfide (75 15 0)	methylene chloride (75 09 2)	trans 1,2 dichloroethene (156 60 5)	1,1 dichloroethane (75 34 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Concentration max		<100	<100	<100	<100	<100	<100	<100	<100

R. Data Rejected

Table A6. VOC Blanks.

Sample ID	Date Collected	cis 1,2 dichoroethene (156 59 2)	chloroform (67 66 3)	1,1,1 trichloroethane (71 55 6)	carbon tetrachloride (56 23 5)	benzene (71 43 2)	1,2 dichloroethane (107 06 2)	trichloroethene (79 01 6)	toluene (108 88 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
Field Blank	9/20/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank	9/19/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank	9/21/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank	9/22/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Equipment Blank	9/20/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Equipment Blank	9/19/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Equipment Blank	9/21/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Equipment Blank	9/22/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank	9/20/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank	9/19/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank	9/21/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank	9/22/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank	9/22/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MDL		0.14	0.07	0.09	0.1	0.07	0.16	0.15	0.1
QL		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Table A6. VOC Blanks.

Sample ID	Date Collected	cis 1,2 dichoroethene (156 59 2)	chloroform (67 66 3)	1,1,1 trichloroethane (71 55 6)	carbon tetrachloride (56 23 5)	benzene (71 43 2)	1,2 dichloroethane (107 06 2)	trichloroethene (79 01 6)	toluene (108 88 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Detections in Samples		0/17	0/17	0/17	0/17	0/17	0/17	0/17	0/17
Concentration min		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Concentration max		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
March 2012									
Field Blank	3/5/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank	3/6/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank	3/7/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank	3/8/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank	3/5/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank	3/6/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank	3/7/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MDL		0.14	0.07	0.09	0.10	0.07	0.16	0.15	0.10
QL		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Detections in Samples		0/20	0/20	0/20	0/20	1/20	0/20	0/20	0/20
Concentration min		<0.5	<0.5	<0.5	<0.5	0.62	<0.5	<0.5	<0.5
Concentration max		<0.5	<0.5	<0.5	<0.5	0.62	<0.5	<0.5	<0.5

Table A6. VOC Blanks.

Sample ID	Date Collected	cis 1,2 dichoroethene (156 59 2)	chloroform (67 66 3)	1,1,1 trichloroethane (71 55 6)	carbon tetrachloride (56 23 5)	benzene (71 43 2)	1,2 dichloroethane (107 06 2)	trichloroethene (79 01 6)	toluene (108 88 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2012									
Field Blank	9/20/12	NA	NA	NA	NA	NA	NA	NA	NA
Trip Blank	9/20/12	NA	NA	NA	NA	NA	NA	NA	NA
MDL									
QL									
Detections in Samples									
Concentration min									
Concentration max									
December 2012									
Field Blank 1-122012	12/3/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank 2-122012	12/4/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank 3-122012	12/5/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pump Equipment Blank 1-122012	12/4/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank 1-122012	12/3/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank 2-122012	12/4/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank 3-122012	12/5/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Table A6. VOC Blanks.

Sample ID	Date Collected	cis 1,2 dichoroethene (156 59 2)	chloroform (67 66 3)	1,1,1 trichloroethane (71 55 6)	carbon tetrachloride (56 23 5)	benzene (71 43 2)	1,2 dichloroethane (107 06 2)	trichloroethene (79 01 6)	toluene (108 88 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MDL		0.1	0.05	0.09	0.09	0.05	0.04	0.12	0.07
QL		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Detections in Samples		0/12	0/12	0/12	0/12	1/12	0/12	0/12	0/12
Concentration min		<0.5	<0.5	<0.5	<0.5	0.08	<0.5	<0.5	<0.5
Concentration max		<0.5	<0.5	<0.5	<0.5	0.08	<0.5	<0.5	<0.5
May 2013									
Field Blank 1-052013	5/28/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank 2-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank 3-052013	5/30/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pump Equipment Blank 1-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank 1-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank 2-052013	5/30/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MDL		0.1	0.05	0.09	0.09	0.05	0.04	0.12	0.07
QL		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Detections in Samples		0/13	0/13	0/13	0/13	3/13	0/13	0/13	0/13
Concentration min		<0.5	<0.5	<0.5	<0.5	0.12	<0.5	<0.5	<0.5

Table A6. VOC Blanks.

Sample ID	Date Collected	cis 1,2 dichoroethene (156 59 2)	chloroform (67 66 3)	1,1,1 trichloroethane (71 55 6)	carbon tetrachloride (56 23 5)	benzene (71 43 2)	1,2 dichloroethane (107 06 2)	trichloroethene (79 01 6)	toluene (108 88 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Concentration max		<100	<100	<100	<100	4300	<100	<100	<100

Table A6. VOC Blanks.

Sample ID	Date Collected	1,1,2-trichloroethane (79-00-5)	tetrachloroethene (127-18-4)	chlorobenzene (108-90-7)	ethylbenzene (100-41-4)	m+p xylene (108-38-3, 106-42-3)	o-xylene (95-47-6)	isopropylbenzene (98-82-8)	1,3,5-trimethylbenzene (108-67-8)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
Field Blank	9/20/2011	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Field Blank	9/19/2011	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Field Blank	9/21/2011	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Field Blank	9/22/2011	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Equipment Blank	9/20/2011	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Equipment Blank	9/19/2011	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Equipment Blank	9/21/2011	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Equipment Blank	9/22/2011	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Trip Blank	9/20/2011	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Trip Blank	9/19/2011	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Trip Blank	9/21/2011	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Trip Blank	9/22/2011	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Trip Blank	9/22/2011	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
MDL			0.1	0.09	0.07	0.17	0.06	0.06	0.06
QL			0.5	0.5	1.0	2.0	0.5	0.5	0.5

Table A6. VOC Blanks.

Sample ID	Date Collected	1,1,2-trichloroethane (79-00-5)	tetrachloroethene (127-18-4)	chlorobenzene (108-90-7)	ethylbenzene (100-41-4)	m+p xylene (108-38-3, 106-42-3)	o-xylene (95-47-6)	isopropylbenzene (98-82-8)	1,3,5-trimethylbenzene (108-67-8)
Detections in Samples			0/17	0/17	0/17	0/17	0/17	0/17	0/17
Concentration min			<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Concentration max			<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
March 2012									
Field Blank	3/5/2012	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Field Blank	3/6/2012	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Field Blank	3/7/2012	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Field Blank	3/8/2012	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Trip Blank	3/5/2012	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Trip Blank	3/6/2012	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Trip Blank	3/7/2012	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
MDL			0.10	0.09	0.07	0.17	0.06	0.06	0.06
QL			0.5	0.5	1.0	2.0	0.5	0.5	0.5
Detections in Samples			0/20	0/20	0/20	0/20	0/20	0/20	0/20
Concentration min			<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
Concentration max			<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5

Table A6. VOC Blanks.

Sample ID	Date Collected	1,1,2-trichloroethane (79-00-5)	tetrachloroethene (127-18-4)	chlorobenzene (108-90-7)	ethylbenzene (100-41-4)	m+p xylene (108-38-3, 106-42-3)	o-xylene (95-47-6)	isopropylbenzene (98-82-8)	1,3,5-trimethylbenzene (108-67-8)
September 2012									
Field Blank	9/20/12	NA	NA	NA	NA	NA	NA	NA	NA
Trip Blank	9/20/12	NA	NA	NA	NA	NA	NA	NA	NA
MDL									
QL									
Detections in Samples									
Concentration min									
Concentration max									
December 2012									
Field Blank 1-122012	12/3/12	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5
Field Blank 2-122012	12/4/12	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5
Field Blank 3-122012	12/5/12	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5
Pump Equipment Blank 1-122012	12/4/12	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5
Trip Blank 1-122012	12/3/12	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5
Trip Blank 2-122012	12/4/12	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5
Trip Blank 3-122012	12/5/12	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5
MDL		0.07	0.13	0.08	0.06	0.15	0.06	0.07	0.08

Table A6. VOC Blanks.

Sample ID	Date Collected	1,1,2-trichloroethane (79-00-5)	tetrachloroethene (127-18-4)	chlorobenzene (108-90-7)	ethylbenzene (100-41-4)	m+p xylene (108-38-3, 106-42-3)	o-xylene (95-47-6)	isopropylbenzene (98-82-8)	1,3,5-trimethylbenzene (108-67-8)
QL		0.5	0.5	0.5	0.5	1	0.5	0.5	0.5
Detections in Samples		0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12
Concentration min		<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5
Concentration max		<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5
May 2013									
Field Blank 1-052013	5/28/2013	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5
Field Blank 2-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5
Field Blank 3-052013	5/30/2013	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5
Pump Equipment Blank 1-052013	5/29/2013	<0.5	<0.5	<0.5	0.07	0.4	0.22	<0.5	<0.5
Trip Blank 1-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5
Trip Blank 2-052013	5/30/2013	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5
MDL		0.07	0.13	0.08	0.06	0.15	0.06	0.07	0.08
QL		0.5	0.5	0.5	0.5	1	0.5	0.5	0.5
Detections in Samples		0/13	0/13	0/13	2/13	3/13	3/13	2/13	2/13
Concentration min		<0.5	<0.5	<0.5	350	0.25	0.09	46	230
Concentration max		<0.5	<0.5	<0.5	720	5600	1500	55	810

R. Data Rejected

Table A6. VOC Blanks.

Sample ID	Date Collected	1,2,4 trimethylbenzene (95 63 6)	1,3 dichlorobenzene (541 73 1)	1,4 dichlorobenzene (106 46 7)	1,2,3 trimethylbenzene (526 73 8)	1,2 dichlorobenzene (95 50 1)	naphthalene (91 20 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011							
Field Blank	9/20/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank	9/19/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank	9/21/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank	9/22/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Equipment Blank	9/20/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Equipment Blank	9/19/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Equipment Blank	9/21/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Equipment Blank	9/22/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank	9/20/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank	9/19/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank	9/21/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank	9/22/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank	9/22/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MDL		0.06	0.1	0.08	0.12	0.13	0.12
QL		0.5	0.5	0.5	0.5	0.5	0.5

Table A6. VOC Blanks.

Sample ID	Date Collected	1,2,4 trimethylbenzene (95 63 6)	1,3 dichlorobenzene (541 73 1)	1,4 dichlorobenzene (106 46 7)	1,2,3 trimethylbenzene (526 73 8)	1,2 dichlorobenzene (95 50 1)	naphthalene (91 20 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Detections in Samples		0/17	0/17	0/17	0/17	0/17	0/17
Concentration min		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Concentration max		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
March 2012							
Field Blank	3/5/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank	3/6/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank	3/7/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank	3/8/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank	3/5/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank	3/6/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank	3/7/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MDL		0.06	0.10	0.08	0.12	0.13	0.12
QL		0.5	0.5	0.5	0.5	0.5	0.5
Detections in Samples		0/20	0/20	0/20	0/20	0/20	0/20
Concentration min		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Concentration max		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Table A6. VOC Blanks.

Sample ID	Date Collected	1,2,4 trimethylbenzene (95 63 6)	1,3 dichlorobenzene (541 73 1)	1,4 dichlorobenzene (106 46 7)	1,2,3 trimethylbenzene (526 73 8)	1,2 dichlorobenzene (95 50 1)	naphthalene (91 20 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2012							
Field Blank	9/20/12	NA	NA	NA	NA	NA	NA
Trip Blank	9/20/12	NA	NA	NA	NA	NA	NA
MDL							
QL							
Detections in Samples							
Concentration min							
Concentration max							
December 2012							
Field Blank 1-122012	12/3/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank 2-122012	12/4/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank 3-122012	12/5/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pump Equipment Blank 1-122012	12/4/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank 1-122012	12/3/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank 2-122012	12/4/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank 3-122012	12/5/12	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Table A6. VOC Blanks.

Sample ID	Date Collected	1,2,4 trimethylbenzene (95 63 6)	1,3 dichlorobenzene (541 73 1)	1,4 dichlorobenzene (106 46 7)	1,2,3 trimethylbenzene (526 73 8)	1,2 dichlorobenzene (95 50 1)	naphthalene (91 20 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MDL		0.03	0.09	0.07	0.15	0.05	0.08
QL		0.5	0.5	0.5	0.5	0.5	0.5
Detections in Samples		1/12	0/12	0/12	0/12	0/12	0/12
Concentration min		0.074	<0.5	<0.5	<0.5	<0.5	<0.5
Concentration max		0.074	<0.5	<0.5	<0.5	<0.5	<0.5
May 2013							
Field Blank 1-052013	5/28/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank 2-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Blank 3-052013	5/30/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pump Equipment Blank 1-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank 1-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trip Blank 2-052013	5/30/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
MDL		0.03	0.09	0.07	0.15	0.05	0.08
QL		0.5	0.5	0.5	0.5	0.5	0.5
Detections in Samples		2/13	0/13	0/13	2/13	0/13	2/13
Concentration min		360	<0.5	<0.5	99	<0.5	25

Table A6. VOC Blanks.

Sample ID	Date Collected	1,2,4 trimethylbenzene (95 63 6)	1,3 dichlorobenzene (541 73 1)	1,4 dichlorobenzene (106 46 7)	1,2,3 trimethylbenzene (526 73 8)	1,2 dichlorobenzene (95 50 1)	naphthalene (91 20 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Concentration max		1200	<100	<100	200	<100	150

Table A7. Low Molecular Weight Acid Blanks.

Sample ID	Date Collected	Lactate (50 21 5)	Formate (64 18 6)	Acetate (64 19 7)	Propionate (79 09 4)	Butyrate (107 92 6)
Units		mg/L	mg/L	mg/L	mg/L	mg/L
September 2011						
Field Blank	9/19/2011	<0.10	0.04	<0.10	<0.10	<0.10
Field Blank	9/20/2011	<0.10	0.04	<0.10	<0.10	<0.10
Field Blank	9/21/2011	<0.10	0.04	0.19	<0.10	<0.10
Field Blank	9/22/2011	<0.10	0.06	0.22	<0.10	<0.10
Equipment Blank	9/19/2011	<0.10	<0.10	0.22	<0.10	<0.10
Equipment Blank	9/20/2011	<0.10	0.04	0.18	<0.10	<0.10
Equipment Blank	9/21/2011	<0.10	0.05	0.21	<0.10	<0.10
Equipment Blank	9/22/2011	<0.10	0.04	0.13	<0.10	<0.10
MDL		0.01	0.01	0.01	0.02	0.01
QL		0.10	0.10	0.10	0.10	0.10
Detections in Samples		0/17	2/17	12/17	0/17	0/17
Concentration min		<0.10	0.11	0.14	<0.10	<0.10
Concentration max		<0.10	0.29	0.35	<0.10	<0.10
March 2012						
Field Blank	3/5/2012	<0.10	0.13	<0.10	<0.10	<0.10
Field Blank	3/6/2012	<0.10	0.09	<0.10	<0.10	<0.10
Field Blank	3/7/2012	<0.10	0.23	<0.10	<0.10	<0.10
Field Blank	3/8/2012	<0.10	0.13	<0.10	<0.10	<0.10
MDL		0.01	0.01	0.01	0.02	0.01
QL		0.10	0.10	0.10	0.10	0.10
Detections in Samples		1/20	20/20	6/20	0/20	0/20
Concentration min		0.08	0.12	0.05	<0.10	<0.10

Table A7. Low Molecular Weight Acid Blanks.

Sample ID	Date Collected	Lactate (50 21 5)	Formate (64 18 6)	Acetate (64 19 7)	Propionate (79 09 4)	Butyrate (107 92 6)
Units		mg/L	mg/L	mg/L	mg/L	mg/L
Concentration max		0.08	1.23	0.07	<0.10	<0.10
September 2012						
Field Blank	9/20/12	NA	NA	NA	NA	NA
MDL						
QL						
Detections in Samples						
Concentration min						
Concentration max						
December 2012						
Field Blank 1-122012	12/3/12	<0.10	R	<0.10	<0.10	<0.10
Field Blank 2-122012	12/4/12	<0.10	R	<0.10	<0.10	<0.10
Field Blank 3-122012	12/5/12	<0.10	R	<0.10	<0.10	<0.10
Pump Equipment Blank 1-122012	12/4/12	<0.10	R	<0.10	<0.10	<0.10
MDL		0.02		0.01	0.02	0.02
QL		0.10		0.10	0.10	0.10
Detections in Samples		0/12		2/12	0/12	0/12
Concentration min		<0.10		0.26	<0.10	<0.10
Concentration max		<0.10		0.33	<0.10	<0.10
May 2013						
Field Blank 1-052013	5/28/2013	NA	NA	NA	NA	NA
Field Blank 2-052013	5/29/2013	NA	NA	NA	NA	NA
Field Blank 3-052013	5/30/2013	NA	NA	NA	NA	NA
Pump Equipment Blank 1-052013	5/29/2013	NA	NA	NA	NA	NA

Table A7. Low Molecular Weight Acid Blanks.

Sample ID	Date Collected	Lactate (50 21 5)	Formate (64 18 6)	Acetate (64 19 7)	Propionate (79 09 4)	Butyrate (107 92 6)
Units		mg/L	mg/L	mg/L	mg/L	mg/L
MDL						
QL						
Detections in Samples						
Concentration min						
Concentration max						

NA. Not Analyzed

Table A8. Dissolved Gas Blanks.

Sample ID	Date Collected	Methane (74 82 8)	Ethane (74 84 0)	Propane (74 98 6)	Butane (106 97 8)
Units		mg/L	mg/L	mg/L	mg/L
September 2011					
Field Blank	9/19/11	<0.0014	<0.0029	<0.0040	<0.0050
Field Blank	9/20/11	<0.0014	<0.0029	<0.0040	<0.0050
Field Blank	9/21/11	<0.0014	0.0013	<0.0040	<0.0050
Field Blank	9/22/11	<0.0014	<0.0029	<0.0040	<0.0050
Equipment Blank	9/19/11	<0.0014	<0.0029	<0.0040	<0.0050
Equipment Blank	9/20/11	<0.0014	<0.0029	<0.0040	<0.0050
Equipment Blank	9/21/11	<0.0014	<0.0029	<0.0040	<0.0050
Equipment Blank	9/22/11	<0.0014	<0.0029	<0.0040	<0.0050
Trip Blank	9/19/11	<0.0014	<0.0029	<0.0040	<0.0050
Trip Blank	9/20/11	<0.0014	<0.0029	<0.0040	<0.0050
Trip Blank	9/21/11	<0.0014	<0.0029	<0.0040	<0.0050
Trip Blank	9/22/11	<0.0014	<0.0029	<0.0040	<0.0050
Trip Blank	9/22/11	R	R	R	R
MDL		0.0002	0.0008	0.0008	0.0010
QL		0.0014	0.0029	0.0040	0.0050
Detections in Samples		9/17	1/17	1/17	1/17
Concentration min		0.0089	0.0017	0.0034	0.0015
Concentration max		0.0188	0.0017	0.0034	0.0015
March 2012					
Field Blank	3/5/2012	<0.0014	<0.0027	<0.0038	<0.0048
Field Blank	3/6/2012	<0.0014	<0.0027	<0.0038	<0.0048
Field Blank	3/7/2012	<0.0014	<0.0027	<0.0038	<0.0048
Field Blank	3/8/2012	<0.0014	<0.0027	<0.0038	<0.0048
Trip Blank	3/5/2012	<0.0014	<0.0027	<0.0038	<0.0048
Trip Blank	3/6/2012	<0.0014	<0.0027	<0.0038	<0.0048
Trip Blank	3/7/2012	<0.0014	<0.0027	<0.0038	<0.0048
Trip Blank	3/8/2012	<0.0014	<0.0027	<0.0038	<0.0048
MDL		0.0003	0.0005	0.0007	0.0007
QL		0.0014	0.0027	0.0038	0.0048
Detections in Samples		18/20	0/20	0/20	0/20
Concentration min		0.0007	<0.0027	<0.0038	<0.0048
Concentration max		0.0242	<0.0027	<0.0038	<0.0048
September 2012					
Field Blank	9/20/2012	NA	NA	NA	NA
Trip Blank	9/20/2012	NA	NA	NA	NA
MDL					
QL					
Detections in Samples					

Table A8. Dissolved Gas Blanks.

Sample ID	Date Collected	Methane (74 82 8)	Ethane (74 84 0)	Propane (74 98 6)	Butane (106 97 8)
Units		mg/L	mg/L	mg/L	mg/L
Concentration min					
Concentration max					
December 2012					
Field Blank 1-122012	12/3/2012	<0.0014	<0.0028	<0.0038	<0.0048
Field Blank 2-122012	12/4/2012	<0.0014	<0.0028	<0.0038	<0.0048
Field Blank 3-122012	12/5/2012	<0.0014	<0.0028	<0.0038	<0.0048
Pump Equipment Blank 1-122012	12/4/2012	<0.0014	<0.0028	<0.0038	<0.0048
Trip Blank 1-122012	12/3/2012	<0.0014	<0.0028	<0.0038	<0.0048
Trip Blank2-122012	12/4/2012	<0.0014	<0.0028	<0.0038	<0.0048
Trip Blank3-122012	12/5/2012	<0.0014	<0.0028	<0.0038	<0.0048
MDL		0.0003	0.0005	0.0007	0.0007
QL		0.0014	0.0028	0.0038	0.0048
Detections in Samples		7/12	0/12	0/12	0/12
Concentration min		0.0011	<0.0028	<0.0038	<0.0048
Concentration max		0.1320	<0.0028	<0.0038	<0.0048
May 2013					
Field Blank 1-052013	5/28/2013	NA	NA	NA	NA
Field Blank 2-052013	5/29/2013	NA	NA	NA	NA
Field Blank 3-052013	5/30/2013	NA	NA	NA	NA
Pump Equipment Blank 1-052013	5/29/2013	NA	NA	NA	NA
Trip Blank 1-052013	5/29/2013	NA	NA	NA	NA
Trip Blank 2-052013	5/30/2013	NA	NA	NA	NA
MDL					
QL					
Detections in Samples					
Concentration min					
Concentration max					

R. Data Rejected

Table A9. Glycol Blanks.

Sample ID	Date Collected	2 butoxyethanol (111 76 2)	Diethylene glycol (111 46 6)	Triethylene glycol (112 27 6)	Tetraethylene glycol (112 60 7)
Units		µg/L	µg/L	µg/L	µg/L
September 2011					
Field Blank	9/19/11	<10	<50	<50	<25
Field Blank	9/20/11	<10	<50	<50	<25
Field Blank	9/21/11	<10	<50	<50	<25
Field Blank	9/22/11	<10	<50	<50	<25
Equipment Blank	9/19/11	<10	<50	<50	<25
Equipment Blank	9/20/11	<10	<50	<50	<25
Equipment Blank	9/21/11	<10	<50	<50	<25
Equipment Blank	9/22/11	<10	<50	<50	<25
QL		5	25	25	25
Detections in Samples		0/17	0/17	0/17	0/17
Concentration min		<10	<50	<50	<25
Concentration max		<10	<50	<50	<25
March 2012					
Field Blank	3/5/2012	<10	<50	<50	<25
Field Blank	3/6/2012	<10	<50	<50	<25
Field Blank	3/7/2012	<10	<50	<50	<25
Field Blank	3/8/2012	<10	<50	<50	<25
QL		10	50	50	25
Detections in Samples		0/20	0/20	0/20	0/20
Concentration min		<10	<50	<50	<25
Concentration max		<10	<50	<50	<25
September 2012					
Field Blank	9/20/2012	NA	NA	NA	NA
QL					
Detections in Samples					
Concentration min					

Table A9. Glycol Blanks.

Sample ID	Date Collected	2 butoxyethanol (111 76 2)	Diethylene glycol (111 46 6)	Triethylene glycol (112 27 6)	Tetraethylene glycol (112 60 7)
Units		µg/L	µg/L	µg/L	µg/L
Concentration max					
December 2012					
Field Blank 1-122012	12/3/2012	<25	<25	<25	<25
Field Blank 2-122012	12/4/2012	<25	<25	<25	<25
Field Blank 3-122012	12/5/2012	<25	<25	<25	<25
Pump Equipment Blank 1-122012	12/4/2012	<25	<25	<25	<25
QL		25	25	25	25
Detections in Samples		0/12	0/12	0/12	0/12
Concentration min		<25	<25	<25	<25
Concentration max		<25	<25	<25	<25
May 2013					
Field Blank 1-052013	5/28/2013	NA	NA	NA	NA
Field Blank 2-052013	5/29/2013	NA	NA	NA	NA
Field Blank 3-052013	5/30/2013	NA	NA	NA	NA
Pump Equipment Blank 1-052013	5/29/2013	NA	NA	NA	NA
QL					
Detections in Samples					
Concentration min					
Concentration max					

NA. Not Analyzed

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	R (+) limonene (5989 27 5)	1,2,4 trichlorobenzene (120 82 1)	1,2 dichlorobenzene (95 50 1)	1,2 dinitrobenzene (528 29 0)	1,3 dichlorobenzene (541 73 1)	1,3 dimethyladamantane (702 79 4)	1,3 dinitrobenzene (99 65 0)	1,4 dichlorobenzene (106 46 7)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
Field Blank	9/19/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Field Blank	9/20/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Field Blank	9/21/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Field Blank	9/22/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Equipment Blank	9/19/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Equipment Blank	9/20/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Equipment Blank	9/21/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Equipment Blank	9/22/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
QL		0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Detections in Samples		0/17	0/17	0/17	0/17	0/17	0/17	0/17	0/17
Concentration min		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Concentration max		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
March 2012									
Field Blank	3/5/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Field Blank	3/6/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	R (+) limonene (5989 27 5)	1,2,4 trichlorobenzene (120 82 1)	1,2 dichlorobenzene (95 50 1)	1,2 dinitrobenzene (528 29 0)	1,3 dichlorobenzene (541 73 1)	1,3 dimethyladamantane (702 79 4)	1,3 dinitrobenzene (99 65 0)	1,4 dichlorobenzene (106 46 7)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Field Blank	3/7/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Field Blank	3/8/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
QL		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Detections in Samples		0/20	0/20	0/20	0/20	0/20	0/20	0/20	0/20
Concentration min		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Concentration max		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
September 2012									
Field Blank	9/20/12	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									
Concentration min									
Concentration max									
December 2012									
Field Blank 1-122012	12/3/12	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Field Blank 2-122012	12/4/12	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	R (+) limonene (5989 27 5)	1,2,4 trichlorobenzene (120 82 1)	1,2 dichlorobenzene (95 50 1)	1,2 dinitrobenzene (528 29 0)	1,3 dichlorobenzene (541 73 1)	1,3 dimethyladamantane (702 79 4)	1,3 dinitrobenzene (99 65 0)	1,4 dichlorobenzene (106 46 7)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Field Blank 3-122012	12/5/12	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Pump Equipment Blank 1-122012	12/4/12	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
QL		1	1	1	1	1	1	1	1
Detections in Samples		0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12
Concentration min		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Concentration max		<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00
May 2013									
Field Blank 1-052013	5/28/2013	NA	NA	NA	NA	NA	NA	NA	NA
Field Blank 2-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
Field Blank 3-052013	5/30/2013	NA	NA	NA	NA	NA	NA	NA	NA
Pump Equipment Blank 1-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									
Concentration min									
Concentration max									

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	1,4 dinitrobenzene (100 25 4)	1 methylnaphthalene (90 12 0)	2,3,4,6 tetrachlorophenol (58 90 2)	2,3,5,6 tetrachlorophenol (935 95 5)	2,4,5 trichlorophenol (95 95 4)	2,4,6 trichlorophenol (88 06 2)	2,4 dichlorophenol (120 83 2)	2,4 dimethylphenol (105 67 9)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
Field Blank	9/19/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Field Blank	9/20/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Field Blank	9/21/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Field Blank	9/22/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Equipment Blank	9/19/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Equipment Blank	9/20/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Equipment Blank	9/21/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Equipment Blank	9/22/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
QL		0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Detections in Samples		0/17	0/17	0/17	0/17	0/17	0/17	0/17	0/17
Concentration min		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Concentration max		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
March 2012									
Field Blank	3/5/2012	<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	1,4 dinitrobenzene (100 25 4)	1 methylnaphthalene (90 12 0)	2,3,4,6 tetrachlorophenol (58 90 2)	2,3,5,6 tetrachlorophenol (935 95 5)	2,4,5 trichlorophenol (95 95 4)	2,4,6 trichlorophenol (88 06 2)	2,4 dichlorophenol (120 83 2)	2,4 dimethylphenol (105 67 9)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Field Blank	3/6/2012	<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Field Blank	3/7/2012	<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Field Blank	3/8/2012	<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
QL		1.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00
Detections in Samples		0/20	0/20	0/20	0/20	0/20	0/20	0/20	0/20
Concentration min		<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Concentration max		<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
September 2012									
Field Blank	9/20/12	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									
Concentration min									
Concentration max									
December 2012									
Field Blank 1-122012	12/3/12	<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	1,4 dinitrobenzene (100 25 4)	1 methylnaphthalene (90 12 0)	2,3,4,6 tetrachlorophenol (58 90 2)	2,3,5,6 tetrachlorophenol (935 95 5)	2,4,5 trichlorophenol (95 95 4)	2,4,6 trichlorophenol (88 06 2)	2,4 dichlorophenol (120 83 2)	2,4 dimethylphenol (105 67 9)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Field Blank 2-122012	12/4/12	<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Field Blank 3-122012	12/5/12	<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Pump Equipment Blank 1-122012	12/4/12	<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
QL		1	1	2	2	2	2	2	2
Detections in Samples		0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12
Concentration min		<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
Concentration max		<4.00	<4.00	<8.00	<8.00	<8.00	<8.00	<8.00	<8.00
May 2013									
Field Blank 1-052013	5/28/2013	NA	NA	NA	NA	NA	NA	NA	NA
Field Blank 2-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
Field Blank 3-052013	5/30/2013	NA	NA	NA	NA	NA	NA	NA	NA
Pump Equipment Blank 1-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									
Concentration min									

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	1,4 dinitrobenzene (100 25 4)	1 methylnaphthalene (90 12 0)	2,3,4,6 tetrachlorophenol (58 90 2)	2,3,5,6 tetrachlorophenol (935 95 5)	2,4,5 trichlorophenol (95 95 4)	2,4,6 trichlorophenol (88 06 2)	2,4 dichlorophenol (120 83 2)	2,4 dimethylphenol (105 67 9)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Concentration max									

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	2,4 dinitrophenol (51 28 5)	2,4dinitrotoluene (121 14 2)	2,6 dinitrotoluene (606 20 2)	2 butoxyethanol (111 76 2)	2 chloronaphthalene (91 58 7)	2 chlorophenol (95 57 8)	2 methylnaphthalene (91 57 6)	2 methylphenol (95 48 7)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
Field Blank	9/19/11	<5.00	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Field Blank	9/20/11	<5.00	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Field Blank	9/21/11	<5.00	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Field Blank	9/22/11	<5.00	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Equipment Blank	9/19/11	<5.00	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Equipment Blank	9/20/11	<5.00	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Equipment Blank	9/21/11	<5.00	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Equipment Blank	9/22/11	<5.00	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
QL		5.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Detections in Samples		0/17	0/17	0/17	0/17	0/17	0/17	0/17	0/17
Concentration min		<5.00	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Concentration max		<5.00	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
March 2012									
Field Blank	3/5/2012	<3.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00
Field Blank	3/6/2012	<3.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	2,4 dinitrophenol (51 28 5)	2,4dinitrotoluene (121 14 2)	2,6 dinitrotoluene (606 20 2)	2 butoxyethanol (111 76 2)	2 chloronaphthalene (91 58 7)	2 chlorophenol (95 57 8)	2 methylnaphthalene (91 57 6)	2 methylphenol (95 48 7)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Field Blank	3/7/2012	<3.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00
Field Blank	3/8/2012	<3.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00
QL		3.00	1.00	1.00	1.00	1.00	2.00	1.00	2.00
Detections in Samples		0/20	0/20	0/20	0/20	0/20	0/20	0/20	0/20
Concentration min		<3.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00
Concentration max		<3.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00
September 2012									
Field Blank	9/20/12	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									
Concentration min									
Concentration max									
December 2012									
Field Blank 1-122012	12/3/12	<3.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00
Field Blank 2-122012	12/4/12	<3.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	2,4 dinitrophenol (51 28 5)	2,4dinitrotoluene (121 14 2)	2,6 dinitrotoluene (606 20 2)	2 butoxyethanol (111 76 2)	2 chloronaphthalene (91 58 7)	2 chlorophenol (95 57 8)	2 methylnaphthalene (91 57 6)	2 methylphenol (95 48 7)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Field Blank 3-122012	12/5/12	<3.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00
Pump Equipment Blank 1-122012	12/4/12	<3.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00
QL		3	1	1	1	1	2	1	2
Detections in Samples		0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12
Concentration min		<3.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00
Concentration max		<12.0	<4.00	<4.00	<4.00	<4.00	<8.00	<4.00	<8.00
May 2013									
Field Blank 1-052013	5/28/2013	NA	NA	NA	NA	NA	NA	NA	NA
Field Blank 2-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
Field Blank 3-052013	5/30/2013	NA	NA	NA	NA	NA	NA	NA	NA
Pump Equipment Blank 1-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									
Concentration min									
Concentration max									

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	2 nitroaniline (88 74 4)	2 nitrophenol (88 75 5)	3&4 methylphenol (108 39 4 & 106 44 5)	3,3' dichlorobenzidine (91 94 1)	3 nitroaniline (99 09 2)	4,6 dinitro 2 methylphenol (534 52 1)	4 bromophenyl phenyl ether (101 55 3)	4 chloro 3 methylphenol (59 50 7)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
Field Blank	9/19/11	<0.50	<0.50	<0.50	NA	NA	<0.50	<0.50	<0.50
Field Blank	9/20/11	<0.50	<0.50	<0.50	NA	NA	<0.50	<0.50	<0.50
Field Blank	9/21/11	<0.50	<0.50	<0.50	NA	NA	<0.50	<0.50	<0.50
Field Blank	9/22/11	<0.50	<0.50	<0.50	NA	NA	<0.50	<0.50	<0.50
Equipment Blank	9/19/11	<0.50	<0.50	<0.50	NA	NA	<0.50	<0.50	<0.50
Equipment Blank	9/20/11	<0.50	<0.50	<0.50	NA	NA	<0.50	<0.50	<0.50
Equipment Blank	9/21/11	<0.50	<0.50	<0.50	NA	NA	<0.50	<0.50	<0.50
Equipment Blank	9/22/11	<0.50	<0.50	<0.50	NA	NA	<0.50	<0.50	<0.50
QL		0.50	0.50	0.50			0.50	0.50	0.50
Detections in Samples		0/17	0/17	0/17			0/17	0/17	0/17
Concentration min		<0.50	<0.50	<0.50			<0.50	<0.50	<0.50
Concentration max		<0.50	<0.50	<0.50			<0.50	<0.50	<0.50
March 2012									
Field Blank	3/5/2012	<1.00	<2.00	<5.00	<1.00	<3.00	<2.00	<1.00	<2.00

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	2 nitroaniline (88 74 4)	2 nitrophenol (88 75 5)	3&4 methylphenol (108 39 4 & 106 44 5)	3,3' dichlorobenzidine (91 94 1)	3 nitroaniline (99 09 2)	4,6 dinitro 2 methylphenol (534 52 1)	4 bromophenyl phenyl ether (101 55 3)	4 chloro 3 methylphenol (59 50 7)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Field Blank	3/6/2012	<1.00	<2.00	<5.00	<1.00	<3.00	<2.00	<1.00	<2.00
Field Blank	3/7/2012	<1.00	<2.00	<5.00	<1.00	<3.00	<2.00	<1.00	<2.00
Field Blank	3/8/2012	<1.00	<2.00	<5.00	<1.00	<3.00	<2.00	<1.00	<2.00
QL		1.00	2.00	5.00	1.00	3.00	2.00	1.00	2.00
Detections in Samples		0/20	0/20	0/20	0/20	0/20	0/20	0/20	0/20
Concentration min		<1.00	<2.00	<5.00	<1.00	<3.00	<2.00	<1.00	<2.00
Concentration max		<1.00	<2.00	<5.00	<1.00	<3.00	<2.00	<1.00	<2.00
September 2012									
Field Blank	9/20/12	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									
Concentration min									
Concentration max									
December 2012									
Field Blank 1-122012	12/3/12	<1.00	<2.00	<5.00	<1.00	<3.00	<2.00	<1.00	<2.00

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	2 nitroaniline (88 74 4)	2 nitrophenol (88 75 5)	3&4 methylphenol (108 39 4 & 106 44 5)	3,3' dichlorobenzidine (91 94 1)	3 nitroaniline (99 09 2)	4,6 dinitro 2 methylphenol (534 52 1)	4 bromophenyl phenyl ether (101 55 3)	4 chloro 3 methylphenol (59 50 7)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Field Blank 2-122012	12/4/12	<1.00	<2.00	<5.00	<1.00	<3.00	<2.00	<1.00	<2.00
Field Blank 3-122012	12/5/12	<1.00	<2.00	<5.00	<1.00	<3.00	<2.00	<1.00	<2.00
Pump Equipment Blank 1-122012	12/4/12	<1.00	<2.00	<5.00	<1.00	<3.00	<2.00	<1.00	<2.00
QL		1	2	5	1	3	2	1	2
Detections in Samples		0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12
Concentration min		<1.00	<2.00	<5.00	<1.00	<3.00	<2.00	<1.00	<2.00
Concentration max		<4.00	<8.00	<20.0	<4.00	<12.0	<8.00	<4.00	<8.00
May 2013									
Field Blank 1-052013	5/28/2013	NA	NA	NA	NA	NA	NA	NA	NA
Field Blank 2-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
Field Blank 3-052013	5/30/2013	NA	NA	NA	NA	NA	NA	NA	NA
Pump Equipment Blank 1-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									
Concentration min									

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	2 nitroaniline (88 74 4)	2 nitrophenol (88 75 5)	3&4 methylphenol (108 39 4 & 106 44 5)	3,3' dichlorobenzidine (91 94 1)	3 nitroaniline (99 09 2)	4,6 dinitro 2 methylphenol (534 52 1)	4 bromophenyl phenyl ether (101 55 3)	4 chloro 3 methylphenol (59 50 7)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Concentration max									

NA. Not Analyzed

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	4-chloroaniline (106-47-8)	4-chlorophenyl phenyl ether (7005-72-3)	4-nitroaniline (100-01-6)	4-nitrophenol (100-02-7)	Acenaphthene (83-32-9)	Acenaphthylene (208-96-8)	Adamantane (281-23-2)	Aniline (62-53-3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
Field Blank	9/19/11	NA	<0.50	NA	<2.50	<0.50	<0.50	<0.50	NA
Field Blank	9/20/11	NA	<0.50	NA	<2.50	<0.50	<0.50	<0.50	NA
Field Blank	9/21/11	NA	<0.50	NA	<2.50	<0.50	<0.50	<0.50	NA
Field Blank	9/22/11	NA	<0.50	NA	<2.50	<0.50	<0.50	<0.50	NA
Equipment Blank	9/19/11	NA	<0.50	NA	<2.50	<0.50	<0.50	<0.50	NA
Equipment Blank	9/20/11	NA	<0.50	NA	<2.50	<0.50	<0.50	<0.50	NA
Equipment Blank	9/21/11	NA	<0.50	NA	<2.50	<0.50	<0.50	<0.50	NA
Equipment Blank	9/22/11	NA	<0.50	NA	<2.50	<0.50	<0.50	<0.50	NA
QL			0.50		2.50	0.50	0.50	0.50	
Detections in Samples			0/17		0/17	0/17	0/17	0/17	
Concentration min			<0.50		<2.50	<0.50	<0.50	<0.50	
Concentration max			<0.50		<2.50	<0.50	<0.50	<0.50	
March 2012									
Field Blank	3/5/2012	<3.00	<1.00	<3.00	<3.00	<1.00	<1.00	<1.00	<1.00
Field Blank	3/6/2012	<3.00	<1.00	<3.00	<3.00	<1.00	<1.00	<1.00	<1.00
Field Blank	3/7/2012	<3.00	<1.00	<3.00	<3.00	<1.00	<1.00	<1.00	<1.00

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	4-chloroaniline (106-47-8)	4-chlorophenyl phenyl ether (7005-72-3)	4-nitroaniline (100-01-6)	4-nitrophenol (100-02-7)	Acenaphthene (83-32-9)	Acenaphthylene (208-96-8)	Adamantane (281-23-2)	Aniline (62-53-3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Field Blank	3/8/2012	<3.00	<1.00	<3.00	<3.00	<1.00	<1.00	<1.00	<1.00
QL		3.00	1.00	3.00	3.00	1.00	1.00	1.00	1.00
Detections in Samples		0/20	0/20	0/20	0/20	0/20	0/20	0/20	0/20
Concentration min		<3.00	<1.00	<3.00	<3.00	<1.00	<1.00	<1.00	<1.00
Concentration max		<3.00	<1.00	<3.00	<3.00	<1.00	<1.00	<1.00	<1.00
September 2012									
Field Blank	9/20/12	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									
Concentration min									
Concentration max									
December 2012									
Field Blank 1-122012	12/3/12	<3.00	<1.00	<3.00	<3.00	<1.00	<1.00	<1.00	<1.00
Field Blank 2-122012	12/4/12	<3.00	<1.00	<3.00	<3.00	<1.00	<1.00	<1.00	<1.00
Field Blank 3-122012	12/5/12	<3.00	<1.00	<3.00	<3.00	<1.00	<1.00	<1.00	<1.00
Pump Equipment Blank 1-122012	12/4/12	<3.00	<1.00	<3.00	<3.00	<1.00	<1.00	<1.00	<1.00

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	4-chloroaniline (106-47-8)	4-chlorophenyl phenyl ether (7005-72-3)	4-nitroaniline (100-01-6)	4-nitrophenol (100-02-7)	Acenaphthene (83-32-9)	Acenaphthylene (208-96-8)	Adamantane (281-23-2)	Aniline (62-53-3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
QL		3	1	3	3	1	1	1	1
Detections in Samples		0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12
Concentration min		<3.00	<1.00	<3.00	<3.00	<1.00	<1.00	<1.00	<1.00
Concentration max		<12.0	<4.00	<12.0	<12.0	<4.00	<4.00	<4.00	<4.00
May 2013									
Field Blank 1-052013	5/28/2013	NA	NA	NA	NA	NA	NA	NA	NA
Field Blank 2-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
Field Blank 3-052013	5/30/2013	NA	NA	NA	NA	NA	NA	NA	NA
Pump Equipment Blank 1-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									
Concentration min									
Concentration max									

NA. Not Analyzed

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Anthracene (120 12 7)	Azobenzene (103 33 3)	Benzo(a)anthracene (56 55 3)	Benzo(a)pyrene (50 32 3)	Benzo(b)fluoranthene (205 99 2)	Benzo(g,h,i)perylene (191 24 2)	Benzo(k)fluoranthene (207 08 9)	Benzoic Acid (65 85 0)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
Field Blank	9/19/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.00
Field Blank	9/20/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.00
Field Blank	9/21/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.00
Field Blank	9/22/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.00
Equipment Blank	9/19/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.00
Equipment Blank	9/20/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.00
Equipment Blank	9/21/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.00
Equipment Blank	9/22/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.00
QL		0.50	0.50	0.50	0.50	0.50	0.50	0.50	5.00
Detections in Samples		0/17	0/17	0/17	0/17	0/17	0/17	0/17	0/17
Concentration min		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.00
Concentration max		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.00

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Anthracene (120 12 7)	Azobenzene (103 33 3)	Benzo(a)anthracene (56 55 3)	Benzo(a)pyrene (50 32 3)	Benzo(b)fluoranthene (205 99 2)	Benzo(g,h,i)perylene (191 24 2)	Benzo(k)fluoranthene (207 08 9)	Benzoic Acid (65 85 0)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
March 2012									
Field Blank	3/5/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<3.00
Field Blank	3/6/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<3.00
Field Blank	3/7/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<3.00
Field Blank	3/8/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<3.00
QL		1.00	1.00	1.00	1.00	1.00	1.00	1.00	3.00
Detections in Samples		0/20	0/20	0/20	0/20	0/20	0/20	0/20	0/20
Concentration min		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<3.00
Concentration max		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<3.00
September 2012									
Field Blank	9/20/12	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Anthracene (120 12 7)	Azobenzene (103 33 3)	Benzo(a)anthracene (56 55 3)	Benzo(a)pyrene (50 32 3)	Benzo(b)fluoranthene (205 99 2)	Benzo(g,h,i)perylene (191 24 2)	Benzo(k)fluoranthene (207 08 9)	Benzoic Acid (65 85 0)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Concentration min									
Concentration max									
December 2012									
Field Blank 1-122012	12/3/12	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<3.00
Field Blank 2-122012	12/4/12	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<3.00
Field Blank 3-122012	12/5/12	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<3.00
Pump Equipment Blank 1-122012	12/4/12	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<3.00
QL		1	1	1	1	1	1	1	3
Detections in Samples		0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12
Concentration min		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<3.00
Concentration max		<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<12.0
May 2013									
Field Blank 1-052013	5/28/2013	NA	NA	NA	NA	NA	NA	NA	NA
Field Blank 2-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Anthracene (120 12 7)	Azobenzene (103 33 3)	Benzo(a)anthracene (56 55 3)	Benzo(a)pyrene (50 32 3)	Benzo(b)fluoranthene (205 99 2)	Benzo(g,h,i)perylene (191 24 2)	Benzo(k)fluoranthene (207 08 9)	Benzoic Acid (65 85 0)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Field Blank 3-052013	5/30/2013	NA	NA	NA	NA	NA	NA	NA	NA
Pump Equipment Blank 1-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									
Concentration min									
Concentration max									

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Benzyl alcohol (100-51-6)	Bis-(2-chloroethoxy)methane (111-91-1)	Bis-(2-chloroethyl)ether (111-44-4)	Bis-(2-chloroisopropyl)ether (108-60-1)	Bis-(2-ethylhexyl) adipate (103-23-1)	Bis-(2-ethylhexyl) phthalate (117-81-7)	Butyl benzyl phthalate (85-68-7)	Carbazole (86-74-8)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
Field Blank	9/19/11	<0.50	<0.50	<0.50	<0.50	<1.00	1.11	<0.50	NA
Field Blank	9/20/11	<0.50	<0.50	<0.50	<0.50	<1.00	<1.00	<0.50	NA
Field Blank	9/21/11	<0.50	<0.50	<0.50	<0.50	<1.00	<1.00	<0.50	NA
Field Blank	9/22/11	<0.50	<0.50	<0.50	<0.50	<1.00	<1.00	<0.50	NA
Equipment Blank	9/19/11	<0.50	<0.50	<0.50	<0.50	<1.00	<1.00	<0.50	NA
Equipment Blank	9/20/11	<0.50	<0.50	<0.50	<0.50	<1.00	<1.00	<0.50	NA
Equipment Blank	9/21/11	<0.50	<0.50	<0.50	<0.50	<1.00	<1.00	<0.50	NA
Equipment Blank	9/22/11	<0.50	<0.50	<0.50	<0.50	<1.00	<1.00	<0.50	NA
QL		0.50	0.50	0.50	0.50	1.00	1.00	0.50	
Detections in Samples		0/17	0/17	0/17	0/17	0/17	2/17	0/17	
Concentration min		<0.50	<0.50	<0.50	<0.50	<1.00	2.02	<0.50	
Concentration max		<0.50	<0.50	<0.50	<0.50	<1.00	2.51	<0.50	

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Benzyl alcohol (100-51-6)	Bis-(2-chloroethoxy)methane (111-91-1)	Bis-(2-chloroethyl)ether (111-44-4)	Bis-(2-chloroisopropyl)ether (108-60-1)	Bis-(2-ethylhexyl) adipate (103-23-1)	Bis-(2-ethylhexyl) phthalate (117-81-7)	Butyl benzyl phthalate (85-68-7)	Carbazole (86-74-8)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
March 2012									
Field Blank	3/5/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<3.00
Field Blank	3/6/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<3.00
Field Blank	3/7/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<3.00
Field Blank	3/8/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<3.00
QL		1.00	1.00	1.00	1.00	1.00	2.00	1.00	3.00
Detections in Samples		0/20	0/20	0/20	0/20	0/20	0/20	0/20	0/20
Concentration min		<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<3.00
Concentration max		<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<3.00
September 2012									
Field Blank	9/20/12	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Benzyl alcohol (100-51-6)	Bis-(2-chloroethoxy)methane (111-91-1)	Bis-(2-chloroethyl)ether (111-44-4)	Bis-(2-chloroisopropyl)ether (108-60-1)	Bis-(2-ethylhexyl) adipate (103-23-1)	Bis-(2-ethylhexyl) phthalate (117-81-7)	Butyl benzyl phthalate (85-68-7)	Carbazole (86-74-8)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Concentration min									
Concentration max									
December 2012									
Field Blank 1-122012	12/3/12	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<3.00
Field Blank 2-122012	12/4/12	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<3.00
Field Blank 3-122012	12/5/12	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<3.00
Pump Equipment Blank 1-122012	12/4/12	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<3.00
QL		1	1	1	1	1	2	1	3
Detections in Samples		0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12
Concentration min		<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<3.00
Concentration max		<4.00	<4.00	<4.00	<4.00	<4.00	<8.00	<4.00	<12.0
May 2013									
Field Blank 1-052013	5/28/2013	NA	NA	NA	NA	NA	NA	NA	NA
Field Blank 2-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Benzyl alcohol (100-51-6)	Bis-(2-chloroethoxy)methane (111-91-1)	Bis-(2-chloroethyl)ether (111-44-4)	Bis-(2-chloroisopropyl)ether (108-60-1)	Bis-(2-ethylhexyl) adipate (103-23-1)	Bis-(2-ethylhexyl) phthalate (117-81-7)	Butyl benzyl phthalate (85-68-7)	Carbazole (86-74-8)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Field Blank 3-052013	5/30/2013	NA	NA	NA	NA	NA	NA	NA	NA
Pump Equipment Blank 1-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									
Concentration min									
Concentration max									

NA. Not Analyzed

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Chrysene (218-01-9)	Dibenz(a,h)anthracene (53-70-3)	Dibenzofuran (132-64-9)	Diethyl phthalate (84-66-2)	Dimethyl phthalate (131-11-3)	Di-n-butyl phthalate (84-74-2)	Di-n-octyl phthalate (117-84-0)	Diphenylamine (122-39-4)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
Field Blank	9/19/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Field Blank	9/20/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Field Blank	9/21/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Field Blank	9/22/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Equipment Blank	9/19/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Equipment Blank	9/20/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Equipment Blank	9/21/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Equipment Blank	9/22/11	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
QL		0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Detections in Samples		0/17	0/17	0/17	0/17	0/17	0/17	0/17	0/17
Concentration min		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Concentration max		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Chrysene (218-01-9)	Dibenz(a,h)anthracene (53-70-3)	Dibenzofuran (132-64-9)	Diethyl phthalate (84-66-2)	Dimethyl phthalate (131-11-3)	Di-n-butyl phthalate (84-74-2)	Di-n-octyl phthalate (117-84-0)	Diphenylamine (122-39-4)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
March 2012									
Field Blank	3/5/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Field Blank	3/6/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Field Blank	3/7/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Field Blank	3/8/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
QL		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Detections in Samples		0/20	0/20	0/20	0/20	0/20	0/20	0/20	0/20
Concentration min		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Concentration max		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
September 2012									
Field Blank	9/20/12	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Chrysene (218-01-9)	Dibenz(a,h)anthracene (53-70-3)	Dibenzofuran (132-64-9)	Diethyl phthalate (84-66-2)	Dimethyl phthalate (131-11-3)	Di-n-butyl phthalate (84-74-2)	Di-n-octyl phthalate (117-84-0)	Diphenylamine (122-39-4)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Concentration min									
Concentration max									
December 2012									
Field Blank 1-122012	12/3/12	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Field Blank 2-122012	12/4/12	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Field Blank 3-122012	12/5/12	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Pump Equipment Blank 1-122012	12/4/12	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
QL		1	1	1	1	1	1	1	1
Detections in Samples		0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12
Concentration min		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Concentration max		<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00
May 2013									
Field Blank 1-052013	5/28/2013	NA	NA	NA	NA	NA	NA	NA	NA
Field Blank 2-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Chrysene (218-01-9)	Dibenz(a,h)anthracene (53-70-3)	Dibenzofuran (132-64-9)	Diethyl phthalate (84-66-2)	Dimethyl phthalate (131-11-3)	Di-n-butyl phthalate (84-74-2)	Di-n-octyl phthalate (117-84-0)	Diphenylamine (122-39-4)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Field Blank 3-052013	5/30/2013	NA	NA	NA	NA	NA	NA	NA	NA
Pump Equipment Blank 1-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									
Concentration min									
Concentration max									

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Fluoranthene (206 44 0)	Fluorene (86 73 7)	Hexachlorobenzene (118 74 1)	Hexachlorobutadiene (87 68 3)	Hexachlorocyclopentadiene (77 47 4)	Hexachloroethane (67 72 1)	Indeno(1,2,3 cd)pyrene (193 39 5)	Isophorone (78 59 1)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
Field Blank	9/19/11	<0.50	<0.50	<0.50	<1.00	<0.50	<1.00	<0.50	<0.50
Field Blank	9/20/11	<0.50	<0.50	<0.50	<1.00	<0.50	<1.00	<0.50	<0.50
Field Blank	9/21/11	<0.50	<0.50	<0.50	<1.00	<0.50	<1.00	<0.50	<0.50
Field Blank	9/22/11	<0.50	<0.50	<0.50	<1.00	<0.50	<1.00	<0.50	<0.50
Equipment Blank	9/19/11	<0.50	<0.50	<0.50	<1.00	<0.50	<1.00	<0.50	<0.50
Equipment Blank	9/20/11	<0.50	<0.50	<0.50	<1.00	<0.50	<1.00	<0.50	<0.50
Equipment Blank	9/21/11	<0.50	<0.50	<0.50	<1.00	<0.50	<1.00	<0.50	<0.50
Equipment Blank	9/22/11	<0.50	<0.50	<0.50	<1.00	<0.50	<1.00	<0.50	<0.50
QL		0.50	0.50	0.50	1.00	0.50	1.00	0.50	0.50
Detections in Samples		0/17	0/17	0/17	0/17	0/17	0/17	0/17	0/17
Concentration min		<0.50	<0.50	<0.50	<1.00	<0.50	<1.00	<0.50	<0.50
Concentration max		<0.50	<0.50	<0.50	<1.00	<0.50	<1.00	<0.50	<0.50

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Fluoranthene (206 44 0)	Fluorene (86 73 7)	Hexachlorobenzene (118 74 1)	Hexachlorobutadiene (87 68 3)	Hexachlorocyclopentadiene (77 47 4)	Hexachloroethane (67 72 1)	Indeno(1,2,3 cd)pyrene (193 39 5)	Isophorone (78 59 1)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
March 2012									
Field Blank	3/5/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Field Blank	3/6/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Field Blank	3/7/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Field Blank	3/8/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
QL		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Detections in Samples		0/20	0/20	0/20	0/20	0/20	0/20	0/20	0/20
Concentration min		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Concentration max		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
September 2012									
Field Blank	9/20/12	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Fluoranthene (206 44 0)	Fluorene (86 73 7)	Hexachlorobenzene (118 74 1)	Hexachlorobutadiene (87 68 3)	Hexachlorocyclopentadiene (77 47 4)	Hexachloroethane (67 72 1)	Indeno(1,2,3 cd)pyrene (193 39 5)	Isophorone (78 59 1)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Concentration min									
Concentration max									
December 2012									
Field Blank 1-122012	12/3/12	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Field Blank 2-122012	12/4/12	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Field Blank 3-122012	12/5/12	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Pump Equipment Blank 1-122012	12/4/12	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
QL		1	1	1	1	1	1	1	1
Detections in Samples		0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12
Concentration min		<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Concentration max		<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00
May 2013									
Field Blank 1-052013	5/28/2013	NA	NA	NA	NA	NA	NA	NA	NA
Field Blank 2-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Fluoranthene (206 44 0)	Fluorene (86 73 7)	Hexachlorobenzene (118 74 1)	Hexachlorobutadiene (87 68 3)	Hexachlorocyclopentadiene (77 47 4)	Hexachloroethane (67 72 1)	Indeno(1,2,3 cd)pyrene (193 39 5)	Isophorone (78 59 1)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Field Blank 3-052013	5/30/2013	NA	NA	NA	NA	NA	NA	NA	NA
Pump Equipment Blank 1-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									
Concentration min									
Concentration max									

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Naphthalene (91-20-3)	Nitrobenzene (98-95-3)	N-nitrosodimethylamine (62-75-9)	N-nitrosodi-n-propylamine (621-64-7)	Pentachlorophenol (87-86-5)	Phenanthrene (85-01-8)	Phenol (108-95-2)	Pyrene (129-00-0)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
Field Blank	9/19/11	<0.50	<0.50	<0.50	<0.50	<1.00	<0.50	<0.50	<0.50
Field Blank	9/20/11	<0.50	<0.50	<0.50	<0.50	<1.00	<0.50	<0.50	<0.50
Field Blank	9/21/11	<0.50	<0.50	<0.50	<0.50	<1.00	<0.50	<0.50	<0.50
Field Blank	9/22/11	<0.50	<0.50	<0.50	<0.50	<1.00	<0.50	<0.50	<0.50
Equipment Blank	9/19/11	<0.50	<0.50	<0.50	<0.50	<1.00	<0.50	<0.50	<0.50
Equipment Blank	9/20/11	<0.50	<0.50	<0.50	<0.50	<1.00	<0.50	<0.50	<0.50
Equipment Blank	9/21/11	<0.50	<0.50	<0.50	<0.50	<1.00	<0.50	<0.50	<0.50
Equipment Blank	9/22/11	<0.50	<0.50	<0.50	<0.50	<1.00	<0.50	<0.50	<0.50
QL		0.50	0.50	0.50	0.50	1.00	0.50	0.50	0.50
Detections in Samples		0/17	0/17	0/17	0/17	0/17	0/17	0/17	0/17
Concentration min		<0.50	<0.50	<0.50	<0.50	<1.00	<0.50	<0.50	<0.50
Concentration max		<0.50	<0.50	<0.50	<0.50	<1.00	<0.50	<0.50	<0.50

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Naphthalene (91-20-3)	Nitrobenzene (98-95-3)	N-nitrosodimethylamine (62-75-9)	N-nitrosodi-n-propylamine (621-64-7)	Pentachlorophenol (87-86-5)	Phenanthrene (85-01-8)	Phenol (108-95-2)	Pyrene (129-00-0)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
March 2012									
Field Blank	3/5/2012	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00	<1.00
Field Blank	3/6/2012	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00	<1.00
Field Blank	3/7/2012	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00	<1.00
Field Blank	3/8/2012	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00	<1.00
QL		1.00	1.00	1.00	1.00	2.00	1.00	2.00	1.00
Detections in Samples		0/20	0/20	0/20	0/20	0/20	0/20	0/20	0/20
Concentration min		<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00	<1.00
Concentration max		<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00	<1.00
September 2012									
Field Blank	9/20/12	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Naphthalene (91-20-3)	Nitrobenzene (98-95-3)	N-nitrosodimethylamine (62-75-9)	N-nitrosodi-n-propylamine (621-64-7)	Pentachlorophenol (87-86-5)	Phenanthrene (85-01-8)	Phenol (108-95-2)	Pyrene (129-00-0)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Concentration min									
Concentration max									
December 2012									
Field Blank 1-122012	12/3/12	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00	<1.00
Field Blank 2-122012	12/4/12	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00	<1.00
Field Blank 3-122012	12/5/12	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00	<1.00
Pump Equipment Blank 1-122012	12/4/12	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00	<1.00
QL		1	1	1	1	2	1	2	1
Detections in Samples		0/12	0/12	0/12	0/12	0/12	0/12	0/12	0/12
Concentration min		<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00	<1.00
Concentration max		<4.00	<4.00	<4.00	<4.00	<8.00	<4.00	<8.00	<4.00
May 2013									
Field Blank 1-052013	5/28/2013	NA	NA	NA	NA	NA	NA	NA	NA
Field Blank 2-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Naphthalene (91-20-3)	Nitrobenzene (98-95-3)	N-nitrosodimethylamine (62-75-9)	N-nitrosodi-n-propylamine (621-64-7)	Pentachlorophenol (87-86-5)	Phenanthrene (85-01-8)	Phenol (108-95-2)	Pyrene (129-00-0)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Field Blank 3-052013	5/30/2013	NA	NA	NA	NA	NA	NA	NA	NA
Pump Equipment Blank 1-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
QL									
Detections in Samples									
Concentration min									
Concentration max									

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Pyridine (110-86-1)	Squalene (111-02-4)	Terpiniol (98-55-5)	tri-(2-butoxyethyl) phosphate (78-51-3)
Units		µg/L	µg/L	µg/L	µg/L
September 2011					
Field Blank	9/19/11	<0.50	<1.00	<0.50	<1.00
Field Blank	9/20/11	<0.50	<1.00	<0.50	<1.00
Field Blank	9/21/11	<0.50	<1.00	<0.50	<1.00
Field Blank	9/22/11	<0.50	<1.00	<0.50	<1.00
Equipment Blank	9/19/11	<0.50	<1.00	<0.50	<1.00
Equipment Blank	9/20/11	<0.50	<1.00	<0.50	<1.00
Equipment Blank	9/21/11	<0.50	<1.00	<0.50	<1.00
Equipment Blank	9/22/11	<0.50	<1.00	<0.50	<1.00
QL		0.50	1.00	0.50	1.00
Detections in Samples		0/17	0/17	0/17	0/17
Concentration min		<0.50	<1.00	<0.50	<1.00
Concentration max		<0.50	<1.00	<0.50	<1.00

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Pyridine (110-86-1)	Squalene (111-02-4)	Terpiniol (98-55-5)	tri-(2-butoxyethyl) phosphate (78-51-3)
Units		µg/L	µg/L	µg/L	µg/L
March 2012					
Field Blank	3/5/2012	<1.00	<2.00	<1.00	NA
Field Blank	3/6/2012	<1.00	<2.00	<1.00	NA
Field Blank	3/7/2012	<1.00	<2.00	<1.00	NA
Field Blank	3/8/2012	<1.00	<2.00	<1.00	NA
QL		1.00	2.00	1.00	
Detections in Samples		0/20	0/20	0/20	
Concentration min		<1.00	<2.00	<1.00	
Concentration max		<1.00	<2.00	<1.00	
September 2012					
Field Blank	9/20/12	NA	NA	NA	NA
QL					
Detections in Samples					

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Pyridine (110-86-1)	Squalene (111-02-4)	Terpiniol (98-55-5)	tri-(2-butoxyethyl) phosphate (78-51-3)
Units		µg/L	µg/L	µg/L	µg/L
Concentration min					
Concentration max					
December 2012					
Field Blank 1-122012	12/3/12	<1.00	<2.00	<1.00	<1.00
Field Blank 2-122012	12/4/12	<1.00	<2.00	<1.00	<1.00
Field Blank 3-122012	12/5/12	<1.00	<2.00	<1.00	<1.00
Pump Equipment Blank 1-122012	12/4/12	<1.00	<2.00	<1.00	<1.00
QL		1	2	1	1
Detections in Samples		0/12	0/12	0/12	0/12
Concentration min		<1.00	<2.00	<1.00	<1.00
Concentration max		<4.00	<8.00	<4.00	<4.00
May 2013					
Field Blank 1-052013	5/28/2013	NA	NA	NA	NA
Field Blank 2-052013	5/29/2013	NA	NA	NA	NA

Table A10. Semi-Volatile Organic Compound (sVOC) Blanks.

Sample ID	Date Collected	Pyridine (110-86-1)	Squalene (111-02-4)	Terpiniol (98-55-5)	tri-(2-butoxyethyl) phosphate (78-51-3)
Units		µg/L	µg/L	µg/L	µg/L
Field Blank 3-052013	5/30/2013	NA	NA	NA	NA
Pump Equipment Blank 1-052013	5/29/2013	NA	NA	NA	NA
QL					
Detections in Samples					
Concentration min					
Concentration max					

NA. Not Analyzed

Table A11. Diesel Range Organic Compounds (DRO) and Gasoline Range Organic Compounds (GRO) Blanks.

Sample ID	Date Collected	GRO/TPH	DRO
Units		µg/L	µg/L
September 2011			
Field Blank	9/19/11	29.9	<20.0
Field Blank	9/20/11	25.0	<20.0
Field Blank	9/21/11	25.5	<20.0
Field Blank	9/22/11	<20.0	<20.0
Equipment Blank	9/19/11	29.1	30.3
Equipment Blank	9/20/11	<20.0	21.4
Equipment Blank	9/21/11	22.2	<20.0
Equipment Blank	9/22/11	<20.0	20.1
QL		20.0	20.0
Detections in Samples		0/17	4/17
Concentration min		<20.0	212
Concentration max		<20.0	254
March 2012			
Field Blank	3/5/2012	<20.0	<20.0
Field Blank	3/6/2012	<20.0	<20.0
Field Blank	3/7/2012	<20.0	<20.0
Field Blank	3/8/2012	<20.0	<20.0
QL		20.0	20.0
Detections in Samples		0/20	4/20
Concentration min		<20.0	105
Concentration max		<20.0	150
September 2012			
Field Blank	9/20/12	NA	NA
QL			
Detections in Samples			
Concentration min			
Concentration max			
December 2012			
Field Blank 1-122012	12/3/12	<20.0	27.5
Field Blank 2-122012	12/4/12	<20.0	<20.0
Field Blank 3-122012	12/5/12	<20.0	<20.0
Pump Equipment Blank 1-122012	12/4/12	<20.0	<20.0

Table A11. Diesel Range Organic Compounds (DRO) and Gasoline Range Organic Compounds (GRO) Blanks.

Sample ID	Date Collected	GRO/TPH	DRO
Units		µg/L	µg/L
QL		20	20
Detections in Samples		2/12	2/12
Concentration min		20.4	770
Concentration max		21.7	853
May 2013			
Field Blank 1-052013	5/28/2013	NA	NA
Field Blank 2-052013	5/29/2013	NA	NA
Field Blank 3-052013	5/30/2013	NA	NA
Pump Equipment Blank 1-052013	5/29/2013	NA	NA
QL			
Detections in Samples			
Concentration min			
Concentration max			

NA. Not Analyzed

Table A12. Anion and DOC Duplicates.

Sample ID	Date Collected	DOC	DIC	NO_3 + NO_2	NH_3	Br	Cl	SO_4^{2}	F	I
Units		mg/L	mg/L	mg N/L	mg N/L	mg/L	mg/L	mg/L	mg/L	µg/L
September 2011										
5× QL		2.50	2.50	0.50	0.50	5.00	5.00	5.00	1.00	
WISETXGW01-092011	9/20/2011	<0.50	50.1	0.01	1.77	3.91	788	72.7	<0.60	NA
WISETXGW01-092011 DUP	9/20/2011	<0.50	50.1	0.03	1.78	3.87	826	75.2	<0.20	NA
RPD (%)		NC	0.0	NC	0.6	NC	4.7	3.4	NC	NC
WISETXSW02-092011	9/21/2011	6.93	17.3	<0.10	<0.10	<1.00	10.9	11.6	0.14	NA
WISETXSW02-092011 DUP	9/21/2011	6.89	17.3	0.02	<0.10	<1.00	10.9	11.5	0.14	NA
RPD (%)		0.6	0.0	NC	NC	NC	0.0	0.9	NC	NC
March 2012										
5× QL		1.25	2.50	0.50	0.50	5.00	5.00	5.00	1.00	
WISETXGW02-032012	3/5/2012	0.32	67.6	0.27	0.55	0.47	67.4	89.9	0.12	NA
WISETXGW02-032012 DUP	3/5/2012	0.31	67.3	0.27	0.57	0.42	68.3	91.3	0.11	NA
RPD (%)		NC	0.44	NC	3.57	NC	1.33	1.55	NC	
WISETXSW02-032012	3/6/2012	6.25	22.1	<0.10	<0.10	<1.00	7.25	14.1	0.09	NA
WISETXSW02-032012 DUP	3/6/2012	6.30	22.2	<0.10	<0.10	<1.00	7.05	14.0	0.09	NA
RPD (%)		0.80	0.45	NC	NC	NC	2.80	0.71	NC	NC
September 2012										
5× QL		2.50	5.00	0.50	0.50	5.00	5.00	5.00	1.00	50.00
WISETXGW01-092012	9/20/2012	0.77	55.5	<0.10	1.56	2.43	553	58.7	0.34	96.1
WISETXGW01-092012 DUP	9/20/2012	0.85	55.4	<0.10	1.48	2.63	561	62.6	0.33	95.8
RPD (%)		NC	0.2	NC	5.3	NC	1.4	6.4	NC	0.3

Table A12. Anion and DOC Duplicates.

Sample ID	Date Collected	DOC	DIC	NO_3 + NO_2	NH_3	Br	Cl	SO_4^{2}	F	I
Units		mg/L	mg/L	mg N/L	mg N/L	mg/L	mg/L	mg/L	mg/L	µg/L
December 2012										
5× QL		2.50	5.00	0.50	0.50	5.00	5.00	5.00	1.00	50.00
WISETXGW13-122012	12/3/2012	0.78	61.2	<0.10	0.62	<1.00	39.7	69.6	<0.20	16.5
WISETXGW13-122012 DUP	12/3/2012	0.72	60.5	<0.10	0.64	<1.00	39.9	68.6	<0.20	16.1
RPD (%)		NC	1.2	NC	3.2	NC	0.5	1.4	NC	NC
WISETXSW04-122012	12/4/2012	22.5	35.6	<0.10	0.08	<1.00	7.34	6.96	0.07	28.2
WISETXSW04-122012 DUP	12/4/2012	22.3	36.0	<0.10	0.07	<1.00	7.51	6.86	0.08	27.0
RPD (%)		0.9	1.1	NC	NC	NC	2.3	1.4	NC	NC
May 2013										
5× QL		2.50	5.00	0.50	0.50	5.00	5.00	5.00	1.00	50.00
WISETXGW04-052013	5/29/2013	0.47	55.2	0.02	0.57	<1.00	35.3	64.8	0.09	17.6
WISETXGW04-052013 DUP	5/29/2013	0.40	55.6	0.03	0.56	<1.00	35.2	64.7	0.08	15.3
RPD (%)		NC	0.7	NC	1.8	NC	0.3	0.2	NC	NC
WISETXSW04-052013	5/29/2013	17.6	33.3	0.04	0.98	<1.00	10.7	3.92	0.14	25.2
WISETXSW04-052013 DUP	5/29/2013	17.4	33.5	0.03	0.98	<1.00	10.8	3.94	0.14	24.4
RPD (%)		1.1	0.6	NC	0.0	NC	0.9	NC	NC	NC

NA. Not Analyzed
NC. Not calculated

Table A13. Dissolved Metal Duplicates.

Sample ID	Date Collected	Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe	Hg
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011														
5× QL		70	2470	100	1665	20	50	1	20	20	35	100	335	
WISETXGW01-092011	9/20/2011	<14	<494	<20	262	64	<10	47.0	<4	<4	<7	<20	45	NA
WISETXGW01-092011 DUP	9/20/2011	<14	<494	<20	265	64	<10	46.4	<4	<4	<7	<20	41	NA
RPD (%)		NC	NC	NC	NC	0.0	NC	1.3	NC	NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	<14	<494	<20	<333	53	<10	26.0	<4	<4	<7	<20	<67	NA
WISETXSW02-092011 DUP	9/21/2011	<14	<494	<20	<333	53	<10	25.7	<4	<4	<7	<20	<67	NA
RPD (%)		NC	NC	NC	NC	0.0	NC	1.2	NC	NC	NC	NC	NC	NC
March 2012														
5× QL		50	1000	5	500	1000	25	25	5	250	10	10	500	
WISETXGW02-032013	3/5/2012	<10	<200	<1.0	172	<200	<5	5.22	<1.0	<50	<2.0	<2.0	<100	NA
WISETXGW02-032012 DUP	3/5/2012	<10	<200	1.0	173	<200	<5	5.32	<1.0	<50	<2.0	<2.0	<100	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-032012	3/6/2012	<10	46	1.7	<100	48	<5	43.7	<1.0	<50	<2.0	<2.0	30	NA
WISETXSW02-032012 DUP	3/6/2012	<10	48	1.7	<100	<200	<5	42.0	<1.0	<50	<2.0	<2.0	29	NA
RPD (%)		NC	NC	NC	NC	NC	NC	4.0	NC	NC	NC	NC	NC	NC
September 2012														
5× QL		50	100	1	200	25	25	0.5	1	25	10	2.5	500	
WISETXGW01-092012	9/20/2012	<10	<20	0.7	222	39	<5	31.5	<0.20	<5	0.6	0.7	112	NA
WISETXGW01-092012 DUP	9/20/2012	<10	<20	0.4	245	38	<5	32.1	<0.20	<5	<2	0.5	108	NA
RPD (%)		NC	NC	NC	9.9	2.6	NC	1.9	NC	NC	NC	NC	NC	NC
December 2012														
5× QL		50	100	1.0	200	25	25	0.5	1.00	25	10.0	2.5	500	1.0
WISETXGW13-122012	12/3/2012	<10	<20	0.4	174	15	<5	2.0	<0.20	<5	2.1	<0.5	<100	<0.2
WISETXGW13-122012 DUP	12/3/2012	<10	<20	0.4	184	14	<5	2.0	<0.20	<5	<2.0	<0.5	<100	<0.2

Table A13. Dissolved Metal Duplicates.

Sample ID	Date Collected	Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe	Hg
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
RPD (%)		NC	NC	NC	NC	NC	NC	0.0	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	<10	97	2.6	45	453	<5	46	<0.20	2	<2.0	1.0	838	<0.2
WISETXSW04-122012 DUP	12/4/2012	<10	172	3.0	66	474	<5	46	<0.20	3	<2.0	1.1	1500	<0.2
RPD (%)		NC	55.8	14.3	NC	4.5	NC	0.0	NC	NC	NC	NC	56.6	NC
May 2013														
5× QL		50	100	1.0	200	25	25	0.5	1.0	25	10	2.5	500	1.0
WISETXGW04-052013	5/29/2013	<10	21	0.4	167	16	<5	2.1	<0.2	<5	<2	1.2	<100	<0.2
WISETXGW04-052013 DUP	5/29/2013	<10	<20	0.4	178	15	<5	2.1	<0.2	<5	<2	0.4	<100	<0.2
RPD (%)		NC	NC	NC	NC	NC	NC	0.0	NC	NC	NC	NC	NC	NC
WISETXSW04-052013	5/29/2013	<10	477	3.7	<40	340	<5	43	<0.2	<5	<2	1.2	2180	<0.2
WISETXSW04-052013 DUP	5/29/2013	<10	277	3.8	49	340	<5	43	<0.2	<5	<2	1.2	1920	<0.2
RPD (%)		NC	53.1	2.7	NC	0.0	NC	0.0	NC	NC	NC	0.0	12.7	NC

NA. Not Analyzed

NC. Not calculated

Table A13. Dissolved Metal Duplicates.

Sample ID	Date Collected	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Se	Si
Units		mg/L	µg/L	mg/L	µg/L	µg/L	mg/L	µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	mg/L
September 2011														
5× QL		2		1	70	85	9	420	0	85	2		150	2
WISETXGW01-092011	9/20/2011	3.94	NA	21.7	62	<17	506	<84	<0.06	<17	28.0	R	<30	7.22
WISETXGW01-092011 DUP	9/20/2011	3.91	NA	21.6	63	<17	510	<84	<0.06	<17	28.6	R	<30	7.44
RPD (%)		0.8	NC	0.5	NC	NC	0.8	NC	NC	NC	2.1	R	NC	3.0
WISETXSW02-092011	9/21/2011	6.43		3.55	5	<17	10.7	<84	<0.06	<17	4.20	R	<30	4.41
WISETXSW02-092011 DUP	9/21/2011	6.32		3.52	5	<17	10.5	<84	<0.06	<17	4.16	R	<30	4.38
RPD (%)		1.7		0.8	NC	NC	1.9	NC	NC	NC	1.0	R	NC	0.7
March 2012														
5× QL		25		25	75	100	25	5	0	5	3	300	25	1
WISETXGW02-032013	3/5/2012	1.56	NA	2.19	8	<20	200	<1.0	NA	<1.0	29.7	<60	R	5.98
WISETXGW02-032012 DUP	3/5/2012	1.59	NA	2.22	8	<20	203	<1.0	NA	<1.0	31.1	<60	R	6.06
RPD (%)		NC	NC	NC	NC	NC	1.5	NC	NC	NC	4.6	NC	R	1.3
WISETXSW02-032012	3/6/2012	5.13	NA	3.10	8	<20	6.71	0.90	NA	<1.0	5.54	<60	R	0.17
WISETXSW02-032012 DUP	3/6/2012	4.90	NA	2.92	6	<20	6.39	0.77	NA	<1.0	5.34	<60	R	0.13
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC	NC	3.7	NC	R	26.7
September 2012														
5× QL		2.5	50	0.25	25	2.5	1.25	1	0.25	1		1	10	0.5
WISETXGW01-092012	9/20/2012	3.1	56	14.6	36	0.6	428	1.2	0.04	<0.2	NA	<0.2	<2	6.1
WISETXGW01-092012 DUP	9/20/2012	3.1	56	14.9	35	0.6	431	1.2	0.04	<0.2	NA	<0.2	<2	6.1
RPD (%)		0.0	0.0	2.0	2.8	NC	0.7	0.0	NC	NC	NC	NC	NC	0.0

Table A13. Dissolved Metal Duplicates.

Sample ID	Date Collected	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Se	Si
Units		mg/L	µg/L	mg/L	µg/L	µg/L	mg/L	µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	mg/L
December 2012														
5× QL		2.5	50	0.25	25	2.5	1.25	1.00	0.25	1.00		1.00	10	0.5
WISETXGW13-122012	12/3/2012	1.0	44	0.75	7.0	0.70	173	<0.20	<0.05	<0.20	NA	<0.20	<2	5.7
WISETXGW13-122012 DUP	12/3/2012	1.0	45	0.76	6.8	0.67	173	<0.20	<0.05	<0.20	NA	<0.20	<2	5.7
RPD (%)		NC	NC	1.3	NC	NC	0.0	NC	NC	NC	NC	NC	NC	0.0
WISETXSW04-122012	12/4/2012	18.5	<10	5.15	227	0.79	4.36	2.4	0.05	0.60	NA	0.13	<2	2.6
WISETXSW04-122012 DUP	12/4/2012	18.6	<10	5.21	280	0.82	4.35	2.8	0.06	1.0	NA	0.14	0.6	2.7
RPD (%)		0.5	NC	1.2	20.9	NC	0.2	15.4	18.2	50.0	NC	NC	NC	3.8
May 2013														
5× QL		2.5	50	0.25	25	2.5	1.25	1.0	0.25	1.00		1.0	10	0.5
WISETXGW04-052013	5/29/2013	1.1	42	0.80	5.0	0.7	159	<0.2	<0.05	0.14	NA	<0.2	<2	5.9
WISETXGW04-052013 DUP	5/29/2013	1.0	43	0.80	<5	1.1	161	<0.2	<0.05	0.17	NA	<0.2	<2	5.9
RPD (%)		NC	NC	0.0	NC	NC	1.3	NC	NC	NC	NC	NC	NC	0.0
WISETXSW04-052013	5/29/2013	24	<10	4.84	433	0.6	4.07	3.2	0.09	1.1	NA	<0.2	0.4	2.2
WISETXSW04-052013 DUP	5/29/2013	24	<10	4.86	429	0.6	3.99	3.2	0.09	1.1	NA	<0.2	0.5	1.4
RPD (%)		0.0	NC	0.4	0.9	NC	2.0	0.0	NC	0.0	NC	NC	NC	44.4

NA. Not Analyzed
NC. Not calculated
R. Data rejected

Table A13. Dissolved Metal Duplicates.

Sample ID	Date Collected	Sr	Th	Ti	Tl	U	V	Zn
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011								
5× QL		20		35	85	250	50	250
WISETXGW01-092011	9/20/2011	4850	NA	<7	<17	16	<10	<50
WISETXGW01-092011 DUP	9/20/2011	4900	NA	<7	<17	17	<10	<50
RPD (%)		1.0	NC	NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	427	NA	<7	<17	<50	<10	<50
WISETXSW02-092011 DUP	9/21/2011	419	NA	<7	<17	<50	<10	<50
RPD (%)		1.9	NC	NC	NC	NC	NC	NC
March 2012								
5× QL		50		50	5	5	25	
WISETXGW02-032013	3/5/2012	599	NA	<10	<1.0	<1.0	<5.0	NA
WISETXGW02-032012 DUP	3/5/2012	607	NA	<10	<1.0	<1.0	<5.0	NA
RPD (%)		1.3	NC	NC	NC	NC	NC	NA
WISETXSW02-032012	3/6/2012	327	NA	7	<1.0	0.57	<5.0	NA
WISETXSW02-032012 DUP	3/6/2012	314	NA	7	<1.0	0.56	<5.0	NA
RPD (%)		4.1	NC	NC	NC	NC	NC	NA
September 2012								
5× QL		25	1	25	1	1	1	25
WISETXGW01-092012	9/20/2012	3320	<0.2	<5	<0.2	<0.2	0.06	1
WISETXGW01-092012 DUP	9/20/2012	3290	<0.2	<5	<0.2	<0.2	0.05	1
RPD (%)		0.9	NC	NC	NC	NC	NC	NC

Table A13. Dissolved Metal Duplicates.

Sample ID	Date Collected	Sr	Th	Ti	Tl	U	V	Zn
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
December 2012								
5× QL		10.0	1.00	25	1.00	1.00	1.0	25
WISETXGW13-122012	12/3/2012	242	<0.20	<5	<0.20	<0.20	0.03	<5
WISETXGW13-122012 DUP	12/3/2012	241	<0.20	<5	<0.20	<0.20	0.02	<5
RPD (%)		0.4	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	233	<0.20	11	<0.20	1.1	1.30	3
WISETXSW04-122012 DUP	12/4/2012	235	0.24	15	<0.20	1.1	2.30	5
RPD (%)		0.9	NC	NC	NC	0.0	55.6	NC
May 2013								
5× QL		10	1.0	25	1.00	1.00	1.0	25
WISETXGW04-052013	5/29/2013	223	<0.2	<5	<0.20	<0.20	0.02	<5
WISETXGW04-052013 DUP	5/29/2013	223	<0.2	<5	<0.20	<0.20	<0.2	<5
RPD (%)		0.0	NC	NC	NC	NC	NC	NC
WISETXSW04-052013	5/29/2013	205	<0.2	<5	<0.20	0.53	1.5	<5
WISETXSW04-052013 DUP	5/29/2013	200	<0.2	<5	<0.20	0.52	1.6	<5
RPD (%)		2.5	NC	NC	NC	NC	6.5	NC

NA. Not Analyzed
NC. Not calculated

Table A14. Total Metal Duplicates.

Sample ID	Date Collected	Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe	Hg
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011														
5× QL		80	2740	110	1850	20	55	2	20	20	40	110	370	
WISETXGW01-092011	9/20/2011	<16	<548	<22	255	64	<11	47.8	<4	<4	<8	<22	115	NA
WISETXGW01-092011 DUP	9/20/2011	<16	<548	<22	257	63	<11	49.5	<4	<4	<8	<22	120	NA
RPD (%)		NC	NC	NC	NC	1.6	NC	3.5	NC	NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	<16	<548	<22	<370	54	<11	26.9	<4	<4	<8	<22	<74	NA
WISETXSW02-092011 DUP	9/21/2011	<16	<548	<22	<370	54	<11	26.8	<4	<4	<8	<22	<74	NA
RPD (%)		NC	NC	NC	NC	0.0	NC	0.4	NC	NC	NC	NC	NC	NC
March 2012														
5× QL		50	1000	5	500	1000	25	25	5	250	10	10	500	
WISETXGW02-032013	3/5/2012	<10	<200	1.1	169	<200	<5	5.25	<1.0	<50	<2.0	2.30	<100	NA
WISETXGW02-032012 DUP	3/5/2012	<10	<200	1.0	175	<200	<5	5.33	<1.0	<50	<2.0	<2.0	<100	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-032012	3/6/2012	<10	79	1.8	<100	48	<5	43.2	<1.0	<50	<2.0	<2.0	86	NA
WISETXSW02-032012 DUP	3/6/2012	<10	92	1.7	<100	<200	<5	42.2	<1.0	<50	<2.0	<2.0	84	NA
RPD (%)		NC	NC	NC	NC	NC	NC	2.3	NC	NC	NC	NC	NC	NC
September 2012														
5× QL		50	100	1	100	15	15	0.25	1	15	10	2.5	250	
WISETXGW01-092012	9/20/2012	<10	<20	0.8	249	41	<3	35.4	<0.20	<3	<2	<0.5	69	NA
WISETXGW01-092012 DUP	9/20/2012	<10	<20	0.9	259	41	<3	35.4	<0.20	<3	<2	<0.5	66	NA
RPD (%)		NC	NC	NC	3.9	0.0	NC	0.0	NC	NC	NC	NC	NC	NC

Table A14. Total Metal Duplicates.

Sample ID	Date Collected	Ag	Al	As	B	Ba	Be	Ca	Cd	Co	Cr	Cu	Fe	Hg
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
December 2012														
5× QL		50	100	1.0	100	15	15	0.25	1.00	15	10.0	2.5	250	1.0
WISETXGW13-122012	12/3/2012	<10	<20	0.5	203	14	<3	2.0	<0.20	<3	<2.0	0.52	<50	<0.2
WISETXGW13-122012 DUP	12/3/2012	<10	<20	0.4	198	14	<3	2.0	<0.20	<3	<2.0	<0.5	<50	<0.2
RPD (%)		NC	NC	NC	2.5	NC	NC	0.0	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	<10	976	3.5	68	481	<3	47	<0.20	2	<2.0	1.9	1950	0.010
WISETXSW04-122012 DUP	12/4/2012	<10	542	3.4	70	478	<3	46	<0.20	2	<2.0	1.2	1840	<0.2
RPD (%)		NC	57.2	2.9	2.9	0.6	NC	2.2	NC	NC	NC	NC	5.8	NC
May 2013														
5×QL		50	100	1.0	100	15	15	0.25	1.0	15	10	2.5	250	1.0
WISETXGW04-052013	5/29/2013	<10	337	0.5	192	16	<3	2.2	<0.2	<3	<2	1.4	114	<0.2
WISETXGW04-052013 DUP	5/29/2013	<10	264	0.6	196	17	<3	2.3	<0.2	<3	<2	1.4	151	<0.2
RPD (%)		NC	24.3	NC	2.1	6.1	NC	4.4	NC	NC	NC	NC	NC	NC
WISETXSW04-052013	5/29/2013	<10	1170	4.4	60.6	342	<3	40	<0.2	<3	<2	1.5	2520	0.02
WISETXSW04-052013 DUP	5/29/2013	<10	1100	4.6	60.8	341	<3	40	<0.2	<3	<2	1.5	2570	<0.2
RPD (%)		NC	6.2	4.4	NC	0.3	NC	0.0	NC	NC	NC	NC	2.0	NC

NA. Not Analyzed
NC. Not calculated

Table A14. Total Metal Duplicates.

Sample ID	Date Collected	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Se	Si
Units		mg/L	µg/L	mg/L	µg/L	µg/L	mg/L	µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	mg/L
September 2011														
5× QL		2		1	80	95	10	465	0.35	95	3	0	165	2
WISETXGW01-092011	9/20/2011	4.11	NA	21.9	62	<19	537	<93	<0.07	<19	26.4	R	<33	6.86
WISETXGW01-092011 DUP	9/20/2011	4.19	NA	22.4	63	<19	541	<93	<0.07	<19	26.5	R	<33	6.85
RPD (%)		1.9	NC	2.3	1.6	NC	0.7	NC	NC	NC	0.4	R	NC	0.1
WISETXSW02-092011	9/21/2011	6.85	NA	3.56	20	<19	11.3	<93	<0.07	<19	3.57	R	<33	3.97
WISETXSW02-092011 DUP	9/21/2011	6.79	NA	3.53	20	<19	11.1	<93	<0.07	<19	3.58	R	<33	3.99
RPD (%)		0.9	NC	0.8	0.0	NC	1.8	NC	NC	NC	0.3	R	NC	0.5
March 2012														
5× QL		25		25	75	100	25	5		5	3	300	25	1
WISETXGW02-032013	3/5/2012	1.49	NA	2.21	8	<20	200	<1.0	NR	<1.0	29.4	<60	R	5.94
WISETXGW02-032012 DUP	3/5/2012	1.55	NA	2.30	8	<20	207	0.30	NR	<1.0	29.4	<60	R	6.25
RPD (%)		NC	NC	NC	NC	NC	3.4	NC	NR	NC	0.0	NC	R	5.1
WISETXSW02-032012	3/6/2012	4.96	NA	2.94	12	<20	6.47	0.74	NR	<1.0	5.50	<60	R	0.22
WISETXSW02-032012 DUP	3/6/2012	4.79	NA	2.90	11	<20	6.29	0.89	NR	<1.0	5.41	<60	R	0.21
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NR	NC	1.6	NC	R	NC
September 2012														
5× QL		1.5	25	0.15	15	2.5	0.65	1	0.15	1		1	10	0.5
WISETXGW01-092012	9/20/2012	3.4	64	16.6	40	0.7	461	1.4	0.02	<0.2	NA	<0.2	<2	6.7
WISETXGW01-092012 DUP	9/20/2012	3.4	65	16.8	40	0.7	458	1.3	0.02	<0.2	NA	<0.2	<2	6.7
RPD (%)		0.0	1.6	1.2	0.0	NC	0.7	7.4	NC	NC	NC	NC	NC	0.0

Table A14. Total Metal Duplicates.

Sample ID	Date Collected	K	Li	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Se	Si
Units		mg/L	µg/L	mg/L	µg/L	µg/L	mg/L	µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	mg/L
December 2012														
5× QL		1.5	25	0.15	15	2.5	0.65	1.00	0.15	1.00		1.00	10	0.25
WISETXGW13-122012	12/3/2012	1.0	45	0.79	7.1	0.65	177	1.0	<0.03	<0.20	NA	<0.20	<2	5.9
WISETXGW13-122012 DUP	12/3/2012	1.0	44	0.80	6.9	0.66	180	0.46	<0.03	0.68	NA	<0.20	<2	5.8
RPD (%)		NC	2.2	1.3	NC	NC	1.7	NC	NC	NC	NC	NC	NC	1.7
WISETXSW04-122012	12/4/2012	18.7	<5	5.39	299	0.81	4.29	4.1	0.22	1.7	NA	0.14	0.7	2.8
WISETXSW04-122012 DUP	12/4/2012	18.6	<5	5.30	296	0.85	4.29	3.4	0.21	1.7	NA	0.14	<2	2.7
RPD (%)		0.5	NC	1.7	1.0	NC	NC	18.7	4.7	0.0	NC	NC	NC	3.6
May 2013														
5×QL		1.5	25	0.15	15	2.5	0.65	1.0	0.15	1.00		1.0	10	0.25
WISETXGW04-052013	5/29/2013	1.0	41	0.86	7.2	0.6	159	0.3	<0.03	0.31	NA	<0.2	<2	6.31
WISETXGW04-052013 DUP	5/29/2013	1.0	42	0.87	7.4	0.8	162	0.7	<0.03	0.42	NA	<0.2	<2	6.58
RPD (%)		NC	2.4	1.2	NC	NC	1.9	NC	NC	NC	NC	NC	NC	4.2
WISETXSW04-052013	5/29/2013	23	<5	4.73	445	0.8	3.84	3.2	0.20	1.40	NA	<0.2	<2	4.01
WISETXSW04-052013 DUP	5/29/2013	23	<5	4.73	446	0.8	3.78	3.1	0.18	1.40	NA	<0.2	<2	3.87
RPD (%)		0.0	NC	0.0	0.2	NC	1.6	3.2	10.5	0.0	NC	NC	NC	3.6

NA. Not Analyzed
NC. Not calculated
R. Data rejected

Table A14. Total Metal Duplicates.

Sample ID	Date Collected	Sr	Th	Ti	Tl	U	V	Zn
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011								
5× QL		20		40	95	280	55	280
WISETXGW01-092011	9/20/2011	4960		<8	<19	<56	<11	<56
WISETXGW01-092011 DUP	9/20/2011	4960		<8	<19	19	<11	<56
RPD (%)		0.0		NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	432		<8	<19	<56	<11	<56
WISETXSW02-092011 DUP	9/21/2011	428		<8	<19	<56	<11	<56
RPD (%)		0.9		NC	NC	NC	NC	NC
March 2012								
5× QL		50		50	5	5	25	0
WISETXGW02-032013	3/5/2012	603		<10	<1.0	<1.0	<5.0	NR
WISETXGW02-032012 DUP	3/5/2012	617		<10	<1.0	<1.0	<5.0	NR
RPD (%)		2.3		NC	NC	NC	NC	NR
WISETXSW02-032012	3/6/2012	327		8	<1.0	0.59	<5.0	NR
WISETXSW02-032012 DUP	3/6/2012	320		7	<1.0	0.60	<5.0	NR
RPD (%)		2.2		NC	NC	NC	NC	NR
September 2012								
5× QL		15	1	15	1	1	1	15
WISETXGW01-092012	9/20/2012	3510	<0.2	<3	<0.2	<0.2	<0.20	2
WISETXGW01-092012 DUP	9/20/2012	3490	<0.2	<3	<0.2	<0.2	0.21	1
RPD (%)		0.6	NC	NC	NC	NC	NC	NC

Table A14. Total Metal Duplicates.

Sample ID	Date Collected	Sr	Th	Ti	Tl	U	V	Zn
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
December 2012								
5× QL		10.0	1.00	15	1.00	1.00	1.0	15
WISETXGW13-122012	12/3/2012	250	<0.20	<3	<0.20	<0.20	0.48	<3
WISETXGW13-122012 DUP	12/3/2012	248	<0.20	<3	<0.20	<0.20	<0.2	<3
RPD (%)		0.8	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	243	0.09	7	<0.20	1.2	3.0	7
WISETXSW04-122012 DUP	12/4/2012	242	0.12	7	<0.20	1.2	2.9	6
RPD (%)		0.4	NC	NC	NC	0.0	3.4	NC
May 2013								
5×QL		10	1.0	15	1.00	1.00	1.0	15
WISETXGW04-052013	5/29/2013	236	<0.2	3	<0.20	<0.20	0.91	2
WISETXGW04-052013 DUP	5/29/2013	238	0.4	7	<0.20	<0.20	0.83	2
RPD (%)		0.8	NC	NC	NC	NC	NC	NC
WISETXSW04-052013	5/29/2013	205	0.2	27	<0.20	0.58	2.8	3
WISETXSW04-052013 DUP	5/29/2013	208	0.5	26	<0.20	0.60	2.6	5
RPD (%)		1.5	NC	3.8	NC	NC	7.4	NC

NA. Not Analyzed

NC. Not calculated

Table A15. Volatile Organic Compound (VOC) Duplicates.

Sample ID	Date Collected	ethanol (64 17 5)	isopropanol (67 63 0)	acrylonitrile (107 13 1)	styrene (100 42 5)	acetone (67 64 1)	tert butyl Alcohol (75 65 0)	methyl tert butyl ether (1634 04 4)	diisopropyl ether (108 20 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
5× QL		500	125	NA	NA	5	25	5	5
WISETXGW01-092011	9/20/2011	<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
WISETXGW01-092011 Dup	9/20/2011	<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
WISETXSW02-092011 Dup	9/21/2011	<100	<25.0	NA	NA	<1.0	<5.0	<1.0	<1.0
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
March 2012									
5× QL		500	125	125	2.5	5	25	5	5
WISETXGW02-032013	3/5/2012	<100	<25.0	<25.0	<0.5	<1.0	<5.0	<1.0	<1.0
WISETXGW02-032012 DUP	3/5/2012	<100	<25.0	<25.0	<0.5	<1.0	<5.0	<1.0	<1.0
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC

Table A15. Volatile Organic Compound (VOC) Duplicates.

Sample ID	Date Collected	ethanol (64 17 5)	isopropanol (67 63 0)	acrylonitrile (107 13 1)	styrene (100 42 5)	acetone (67 64 1)	tert butyl Alcohol (75 65 0)	methyl tert butyl ether (1634 04 4)	diisopropyl ether (108 20 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
WISETXSW02-032012	3/6/2012	<100	<25.0	<25.0	<0.5	<1.0	<5.0	<1.0	<1.0
WISETXSW02-032012 DUP	3/6/2012	<100	<25.0	<25.0	<0.5	<1.0	<5.0	<1.0	<1.0
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
September 2012									
5× QL		NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
December 2012									
5× QL		500	50	5	NA	5	50	2.5	2.5
WISETXGW13-122012	12/3/2012	<100	<10	<1	NA	<1	<10	<0.5	<0.5
WISETXGW13-122012 DUP	12/3/2012	<100	<10	<1	NA	<1	<10	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	<100	<10	<1	NA	9.8	<10	<0.5	<0.5

Table A15. Volatile Organic Compound (VOC) Duplicates.

Sample ID	Date Collected	ethanol (64 17 5)	isopropanol (67 63 0)	acrylonitrile (107 13 1)	styrene (100 42 5)	acetone (67 64 1)	tert butyl Alcohol (75 65 0)	methyl tert butyl ether (1634 04 4)	diisopropyl ether (108 20 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
WISETXSW04-122012 DUP	12/4/2012	<100	<10	<1	NA	8.7	<10	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
May 2013									
5× QL		500	50	5	2.5	5	50	2.5	2.5
WISETXGW04-052013	5/29/2013	<100	<10	<1	<0.5	2.1	<10	<0.5	<0.5
WISETXGW04-052013 DUP	5/29/2013	<100	<10	<1	<0.5	1.7	<10	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-052013	5/29/2013	<100	<10	<1	<0.5	3.1	<10	<0.5	<0.5
WISETXSW04-052013 DUP	5/29/2013	<100	<10	<1	<0.5	3.5	<10	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC

NA. Not Analyzed
NC. Not Calculated

Table A15. Volatile Organic Compound (VOC) Duplicates.

Sample ID	Date Collected	ethyl tert butyl ether (637 92 3)	tert amyl methyl ether (994 05 8)	vinyl chloride (75 01 4)	1,1 dichloroethene (75 35 4)	carbon disulfide (75 15 0)	methylene chloride (75 09 2)	trans 1,2 dichloroethene (156 60 5)	1,1 dichloroethane (75 34 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
5× QL		5	5	2.5	NA	2.5	5	2.5	2.5
WISETXGW01-092011	9/20/2011	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
WISETXGW01-092011 Dup	9/20/2011	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
WISETXSW02-092011 Dup	9/21/2011	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
March 2012									
5× QL		5	5	2.5	NA	2.5	5	2.5	2.5
WISETXGW02-032013	3/5/2012	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
WISETXGW02-032012 DUP	3/5/2012	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
RPD (%)		NC	NC	NC	R	NC	NC	NC	NC

Table A15. Volatile Organic Compound (VOC) Duplicates.

Sample ID	Date Collected	ethyl tert butyl ether (637 92 3)	tert amyl methyl ether (994 05 8)	vinyl chloride (75 01 4)	1,1 dichloroethene (75 35 4)	carbon disulfide (75 15 0)	methylene chloride (75 09 2)	trans 1,2 dichloroethene (156 60 5)	1,1 dichloroethane (75 34 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
WISETXSW02-032012	3/6/2012	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
WISETXSW02-032012 DUP	3/6/2012	<1.0	<1.0	<0.5	R	<0.5	<1.0	<0.5	<0.5
RPD (%)		NC	NC	NC	R	NC	NC	NC	NC
September 2012									
5× QL		NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
December 2012									
5× QL		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
WISETXGW13-122012	12/3/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
WISETXGW13-122012 DUP	12/3/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC

Table A15. Volatile Organic Compound (VOC) Duplicates.

Sample ID	Date Collected	ethyl tert butyl ether (637 92 3)	tert amyl methyl ether (994 05 8)	vinyl chloride (75 01 4)	1,1 dichloroethene (75 35 4)	carbon disulfide (75 15 0)	methylene chloride (75 09 2)	trans 1,2 dichloroethene (156 60 5)	1,1 dichloroethane (75 34 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
WISETXSW04-122012	12/4/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
WISETXSW04-122012 DUP	12/4/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
May 2013									
5× QL		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
WISETXGW04-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
WISETXGW04-052013 DUP	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
WISETXSW04-052013 DUP	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC

NA. Not Analyzed
NC. Not Calculated
R. Data Rejected

Table A15. Volatile Organic Compound (VOC) Duplicates.

Sample ID	Date Collected	cis 1,2 dichoroethene (156 59 2)	chloroform (67 66 3)	1,1,1 trichloroethane (71 55 6)	carbon tetrachloride (56 23 5)	benzene (71 43 2)	1,2 dichloroethane (107 06 2)	trichloroethene (79 01 6)	toluene (108 88 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
5× QL		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
WISETXGW01-092011	9/20/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
WISETXGW01-092011 Dup	9/20/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
WISETXSW02-092011 Dup	9/21/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
March 2012									
5× QL		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
WISETXGW02-032013	3/5/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
WISETXGW02-032012 DUP	3/5/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC

Table A15. Volatile Organic Compound (VOC) Duplicates.

Sample ID	Date Collected	cis 1,2 dichloroethene (156 59 2)	chloroform (67 66 3)	1,1,1 trichloroethane (71 55 6)	carbon tetrachloride (56 23 5)	benzene (71 43 2)	1,2 dichloroethane (107 06 2)	trichloroethene (79 01 6)	toluene (108 88 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
WISETXSW02-032012	3/6/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
WISETXSW02-032012 DUP	3/6/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
September 2012									
5× QL		NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
December 2012									
5× QL		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
WISETXGW13-122012	12/3/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
WISETXGW13-122012 DUP	12/3/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Table A15. Volatile Organic Compound (VOC) Duplicates.

Sample ID	Date Collected	cis 1,2 dichoroethene (156 59 2)	chloroform (67 66 3)	1,1,1 trichloroethane (71 55 6)	carbon tetrachloride (56 23 5)	benzene (71 43 2)	1,2 dichloroethane (107 06 2)	trichloroethene (79 01 6)	toluene (108 88 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
WISETXSW04-122012 DUP	12/4/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
May 2013									
5× QL		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
WISETXGW04-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
WISETXGW04-052013 DUP	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
WISETXSW04-052013 DUP	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC

NA. Not Analyzed

NC. Not Calculated

Table A15. Volatile Organic Compound (VOC) Duplicates.

Sample ID	Date Collected	1,1,2 trichloroethane (79 00 5)	tetrachloroethene (127 18 4)	chlorobenzene (108 90 7)	ethylbenzene (100 41 4)	m+p xylene (108 38 3, 106 42 3)	o xylene (95 47 6)	isopropylbenzene (98 82 8)	1,3,5 trimethylbenzene (108 67 8)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
5× QL		NA	2.5	2.5	5	10	2.5	2.5	2.5
WISETXGW01-092011	9/20/2011	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
WISETXGW01-092011 Dup	9/20/2011	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
WISETXSW02-092011 Dup	9/21/2011	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
March 2012									
5× QL		NA	2.5	2.5	5	10	2.5	2.5	2.5
WISETXGW02-032013	3/5/2012	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
WISETXGW02-032012 DUP	3/5/2012	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
RPD (%)		R	NC	NC	NC	NC	NC	NC	NC

Table A15. Volatile Organic Compound (VOC) Duplicates.

Sample ID	Date Collected	1,1,2 trichloroethane (79 00 5)	tetrachloroethene (127 18 4)	chlorobenzene (108 90 7)	ethylbenzene (100 41 4)	m+p xylene (108 38 3, 106 42 3)	o xylene (95 47 6)	isopropylbenzene (98 82 8)	1,3,5 trimethylbenzene (108 67 8)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
WISETXSW02-032012	3/6/2012	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
WISETXSW02-032012 DUP	3/6/2012	R	<0.5	<0.5	<1.0	<2.0	<0.5	<0.5	<0.5
RPD (%)		R	NC	NC	NC	NC	NC	NC	NC
September 2012									
5× QL		NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
December 2012									
5× QL		2.5	2.5	2.5	2.5	5	2.5	2.5	2.5
WISETXGW13-122012	12/3/2012	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5
WISETXGW13-122012 DUP	12/3/2012	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5

Table A15. Volatile Organic Compound (VOC) Duplicates.

Sample ID	Date Collected	1,1,2 trichloroethane (79 00 5)	tetrachloroethene (127 18 4)	chlorobenzene (108 90 7)	ethylbenzene (100 41 4)	m+p xylene (108 38 3, 106 42 3)	o xylene (95 47 6)	isopropylbenzene (98 82 8)	1,3,5 trimethylbenzene (108 67 8)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
WISETXSW04-122012 DUP	12/4/2012	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
May 2013									
5× QL		2.5	2.5	2.5	2.5	5	2.5	2.5	2.5
WISETXGW04-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5
WISETXGW04-052013 DUP	5/29/2013	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5
WISETXSW04-052013 DUP	5/29/2013	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC

NA. Not Analyzed
NC. Not Calculated
R. Data Rejected

Table A15. Volatile Organic Compound (VOC) Duplicates.

Sample ID	Date Collected	1,2,4 trimethylbenzene (95 63 6)	1,3 dichlorobenzene (541 73 1)	1,4 dichlorobenzene (106 46 7)	1,2,3 trimethylbenzene (526 73 8)	1,2 dichlorobenzene (95 50 1)	naphthalene (91 20 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011							
5× QL		2.5	2.5	2.5	2.5	2.5	2.5
WISETXGW01-092011	9/20/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
WISETXGW01-092011 Dup	9/20/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
WISETXSW02-092011 Dup	9/21/2011	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC
March 2012							
5× QL		2.5	2.5	2.5	2.5	2.5	2.5
WISETXGW02-032013	3/5/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
WISETXGW02-032012 DUP	3/5/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC

Table A15. Volatile Organic Compound (VOC) Duplicates.

Sample ID	Date Collected	1,2,4 trimethylbenzene (95 63 6)	1,3 dichlorobenzene (541 73 1)	1,4 dichlorobenzene (106 46 7)	1,2,3 trimethylbenzene (526 73 8)	1,2 dichlorobenzene (95 50 1)	naphthalene (91 20 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
WISETXSW02-032012	3/6/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
WISETXSW02-032012 DUP	3/6/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC
September 2012							
5× QL		NA	NA	NA	NA	NA	NA
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC
December 2012							
5× QL		2.5	2.5	2.5	2.5	2.5	2.5
WISETXGW13-122012	12/3/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
WISETXGW13-122012 DUP	12/3/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Table A15. Volatile Organic Compound (VOC) Duplicates.

Sample ID	Date Collected	1,2,4 trimethylbenzene (95 63 6)	1,3 dichlorobenzene (541 73 1)	1,4 dichlorobenzene (106 46 7)	1,2,3 trimethylbenzene (526 73 8)	1,2 dichlorobenzene (95 50 1)	naphthalene (91 20 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
WISETXSW04-122012 DUP	12/4/2012	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC
May 2013							
5× QL		2.5	2.5	2.5	2.5	2.5	2.5
WISETXGW04-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
WISETXGW04-052013 DUP	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC
WISETXSW04-052013	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
WISETXSW04-052013 DUP	5/29/2013	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD (%)		NC	NC	NC	NC	NC	NC

NA. Not Analyzed

NC. Not Calculated

Table A16. Low Molecular Weight Acids Duplicates.

Sample ID	Date Collected	Lactate (50 21 5)	Formate (64 18 6)	Acetate (64 19 7)	Propionate (79 09 4)	Butyrate (107 92 6)
Units		mg/L	mg/L	mg/L	mg/L	mg/L
September 2011						
5× QL		0.50	0.50	0.50	0.50	0.50
WISETXGW01-092011	9/20/2011	<0.10	<0.10	<0.10	<0.10	<0.10
WISETXGW01-092011 DUP	9/20/2011	<0.10	<0.10	<0.10	<0.10	<0.10
RPD (%)		NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	<0.10	<0.10	0.24	<0.10	<0.10
WISETXSW02-092011 DUP	9/21/2011	<0.10	<0.10	0.23	<0.10	<0.10
RPD (%)		NC	NC	4.3	NC	NC
March 2012						
5× QL		0.50	0.50	0.50	0.50	0.50
WISETXGW02-032013	3/5/2012	<0.10	0.41	<0.10	<0.10	<0.10
WISETXGW02-032012 DUP	3/5/2012	<0.10	0.42	<0.10	<0.10	<0.10
RPD (%)		NC	NC	NC	NC	NC
WISETXSW02-032012	3/6/2012	<0.10	0.12	0.07	<0.10	<0.10
WISETXSW02-032012 DUP	3/6/2012	<0.10	0.12	0.05	<0.10	<0.10
RPD (%)		NC	NC	NC	NC	NC
September 2012						
5× QL						
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC
December 2012						
5× QL		0.50	0.50	0.50	0.50	0.50
WISETXGW13-122012	12/3/2012	<0.10	R	<0.10	<0.10	<0.10
WISETXGW13-122012 DUP	12/3/2012	<0.10	R	<0.10	<0.10	<0.10
RPD (%)		NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	<0.10	R	0.33	<0.10	<0.10
WISETXSW04-122012 DUP	12/4/2012	<0.10	R	0.26	<0.10	<0.10
RPD (%)		NC	NC	NC	NC	NC
May 2013						
5× QL						
WISETXGW04-052013	5/29/2013	NA	NA	NA	NA	NA
WISETXGW04-052013 DUP	5/29/2013	NA	NA	NA	NA	NA

Table A16. Low Molecular Weight Acids Duplicates.

Sample ID	Date Collected	Lactate (50 21 5)	Formate (64 18 6)	Acetate (64 19 7)	Propionate (79 09 4)	Butyrate (107 92 6)
Units		mg/L	mg/L	mg/L	mg/L	mg/L
RPD (%)		NC	NC	NC	NC	NC
WISETXSW04-122012	5/29/2013	NA	NA	NA	NA	NA
WISETXSW04-122012 DUP	5/29/2013	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC

NA. Not Analyzed
NC. Not Calculated

Table A17. Dissolved Gas Duplicates.

Sample ID	Date Collected	Methane (74 82 8)	Ethane (74 84 0)	Propane (74 98 6)	Butane (106 97 8)
Units		mg/L	mg/L	mg/L	mg/L
September 2011					
5× QL		0.0070	0.0145	0.0200	0.0250
WISETXGW01-092011	9/20/2011	0.0093	<0.0029	<0.0040	<0.0050
WISETXGW01-092011 DUP	9/20/2011	0.0089	<0.0029	<0.0040	<0.0050
RPD (%)		1.1	NC	NC	NC
WISETXSW02-092011	9/21/2011	0.0096	<0.0029	<0.0040	<0.0050
WISETXSW02-092011 DUP	9/21/2011	0.0096	<0.0029	<0.0040	<0.0050
RPD (%)		0.0	NC	NC	NC
March 2012					
5× QL		0.0070	0.0135	0.0190	0.0240
WISETXGW02-032013	3/5/2012	0.0016	<0.0027	<0.0038	<0.0048
WISETXGW02-032012 DUP	3/5/2012	0.0017	<0.0027	<0.0038	<0.0048
RPD (%)		NC	NC	NC	NC
WISETXSW02-032012	3/6/2012	0.0082	<0.0027	<0.0038	<0.0048
WISETXSW02-032012 DUP	3/6/2012	0.0071	<0.0027	<0.0038	<0.0048
RPD (%)		14.4	NC	NC	NC
September 2012					
5× QL		NA	NA	NA	NA
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC
December 2012					
5× QL		0.0070	0.0140	0.0190	0.0240
WISETXGW13-122012	12/3/2012	0.0014	<0.0028	<0.0038	<0.0048
WISETXGW13-122012 DUP	12/3/2012	0.0011	<0.0028	<0.0038	<0.0048
RPD (%)		NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	0.1320	<0.0028	<0.0038	<0.0048
WISETXSW04-122012 DUP	12/4/2012	0.1260	<0.0028	<0.0038	<0.0048
RPD (%)		4.7	NC	NC	NC
May 2013					
5× QL					
WISETXGW04-052013	5/29/2013	NA	NA	NA	NA
WISETXGW04-052013 DUP	5/29/2013	NA	NA	NA	NA

Table A17. Dissolved Gas Duplicates.

Sample ID	Date Collected	Methane (74 82 8)	Ethane (74 84 0)	Propane (74 98 6)	Butane (106 97 8)
Units		mg/L	mg/L	mg/L	mg/L
RPD (%)		NC	NC	NC	NC
WISETXSW04-122012	5/29/2013	NA	NA	NA	NA
WISETXSW04-122012 DUP	5/29/2013	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC

NA. Not Analyzed
NC. Not Calculated

Table A18. Glycol Duplicates.

Sample ID	Date Collected	2 butoxyethanol (111 76 2)	Diethylene glycol (111 46 6)	Triethylene glycol (112 27 6)	Tetraethylene glycol (112 60 7)
Units		µg/L	µg/L	µg/L	µg/L
September 2011					
5× QL		25	125	125	125
WISETXGW01-092011	9/20/2011	<10	<50	<50	<25
WISETXGW01-092011 DUP	9/20/2011	<10	<50	<50	<25
RPD (%)		NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	<10	<50	<50	<25
WISETXSW02-092011 DUP	9/21/2011	<10	<50	<50	<25
RPD (%)		NC	NC	NC	NC
March 2012					
5× QL		50	250	250	125
WISETXGW02-032013	3/5/2012	<10	<50	<50	<25
WISETXGW02-032012 DUP	3/5/2012	<10	<50	<50	<25
RPD (%)		NC	NC	NC	NC
WISETXSW02-032012	3/6/2012	<10	<50	<50	<25
WISETXSW02-032012-DUP	3/6/2012	<10	<50	<50	<25
RPD (%)		NC	NC	NC	NC
September 2012					
5× QL		NA	NA	NA	NA
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC
December 2012					
QL		25	25	25	25
5× QL		125	125	125	125
WISETXGW13-122012	12/3/2012	<25	<25	<25	<25
WISETXGW13-122012 DUP	12/3/2012	<25	<25	<25	<25
RPD (%)		NC	NC	NC	NC

Table A18. Glycol Duplicates.

Sample ID	Date Collected	2 butoxyethanol (111 76 2)	Diethylene glycol (111 46 6)	Triethylene glycol (112 27 6)	Tetraethylene glycol (112 60 7)
Units		µg/L	µg/L	µg/L	µg/L
WISETXSW04-122012	12/4/2012	<25	<25	<25	<25
WISETXSW04-122012 DUP	12/4/2012	<25	<25	<25	<25
RPD (%)		NC	NC	NC	NC
May 2013					
5× QL					
WISETXGW04-052013	5/29/2013	NA	NA	NA	NA
WISETXGW04-052013 DUP	5/29/2013	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC
WISETXSW04-122012	5/29/2013	NA	NA	NA	NA
WISETXSW04-122012 DUP	5/29/2013	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC

NA. Not Analyzed
NC. Not Calculated

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	R-(+)-limonene (5989-27-5)	1,2,4-trichlorobenzene (120-82-1)	1,2-dichlorobenzene (95-50-1)	1,2-dinitrobenzene (528-29-0)	1,3-dichlorobenzene (541-73-1)	1,3-dimethyladamantane (702-79-4)	1,3 -dinitrobenzene (99-65-0)	1,4-dichlorobenzene (106-46-7)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
5× QL		2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
WISETXGW01-092011	9/20/2011	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
WISETXGW01-092011 DUP	9/20/2011	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
WISETXSW02-092011 DUP	9/21/2011	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
March 2012									
5× QL		5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
WISETXGW02-032013	3/5/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
WISETXGW02-032012 DUP	3/5/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-032012	3/6/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
WISETXSW02-032012 DUP	3/6/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
September 2012									
5× QL									
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
December 2012									
5× QL		5	5	5	5	5	5	5	5
WISETXGW13-122012	12/3/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
WISETXGW13-122012 DUP	12/3/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	R-(+)-limonene (5989-27-5)	1,2,4-trichlorobenzene (120-82-1)	1,2-dichlorobenzene (95-50-1)	1,2-dinitrobenzene (528-29-0)	1,3-dichlorobenzene (541-73-1)	1,3-dimethyladamantane (702-79-4)	1,3 -dinitrobenzene (99-65-0)	1,4-dichlorobenzene (106-46-7)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00
WISETXSW04-122012 DUP	12/4/2012	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
May 2013									
5× QL									
WISETXGW04-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW04-052013 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXSW04-122012 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC

NA. Not Analyzed
NC. Not Calculated

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	1,4 dinitrobenzene (100 25 4)	1 methylnaphthalene (90 12 0)	2,3,4,6 tetrachlorophenol (58 90 2)	2,3,5,6 tetrachlorophenol (935 95 5)	2,4,5 trichlorophenol (95 95 4)	2,4,6 trichlorophenol (88 06 2)	2,4 dichlorophenol (120 83 2)	2,4 dimethylphenol (105 67 9)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
5× QL		2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
WISETXGW01-092011	9/20/2011	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
WISETXGW01-092011 DUP	9/20/2011	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
WISETXSW02-092011 DUP	9/21/2011	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
March 2012									
5× QL		5.00	5.00	10.00	10.00	10.00	10.00	10.00	10.00
WISETXGW02-032013	3/5/2012	<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
WISETXGW02-032012 DUP	3/5/2012	<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-032012	3/6/2012	<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
WISETXSW02-032012 DUP	3/6/2012	<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
September 2012									
5× QL									
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
December 2012									
5× QL		5	5	10	10	10	10	10	10
WISETXGW13-122012	12/3/2012	<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
WISETXGW13-122012 DUP	12/3/2012	<1.00	<1.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	1,4 dinitrobenzene (100 25 4)	1 methylnaphthalene (90 12 0)	2,3,4,6 tetrachlorophenol (58 90 2)	2,3,5,6 tetrachlorophenol (935 95 5)	2,4,5 trichlorophenol (95 95 4)	2,4,6 trichlorophenol (88 06 2)	2,4 dichlorophenol (120 83 2)	2,4 dimethylphenol (105 67 9)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	<4.00	<4.00	<8.00	<8.00	<8.00	<8.00	<8.00	<8.00
WISETXSW04-122012 DUP	12/4/2012	<4.00	<4.00	<8.00	<8.00	<8.00	<8.00	<8.00	<8.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
May 2013									
5× QL									
WISETXGW04-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW04-052013 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXSW04-122012 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC

NA. Not Analyzed
NC. Not Calculated

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	2,4 dinitrophenol (51 28 5)	2,4dinitrotoluene (121 14 2)	2,6 dinitrotoluene (606 20 2)	2 butoxyethanol (111 76 2)	2 chloronaphthalene (91 58 7)	2 chlorophenol (95 57 8)	2 methylnaphthalene (91 57 6)	2 methylphenol (95 48 7)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
5× QL		25.00	2.50	2.50	2.50	2.50	2.50	2.50	2.50
WISETXGW01-092011	9/20/2011	<5.00	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
WISETXGW01-092011 DUP	9/20/2011	<5.00	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	<5.00	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
WISETXSW02-092011 DUP	9/21/2011	<5.00	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
March 2012									
5× QL		15.00	5.00	5.00	5.00	5.00	10.00	5.00	10.00
WISETXGW02-032013	3/5/2012	<3.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00
WISETXGW02-032012 DUP	3/5/2012	<3.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-032012	3/6/2012	<3.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00
WISETXSW02-032012 DUP	3/6/2012	<3.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
September 2012									
5× QL									
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
December 2012									
5× QL		15	5	5	5	5	10	5	10
WISETXGW13-122012	12/3/2012	<3.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00
WISETXGW13-122012 DUP	12/3/2012	<3.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	2,4 dinitrophenol (51 28 5)	2,4dinitrotoluene (121 14 2)	2,6 dinitrotoluene (606 20 2)	2 butoxyethanol (111 76 2)	2 chloronaphthalene (91 58 7)	2 chlorophenol (95 57 8)	2 methylnaphthalene (91 57 6)	2 methylphenol (95 48 7)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	<12.0	<4.00	<4.00	<4.00	<4.00	<8.00	<4.00	<8.00
WISETXSW04-122012 DUP	12/4/2012	<12.0	<4.00	<4.00	<4.00	<4.00	<8.00	<4.00	<8.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
May 2013									
5× QL									
WISETXGW04-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW04-052013 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXSW04-122012 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC

NA. Not Analyzed
NC. Not Calculated

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	2 nitroaniline (88 74 4)	2 nitrophenol (88 75 5)	3&4 methylphenol (108 39 4 & 106 44 5)	3,3' dichlorobenzidine (91 94 1)	3 nitroaniline (99 09 2)	4,6 dinitro 2 methylphenol (534 52 1)	4 bromophenyl phenyl ether (101 55 3)	4 chloro 3 methylphenol (59 50 7)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
5× QL		2.50	2.50	2.50	5.00	2.50	2.50	2.50	2.50
WISETXGW01-092011	9/20/2011	<0.50	<0.50	<0.50	NR	NR	<0.50	<0.50	<0.50
WISETXGW01-092011 DUP	9/20/2011	<0.50	<0.50	<0.50	NR	NR	<0.50	<0.50	<0.50
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	<0.50	<0.50	<0.50	NR	NR	<0.50	<0.50	<0.50
WISETXSW02-092011 DUP	9/21/2011	<0.50	<0.50	<0.50	NR	NR	<0.50	<0.50	<0.50
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
March 2012									
5× QL		5.00	10.00	25.00	5.00	15.00	10.00	5.00	10.00
WISETXGW02-032013	3/5/2012	<1.00	<2.00	<5.00	<1.00	<3.00	<2.00	<1.00	<2.00
WISETXGW02-032012 DUP	3/5/2012	<1.00	<2.00	<5.00	<1.00	<3.00	<2.00	<1.00	<2.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-032012	3/6/2012	<1.00	<2.00	<5.00	<1.00	<3.00	<2.00	<1.00	<2.00
WISETXSW02-032012 DUP	3/6/2012	<1.00	<2.00	<5.00	<1.00	<3.00	<2.00	<1.00	<2.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
September 2012									
5× QL									
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
December 2012									
5× QL		5	10	25	5	15	10	5	10
WISETXGW13-122012	12/3/2012	<1.00	<2.00	<5.00	<1.00	<3.00	<2.00	<1.00	<2.00
WISETXGW13-122012 DUP	12/3/2012	<1.00	<2.00	<5.00	<1.00	<3.00	<2.00	<1.00	<2.00

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	2 nitroaniline (88 74 4)	2 nitrophenol (88 75 5)	3&4 methylphenol (108 39 4 & 106 44 5)	3,3' dichlorobenzidine (91 94 1)	3 nitroaniline (99 09 2)	4,6 dinitro 2 methylphenol (534 52 1)	4 bromophenyl phenyl ether (101 55 3)	4 chloro 3 methylphenol (59 50 7)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	<4.00	<8.00	<20.0	<4.00	<12.0	<8.00	<4.00	<8.00
WISETXSW04-122012 DUP	12/4/2012	<4.00	<8.00	<20.0	<4.00	<12.0	<8.00	<4.00	<8.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
May 2013									
5× QL									
WISETXGW04-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW04-052013 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXSW04-122012 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC

NA. Not Analyzed
NC. Not Calculated

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	4 chloroaniline (106 47 8)	4 chlorophenyl phenyl ether (7005 72 3)	4 nitroaniline (100 01 6)	4 nitrophenol (100 02 7)	Acenaphthene (83 32 9)	Acenaphthylene (208 96 8)	Adamantane (281 23 2)	Aniline (62 53 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
5× QL		5.00	2.50	2.50	12.50	2.50	2.50	2.50	5.00
WISETXGW01-092011	9/20/2011	NR	<0.50	NR	<2.50	<0.50	<0.50	<0.50	NR
WISETXGW01-092011 DUP	9/20/2011	NR	<0.50	NR	<2.50	<0.50	<0.50	<0.50	NR
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	NR	<0.50	NR	<2.50	<0.50	<0.50	<0.50	NR
WISETXSW02-092011 DUP	9/21/2011	NR	<0.50	NR	<2.50	<0.50	<0.50	<0.50	NR
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
March 2012									
5× QL		15.00	5.00	15.00	15.00	5.00	5.00	5.00	5.00
WISETXGW02-032013	3/5/2012	<3.00	<1.00	<3.00	<3.00	<1.00	<1.00	<1.00	<1.00
WISETXGW02-032012 DUP	3/5/2012	<3.00	<1.00	<3.00	<3.00	<1.00	<1.00	<1.00	<1.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-032012	3/6/2012	<3.00	<1.00	<3.00	<3.00	<1.00	<1.00	<1.00	<1.00
WISETXSW02-032012 DUP	3/6/2012	<3.00	<1.00	<3.00	<3.00	<1.00	<1.00	<1.00	<1.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
September 2012									
5× QL									
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
December 2012									
5× QL		15	5	15	15	5	5	5	5
WISETXGW13-122012	12/3/2012	<3.00	<1.00	<3.00	<3.00	<1.00	<1.00	<1.00	<1.00
WISETXGW13-122012 DUP	12/3/2012	<3.00	<1.00	<3.00	<3.00	<1.00	<1.00	<1.00	<1.00

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	4 chloroaniline (106 47 8)	4 chlorophenyl phenyl ether (7005 72 3)	4 nitroaniline (100 01 6)	4 nitrophenol (100 02 7)	Acenaphthene (83 32 9)	Acenaphthylene (208 96 8)	Adamantane (281 23 2)	Aniline (62 53 3)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	<12.0	<4.00	<12.0	<12.0	<4.00	<4.00	<4.00	<4.00
WISETXSW04-122012 DUP	12/4/2012	<12.0	<4.00	<12.0	<12.0	<4.00	<4.00	<4.00	<4.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
May 2013									
5× QL									
WISETXGW04-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW04-052013 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXSW04-122012 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC

NA. Not Analyzed
NC. Not Calculated

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	Anthracene (120 12 7)	Azobenzene (103 33 3)	Benzo(a)anthracene (56 55 3)	Benzo(a)pyrene (50 32 3)	Benzo(b)fluoranthene (205 99 2)	Benzo(g,h,i)perylene (191 24 2)	Benzo(k)fluoranthene (207 08 9)	Benzoic Acid (65 85 0)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
5× QL		2.50	2.50	2.50	2.50	2.50	2.50	2.50	25.00
WISETXGW01-092011	9/20/2011	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.00
WISETXGW01-092011 DUP	9/20/2011	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.00
WISETXSW02-092011 DUP	9/21/2011	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<5.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
March 2012									
5× QL		5.00	5.00	5.00	5.00	5.00	5.00	5.00	15.00
WISETXGW02-032013	3/5/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<3.00
WISETXGW02-032012 DUP	3/5/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<3.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-032012	3/6/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<3.00
WISETXSW02-032012 DUP	3/6/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<3.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
September 2012									
5× QL									
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
December 2012									
5× QL		5	5	5	5	5	5	5	15
WISETXGW13-122012	12/3/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<3.00
WISETXGW13-122012 DUP	12/3/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<3.00

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	Anthracene (120 12 7)	Azobenzene (103 33 3)	Benzo(a)anthracene (56 55 3)	Benzo(a)pyrene (50 32 3)	Benzo(b)fluoranthene (205 99 2)	Benzo(g,h,i)perylene (191 24 2)	Benzo(k)fluoranthene (207 08 9)	Benzoic Acid (65 85 0)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<12.0
WISETXSW04-122012 DUP	12/4/2012	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<12.0
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
May 2013									
5× QL									
WISETXGW04-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW04-052013 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXSW04-122012 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC

NA. Not Analyzed

NC. Not Calculated

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	Benzyl alcohol (100 51 6)	Bis (2 chloroethoxy)methane (111 91 1)	Bis (2 chloroethyl)ether (111 44 4)	Bis (2 chloroisopropyl)ether (108 60 1)	Bis (2 ethylhexyl) adipate (103 23 1)	Bis (2 ethylhexyl) phthalate (117 81 7)	Butyl benzyl phthalate (85 68 7)	Carbazole (86 74 8)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
5× QL		2.50	2.50	2.50	2.50	5.00	5.00	2.50	2.50
WISETXGW01-092011	9/20/2011	<0.50	<0.50	<0.50	<0.50	<1.00	<1.00	<0.50	NR
WISETXGW01-092011 DUP	9/20/2011	<0.50	<0.50	<0.50	<0.50	<1.00	<1.00	<0.50	NR
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	<0.50	<0.50	<0.50	<0.50	<1.00	<1.00	<0.50	NR
WISETXSW02-092011 DUP	9/21/2011	<0.50	<0.50	<0.50	<0.50	<1.00	<1.00	<0.50	NR
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
March 2012									
5× QL		5.00	5.00	5.00	5.00	5.00	10.00	5.00	15.00
WISETXGW02-032013	3/5/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<3.00
WISETXGW02-032012 DUP	3/5/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<3.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-032012	3/6/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<3.00
WISETXSW02-032012 DUP	3/6/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<3.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
September 2012									
5× QL									
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
December 2012									
5× QL		5	5	5	5	5	10	5	15
WISETXGW13-122012	12/3/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<3.00
WISETXGW13-122012 DUP	12/3/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<3.00

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	Benzyl alcohol (100 51 6)	Bis (2 chloroethoxy)methane (111 91 1)	Bis (2 chloroethyl)ether (111 44 4)	Bis (2 chloroisopropyl)ether (108 60 1)	Bis (2 ethylhexyl) adipate (103 23 1)	Bis (2 ethylhexyl) phthalate (117 81 7)	Butyl benzyl phthalate (85 68 7)	Carbazole (86 74 8)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	<4.00	<4.00	<4.00	<4.00	<4.00	<8.00	<4.00	<12.0
WISETXSW04-122012 DUP	12/4/2012	<4.00	<4.00	<4.00	<4.00	<4.00	<8.00	<4.00	<12.0
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
May 2013									
5× QL									
WISETXGW04-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW04-052013 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXSW04-122012 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC

NA. Not Analyzed

NC. Not Calculated

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	Chrysene (218 01 9)	Dibenz(a,h)anthracene (53 70 3)	Dibenzofuran (132 64 9)	Diethyl phthalate (84 66 2)	Dimethyl phthalate (131 11 3)	Di n butyl phthalate (84 74 2)	Di n octyl phthalate (117 84 0)	Diphenylamine (122 39 4)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
5× QL		2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
WISETXGW01-092011	9/20/2011	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
WISETXGW01-092011 DUP	9/20/2011	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
WISETXSW02-092011 DUP	9/21/2011	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
March 2012									
5× QL		5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
WISETXGW02-032013	3/5/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
WISETXGW02-032012 DUP	3/5/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-032012	3/6/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
WISETXSW02-032012 DUP	3/6/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
September 2012									
5× QL									
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
December 2012									
5× QL		5	5	5	5	5	5	5	5
WISETXGW13-122012	12/3/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
WISETXGW13-122012 DUP	12/3/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	Chrysene (218 01 9)	Dibenz(a,h)anthracene (53 70 3)	Dibenzofuran (132 64 9)	Diethyl phthalate (84 66 2)	Dimethyl phthalate (131 11 3)	Di n butyl phthalate (84 74 2)	Di n octyl phthalate (117 84 0)	Diphenylamine (122 39 4)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00
WISETXSW04-122012 DUP	12/4/2012	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
May 2013									
5× QL									
WISETXGW04-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW04-052013 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXSW04-122012 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC

NA. Not Analyzed
NC. Not Calculated

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	Fluoranthene (206-44-0)	Fluorene (86-73-7)	Hexachlorobenzene (118-74-1)	Hexachlorobutadiene (87-68-3)	Hexachlorocyclopentadiene (77-47-4)	Hexachloroethane (67-72-1)	Indeno(1,2,3-cd)pyrene (193-39-5)	Isophorone (78-59-1)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
5× QL		2.50	2.50	2.50	5.00	2.50	5.00	2.50	2.50
WISETXGW01-092011	9/20/2011	<0.50	<0.50	<0.50	<1.00	<0.50	<1.00	<0.50	<0.50
WISETXGW01-092011 DUP	9/20/2011	<0.50	<0.50	<0.50	<1.00	<0.50	<1.00	<0.50	<0.50
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	<0.50	<0.50	<0.50	<1.00	<0.50	<1.00	<0.50	<0.50
WISETXSW02-092011 DUP	9/21/2011	<0.50	<0.50	<0.50	<1.00	<0.50	<1.00	<0.50	<0.50
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
March 2012									
5× QL		5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
WISETXGW02-032013	3/5/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
WISETXGW02-032012 DUP	3/5/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-032012	3/6/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
WISETXSW02-032012 DUP	3/6/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
September 2012									
5× QL									
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
December 2012									
5× QL		5	5	5	5	5	5	5	5
WISETXGW13-122012	12/3/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
WISETXGW13-122012 DUP	12/3/2012	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	Fluoranthene (206-44-0)	Fluorene (86-73-7)	Hexachlorobenzene (118-74-1)	Hexachlorobutadiene (87-68-3)	Hexachlorocyclopentadiene (77-47-4)	Hexachloroethane (67-72-1)	Indeno(1,2,3-cd)pyrene (193-39-5)	Isophorone (78-59-1)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00
WISETXSW04-122012 DUP	12/4/2012	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
May 2013									
5× QL									
WISETXGW04-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW04-052013 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXSW04-122012 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC

NA. Not Analyzed
NC. Not Calculated

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	Naphthalene (91-20-3)	Nitrobenzene (98-95-3)	N-nitrosodimethylamine (62-75-9)	N-nitrosodi-n-propylamine (621-64-7)	Pentachlorophenol (87-86-5)	Phenanthrene (85-01-8)	Phenol (108-95-2)	Pyrene (129-00-0)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
September 2011									
5× QL		2.50	2.50	2.50	2.50	5.00	2.50	2.50	2.50
WISETXGW01-092011	9/20/2011	<0.50	<0.50	<0.50	<0.50	<1.00	<0.50	<0.50	<0.50
WISETXGW01-092011 DUP	9/20/2011	<0.50	<0.50	<0.50	<0.50	<1.00	<0.50	<0.50	<0.50
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	<0.50	<0.50	<0.50	<0.50	<1.00	<0.50	<0.50	<0.50
WISETXSW02-092011 DUP	9/21/2011	<0.50	<0.50	<0.50	<0.50	<1.00	<0.50	<0.50	<0.50
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
March 2012									
5× QL		5.00	5.00	5.00	5.00	10.00	5.00	10.00	5.00
WISETXGW02-032013	3/5/2012	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00	<1.00
WISETXGW02-032012 DUP	3/5/2012	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00	<1.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW02-032012	3/6/2012	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00	<1.00
WISETXSW02-032012 DUP	3/6/2012	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00	<1.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
September 2012									
5× QL									
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
December 2012									
5× QL		5	5	5	5	10	5	10	5
WISETXGW13-122012	12/3/2012	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00	<1.00

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	Naphthalene (91-20-3)	Nitrobenzene (98-95-3)	N-nitrosodimethylamine (62-75-9)	N-nitrosodi-n-propylamine (621-64-7)	Pentachlorophenol (87-86-5)	Phenanthrene (85-01-8)	Phenol (108-95-2)	Pyrene (129-00-0)
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
WISETXGW13-122012 DUP	12/3/2012	<1.00	<1.00	<1.00	<1.00	<2.00	<1.00	<2.00	<1.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	<4.00	<4.00	<4.00	<4.00	<8.00	<4.00	<8.00	<4.00
WISETXSW04-122012 DUP	12/4/2012	<4.00	<4.00	<4.00	<4.00	<8.00	<4.00	<8.00	<4.00
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
May 2013									
5× QL									
WISETXGW04-052013	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXGW04-052013 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC
WISETXSW04-122012	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
WISETXSW04-122012 DUP	5/29/2013	NA	NA	NA	NA	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC	NC	NC	NC	NC

NA. Not Analyzed
NC. Not Calculated

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	Pyridine (110-86-1)	Squalene (111-02-4)	Terpiniol (98-55-5)	tri-(2-butoxyethyl) phosphate (78-51-3)
Units		µg/L	µg/L	µg/L	µg/L
September 2011					
5× QL		2.50	5.00	2.50	5.00
WISETXGW01-092011	9/20/2011	<0.50	<1.00	<0.50	<1.00
WISETXGW01-092011 DUP	9/20/2011	<0.50	<1.00	<0.50	<1.00
RPD (%)		NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	<0.50	<1.00	<0.50	<1.00
WISETXSW02-092011 DUP	9/21/2011	<0.50	<1.00	<0.50	<1.00
RPD (%)		NC	NC	NC	NC
March 2012					
5× QL		5.00	10.00	5.00	5.00
WISETXGW02-032013	3/5/2012	<1.00	<2.00	<1.00	NR
WISETXGW02-032012 DUP	3/5/2012	<1.00	<2.00	<1.00	NR
RPD (%)		NC	NC	NC	NC
WISETXSW02-032012	3/6/2012	<1.00	<2.00	<1.00	NR
WISETXSW02-032012 DUP	3/6/2012	<1.00	<2.00	<1.00	NR
RPD (%)		NC	NC	NC	NC
September 2012					
5× QL					
WISETXGW01-092012	9/20/2012	NA	NA	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC
December 2012					
5× QL		5	10	5	5
WISETXGW13-122012	12/3/2012	<1.00	<2.00	<1.00	<1.00

Table A19. Semi-Volatile Organic Compounds (sVOC) Duplicates.

Sample ID	Date Collected	Pyridine (110-86-1)	Squalene (111-02-4)	Terpiniol (98-55-5)	tri-(2-butoxyethyl) phosphate (78-51-3)
Units		µg/L	µg/L	µg/L	µg/L
WISETXGW13-122012 DUP	12/3/2012	<1.00	<2.00	<1.00	<1.00
RPD (%)		NC	NC	NC	NC
WISETXSW04-122012	12/4/2012	<4.00	<8.00	<4.00	<4.00
WISETXSW04-122012 DUP	12/4/2012	<4.00	<8.00	<4.00	<4.00
RPD (%)		NC	NC	NC	NC
May 2013					
5× QL					
WISETXGW04-052013	5/29/2013	NA	NA	NA	NA
WISETXGW04-052013 DUP	5/29/2013	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC
WISETXSW04-122012	5/29/2013	NA	NA	NA	NA
WISETXSW04-122012 DUP	5/29/2013	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC

NA. Not Analyzed
NC. Not Calculated

Table A20. Diesel Range Organic Compounds (DRO) and Gasoline Range Organic Compounds (GRO) Duplicates.

Sample ID	Date Collected	GRO/TPH	DRO
Units		µg/L	µg/L
September 2011			
5× QL		100	100
WISETXGW01-092011	9/20/2011	<20.0	<20.0
WISETXGW01-092011 DUP	9/20/2011	<20.0	<20.0
RPD (%)		NC	NC
WISETXSW02-092011	9/21/2011	<20.0	243
WISETXSW02-092011 DUP	9/21/2011	<20.0	254
RPD (%)		NC	4.4
March 2012			
5× QL		100	100
WISETXGW02-032013	3/5/2012	<20.0	<20.0
WISETXGW02-032012 DUP	3/5/2012	<20.0	<20.0
RPD (%)		NC	NC
WISETXSW02-032012	3/6/2012	<20.0	105
WISETXSW02-032012 DUP	3/6/2012	<20.0	140
RPD (%)		NC	28.6
September 2012			
5× QL		NA	NA
WISETXGW01-092012	9/20/2012	NA	NA
WISETXGW01-092012 DUP	9/20/2012	NA	NA
RPD (%)		NC	NC
December 2012			
5× QL		100	100
WISETXGW13-122012	12/3/2012	<20.0	<20.0
WISETXGW13-122012 DUP	12/3/2012	<20.0	<20.0
RPD (%)		NC	NC
WISETXSW04-122012	12/4/2012	<20.0	770
WISETXSW04-122012 DUP	12/4/2012	21.7	853

Table A20. Diesel Range Organic Compounds (DRO) and Gasoline Range Organic Compounds (GRO) Duplicates.

Sample ID	Date Collected	GRO/TPH	DRO
Units		µg/L	µg/L
RPD (%)		NC	10.2
May 2013			
WISETXGW04-052013	5/29/2013	NA	NA
WISETXGW04-052013 DUP	5/29/2013	NA	NA
RPD (%)		NC	NC
WISETXSW04-122012	5/29/2013	NA	NA
WISETXSW04-122012 DUP	5/29/2013	NA	NA
RPD (%)		NC	NC

NA. Not Analyzed
NC. Not Calculated

Table A21. Stable Water Isotope Duplicates.

Sample ID	Date Collected	δ^2H	$\delta^{18}O$
Units		‰	‰
September 2011			
WISETXGW01-092011	9/20/2011	NA	NA
WISETXGW01-092011 DUP	9/20/2011	NA	NA
RPD (%)		NC	NC
WISETXSW02-092011	9/21/2011	NA	NA
WISETXSW02-092011 DUP	9/21/2011	NA	NA
RPD (%)		NC	NC
March 2012			
WISETXGW02-032013	3/5/2012	-33.09	-5.59
WISETXGW02-032012 DUP	3/5/2012	-33.17	-5.54
RPD (%)		0.3	0.9
WISETXSW02-032012	3/6/2012	NA	NA
WISETXSW02-032012 DUP	3/6/2012	NA	NA
RPD (%)		NA	NA
September 2012			
WISETXGW01-092012	9/20/2012	-34.31	-5.53
WISETXGW01-092012 DUP	9/20/2012	-34.54	-5.57
RPD (%)		0.7	0.7
December 2012			
WISETXGW13-122012	12/3/2012	-34.66	-5.92
WISETXGW13-122012 DUP	12/3/2012	-34.72	-5.86
RPD (%)		0.2	1.0
WISETXSW04-122012	12/4/2012	9.53	3.39
WISETXSW04-122012 DUP	12/4/2012	9.89	3.50
RPD (%)		3.7	3.3
May 2013			
WISETXGW04-052013	5/29/2013	-35.23	-5.79
WISETXGW04-052013 DUP	5/29/2013	-35.41	-5.85
RPD (%)		0.5	1.0
WISETXSW04-052013	5/29/2013	1.99	1.37
WISETXSW04-052013 DUP	5/29/2013	2.11	1.38
RPD (%)		5.8	1.1

NA. Not Analyzed

NC. Not Calculated

Table A22. ^{87}Sr and ^{86}Sr Stable Isotopes of Water Duplicates.

Sample ID	Date Collected	Sr	$^{87}Sr/^{86}Sr$	1/Sr	Rb/Sr
Units		µg/L	Atom Ratio	L/µg	Weight Ratio
September 2011					
WISETXGW01-092011	9/20/2011	NA	NA	NA	NA
WISETXGW01-092011 DUP	9/20/2011	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC
WISETXSW02-092011	9/21/2011	NA	NA	NA	NA
WISETXSW02-092011 DUP	9/21/2011	NA	NA	NA	NA
RPD (%)		NC	NC	NC	NC
March 2012					
WISETXGW02-032013	3/5/2012	566	0.708491	0.0017668	0.001413
WISETXGW02-032012 DUP	3/5/2012	557	0.708491	0.0017953	0.001436
RPD (%)		1.6	0.0	1.6	1.6
WISETXSW02-032012	3/6/2012	NR	NR	NR	NR
WISETXSW02-032012 DUP	3/6/2012	NR	NR	NR	NR
RPD (%)		NC	NC	NC	NC
September 2012					
WISETXGW01-092012	9/20/2012	3750	0.70880	0.0000243	0.0910813
WISETXGW01-092012 DUP	9/20/2012	3740	0.70877	0.0000243	0.0908384
RPD (%)		0.3	0.0	0.0	0.3
December 2012					
WISETXGW13-122012	12/3/2012	237	0.70848	0.004219409	0.002531646
WISETXGW13-122012 DUP	12/3/2012	241	0.70849	0.004149378	0.002489627
RPD (%)		1.7	0.0	1.7	1.7
WISETXSW04-122012	12/4/2012	233	0.70969	0.004291845	0.012017167
WISETXSW04-122012 DUP	12/4/2012	233	0.70973	0.004291845	0.012017167
RPD (%)		0.0	0.0	0.0	0.0
May 2013					
WISETXGW04-052013	5/29/2013	221	0.708407	2.41412E-05	0.0053352
WISETXGW04-052013 DUP	5/29/2013	222	0.708397	2.41412E-05	0.005359341
RPD (%)		0.5	0.0	0.0	0.5
WISETXSW04-052013	5/29/2013	198	0.709651	2.41412E-05	0.004779953
WISETXSW04-052013 DUP	5/29/2013	198	0.709667	2.41412E-05	0.004779953
RPD (%)		0.0	0.0	0.0	0.0

NA. Not Analyzed

NC. Not Calculated

Table A23. Data Usability Summary[1].

Analysis/Lab	Summary of QA/QC Results	Impact on Data/Usability
September 2011		
Field Parameters/EPA on-site	Results for ferrous iron and sulfide are considered screening values as they were measured on site with field kits. A YSI performance check was not done at mid-day on September 19, 2011. Initial and end of day checks were done and were within acceptance limits.	All detected results are footnoted in the data summary as estimated. Data usability is unaffected. Sample measurements were bracketed by performance checks prior to first sample measurement and after last sample measurement which indicated the YSI was operating within acceptance limits. No impact to data usability.
Dissolved gases/ Shaw Environmental	Dissolved gases (methane, ethane, propane, butane) were detected in one of two trip blanks collected on 9/22/2011 due to carryover in the analytical process from standards analyzed prior to the blanks. Sample WISETXSW03 was qualified with a "B" due to the trip blank described above.	Trip blank was rejected and qualified with an "R" as unusable. The qualification of sample WISETXSW03 with "B"was not appropriate since the trip blank was rejected. The data is usable with no qualifications.
DOC/ORD/NRMRL- Ada	DOC in two equipment blanks were >QL.	The "B" qualifier was applied to affected sample WISETXGW05. Sample value is <2x equipment blank value; data is usable with caution that the qualifier indicates.
DIC/ORD/NRMRL- Ada	All QA/QC criteria were met.	Meets project requirements.
Anions/ Ammonia ORD/NRMRL- Ada	Equipment blank for NO3+NO2 collected on 9/22/2011 was preserved with nitric acid instead of sulfuric acid. Holding time exceeded for Br analysis. RSKSOP-276v3 was initially used but high chloride concentrations interfered with bromide analysis. The re-analysis of Br was performed using RSKSOP-214v5 (a modified version of Standard Method 4500-Br D, 21st Edition 2005 using Flow Injection Analysis). This method is specified in the QAPP for nitrate+nitrite and ammonium but was not specified for bromide. The re-analysis was	Equipment blank was rejected and qualified with an "R"; this blank data is unusable. No impact to data usability as all other field and equipment blanks had no detected values. All bromide results are qualified "H" to indicate samples exceeded 28-day holding time. Holding time exceedance is considered a potential negative bias which is taken into account for data usability.

Table A23. Data Usability Summary[1].

Analysis/Lab	Summary of QA/QC Results	Impact on Data/Usability
	conducted past the 28 day holding time (between 34 and 41 days after sample collection).	
Dissolved Metals/ Shaw Environmental	ICP-MS: All ICP-MS results were rejected and replaced with ICP-OES results. The reasons stated were potential interferences and that interference check standards were not run. ICP-OES: Dissolved Sb results are rejected due to potential spectral interference. Continuing calibration checks were analyzed at appropriate intervals, however, some metals (B, Ba, K, Na, Ag, Si, S, P, and U) were not always included in the check standards at the required intervals	ICP-MS: The ICP-MS data were replaced with ICP-OES data. Detection and quantitation limits are higher than desirable. The ICP-OES data cannot be compared with the subsequent ICP-MS data for trace metals from the remaining sampling events. ICP-OES: Sb results for all samples are qualified with an "R" and data are rejected as unusable. All samples with detected quantities for these metals are qualified "J" as estimated. Data for B, Ba, K, Na, Ag, Si, S, P, and U are usable as positive identifications with estimated concentrations.
Total Metals/ Shaw Environmental	ICP-MS: All ICP-MS results were rejected and replaced with ICP-OES results. The reasons stated were potential interferences and that interference check standards were not run. ICP-OES: Total Sb results are rejected due to potential spectral interference. Continuing calibration checks were being analyzed at appropriate intervals, however	ICP-MS: The ICP-MS data were replaced with ICP-OES data. Detection and quantitation limits are higher than desirable. The ICP-OES data cannot be compared with the subsequent ICP-MS data for trace metals from the last two sampling events. ICP-OES: Total Sb results for all samples are qualified with an "R" and data are rejected as unusable. All samples with detected quantities for these metals are

Table A23. Data Usability Summary[1].

Analysis/Lab	Summary of QA/QC Results	Impact on Data/Usability
	some metals (B, Ba, K, Na, Ag, Si, S, P, and U) were not always included in the check standards at the required intervals. Digestion: It was determined that all parameters were not adhered to in EPA Method 3015A.	qualified "J" as estimated. Data for B, Ba, K, Na, Ag, Si, S, P, and U are usable as positive identifications with estimated concentrations. The "J" qualifier has been applied to detections above the QL for all total metals. Data is usable as positive identifications with estimated concentrations.
Charge Balance	The calculated charge balance ranged from 0.3 to 4.7% based on major anions (bicarbonate, chloride, and sulfate) and major cations (dissolved calcium, magnesium, potassium, and sodium).	Meets project requirements.
Measured SPC Versus Calculated SPC	The measured SPC versus calculate SPC ranged from 3.9 to 14.1%.	Meet project requirements.
VOC/ Shaw Environmental	The matrix spike results for 1,1-dichloroethene and 1,1,2-trichloroethane are significantly outside the control limits. These compounds are known to be affected by base hydrolysis. The preservative, trisodium phosphate (TSP), is a base and elevated temperatures (heated headspace sample introduction) will accelerate the hydrolysis of 1,1,2-trichloroethane to 1,1-dichloroethene. Low matrix spike recovery for carbon disulfide.	All data for 1,1-dichloroethene and 1,1,2-trichloroethane are qualified with "R" and rejected as unusable. Affected samples (see Appendix B) qualified with "J-". There is a potential negative bias that is taken into account for data usability.
Low Molecular Weight Acids/ Shaw Environmental	Two field blanks and all equipment blanks were above QL for acetate.	Samples with detected quantities are qualified with a "B." Sample values are close to field and equipment blanks; data is unusable.
Glycols/ EPA Region 3 Laboratory	The method for glycols was under development. All samples analyzed for 2-butoxyethanol exceeded the 14 day holding time limit by 1-3 days and samples collected on 9/21 and 9/20 analyzed for the three glycol analytes were 1-2	The QAPP stated these are to be considered screening values until method was validated. Even though the data is considered as screening, it still is usable as on-going QC checks provide confidence that the method can detect glycols. The affected samples are qualified with "H" indicating a potential negative bias that is taken into account for data

Table A23. Data Usability Summary[1].

Analysis/Lab	Summary of QA/QC Results	Impact on Data/Usability
	days past the 14 day limit.	usability.
sVOC/ EPA Region 8 Laboratory	Low recoveries of blank spikes for R-(+)-limonene, 1,3-dimethyladamantane, adamantane, diphenylamine, and squalene. The analytes 3-nitroaniline, 4-choloroaniline, 4-nitroaniline, aniline, and carbazole were subject to poor extraction or did not produce a linear calibration curve and were not reported by the laboratory. 3,3'-dichlorobenzidene was not in the stock standard used by the laboratory and was not reported by the laboratory. A field blank was above QL for bis-(2-ethylhexyl) phthalate. A matrix spike recovery was high for bis-(2-ethylhexyl) phthalate.	Affected samples (see Appendix B) were qualified with "J-" (see Appendix B) for a potential negative bias that is taken into account for data usability. Data for these compounds were not reported and noted as "NR." The loss of these data is not significant as they were not detected in subsequent rounds. Data for 3,3'-dichlorobenzidene were not reported and noted as "NR". The loss of these data is not significant as they were not detected in subsequent rounds. Affected sample WISETXGW06 was qualified with a "B." Sample data is usable with caution as it is only twice the blank value. Affected sample WISETXGW11 was qualified with a "J+" indicating potential for a positive bias. Bis-(2-ethylhexyl) phthalate is a common laboratory contaminant and its true presence in sample WISETXGW11 is thus questionable: data should be used with caution.
DRO- GRO/ EPA Region 8 Laboratory	DRO: Low recovery for a matrix spike. GRO: Three field blanks and two equipment blanks were above QL.	DRO: Affected samples WISETXSW01, WISETXSW02, WISETXSW02dup, and WISETXSW03 and three of four equipment blanks collected were qualified with a J- for potential negative bias. The data are usable but may be higher than reported. GRO: All samples were <QL, therefore no impact to data usability.
O and H Stable Isotopes of water/ Shaw Environmental	Not analyzed in this sampling round.	NA
Sr Isotopes/ USGS Laboratory	Not analyzed in this sampling round.	NA

Table A23. Data Usability Summary[1].

Analysis/Lab	Summary of QA/QC Results	Impact on Data/Usability
March 2012		
Field Parameters/EPA on-site	Results for ferrous iron and sulfide are considered screening values as they were measured on site with field kits.	All detected results are footnoted in the data summary as estimated. Data usability is unaffected.
	A YSI performance check was not done at mid-day on March 8, 2012. Initial and end of day checks were done and were within acceptance limits.	Only one sample collected on March 8, 2012. A mid–day check was not required. No impact to data usability.
Dissolved gases/ Shaw Environmental	All QA/QC criteria were met.	Meets project requirements.
DOC/ ORD/NRMRL- Ada	DOC was detected above the QL in three equipment blanks collected.	The affected samples have been qualified with "B". Affected samples WISETXSW01, WISETXSW02, WISETXSW02dup, and WISETXSW03 are more than 7x greater than equipment blank value; data are usable. WISETXGW11 is greater than the associated blank and is usable with caution. Values for other affected samples are too close to equipment blank value; data are unusable.
DIC/ ORD/NRMRL- Ada	All QA/QC criteria were met.	Meets project requirements.
Anions/ Ammonia ORD/NRMRL- Ada	All QA/QC criteria were met.	Meets project requirements.
Dissolved Metals/ Shaw Environmental	ICP-MS: All ICP-MS results analyzed were rejected due to potential interferences and that interference check standards were not run. Samples were re-analyzed using a CLP lab.	CLP lab ICP-MS data were used. Samples re-analyzed by CLP using EPA CLP Inorganic Statement of Work (SOW) ISM01.3, Exhibit D – Part B.
	ICP-OES: Continuing calibration checks were analyzed at appropriate intervals, however these metals (B, Ba, K, Na, Ag, Si, S, and P) were not always included in the check standards at the required intervals.	CLP lab ICP-OES data were used. Samples re-analyzed by CLP using EPA CLP Inorganic Statement of Work (SOW) ISM01.3, Exhibit D – Part B.
Dissolved Metals/ CLP	ICP-OES: Matrix spike recoveries were low and outside limits for Fe.	The "J-" qualifier was applied to all samples including field blanks and equipment blanks indicating a potential negative bias that is taken into account for data usability.
	Laboratory duplicate for S exceeded acceptance limits.	The "*" qualifier was applied to S data for affected samples

Table A23. Data Usability Summary[1].

Analysis/Lab	Summary of QA/QC Results	Impact on Data/Usability
		WiseTXGW13-032012, WiseTXGW14-032012, WiseTXGW15-032012, WiseTXGW16-032012, WiseTXSW01-032012, WiseTXSW02-032012, WiseTXSW02-032012dup , and WiseTXSW03-032012. Positive identifications may lack precision; data are usable with caution.
	ICP-MS: Se analysis was subject to interference from bromide, a known issue with these samples.	ICP-MS: All dissolved Se data were qualified with "R" as rejected. Data are unusable.
Total Metals/ Shaw Environmental	ICP-MS: All ICP-MS results were rejected due to potential interferences and that interference check standards were not run. Samples were re-analyzed using a CLP lab.	CLP lab ICP-MS data were used.
	ICP-OES: Continuing calibration checks were analyzed at appropriate intervals, however these metals (B, Ba, K, Na, Ag, Si, S, and P) were not always included in the check standards at the required intervals.	CLP lab ICP-OES data were used.
Total Metals/ CLP	ICP-OES**:** Matrix spike recoveries were low and not within control limits for Fe for all samples.	The "J-" qualifier was applied for total Fe to all samples including field blanks and equipment blanks indicating a potential negative bias that is taken into account for data usability.
	Laboratory duplicate analysis for S exceeded acceptance limits. Total S for duplicate sample WISETXSW02-032012 Dup was above the RPD limit at 22%.	The"*"qualifier was applied for total S to affected samples WiseTXSW01-032012, WiseTXSW02-032012, WiseTXSW02-032012 dup and WiseTXSW03-032012. Positive identifications may lack precision; data are usable with caution.
	Low matrix spike recovery for S.	The "J-" qualifier was applied for total S to affected samples WiseTXGW13-032012 and WiseTXGW14-032012. There is a potential negative bias that is taken into account for data usability.
	ICP-MS: Se analysis was subject to interference from bromide, a known issue with these samples.	ICP-MS: All total Se data were qualified with "R" as rejected. Data are unusable.

Table A23. Data Usability Summary[1].

Analysis/Lab	Summary of QA/QC Results	Impact on Data/Usability
Charge Balance	The calculated charge balance ranged from 0.4 to 9.1% based on major anions (bicarbonate, chloride, and sulfate) and major cations (dissolved calcium, magnesium, potassium, and sodium).	Meets project requirements.
Measured SPC Versus Calculated SPC	The measured SPC versus calculate SPC ranged from 0.8 to 16.7%.	All Samples except WISETXGW08 meet project requirements. WISETXGW08 measured SPC versus calculated SPC was 16.7% and slightly outside the desired range and is usable with caution.
VOC/ Shaw Environmental	The matrix spike results for 1,1-dichloroethene and 1,1,2-trichloroethane are significantly outside the control limits.The compounds 1,1,2-trichloroethane and 1,1-dichloroethene are known to be affected by base hydrolysis. The preservative used, trisodium phosphate (TSP), is a base and elevated temperatures (heated headspace sample introduction) will accelerate the hydrolysis of 1,1,2-trichloroethane to 1,1-dichloroethene. Matrix spikes and matrix spike duplicate recoveries were outside acceptable limits for certain analytes: GW01 MS (58.2% acrylonitrile), GW01 MSD (50.3% acrylonitrile), 60.5% carbon disulfide, , , 50.4% carbon disulfide, , GW11 MS (69.8% acrylonitrile), GW11 MSD (68.1% acrylonitrile), , 67.2% acetone, 60.8% carbon disulfide,) and GW10 MSD (, 65.6% acetone, 64.8% carbon disulfide).	All data for 1,1-dichloroethene and 1,1,2-trichloroethane are qualified with “R” and rejected as unusable. The “J-“ qualifier was applied to all acrylonitrile and carbon disulfide data. For acetone, the “J-“ qualifier was applied to affected samples WiseTXGW06-032012, WiseTXGW07-032012, WiseTXGW09-032012, WiseTXGW10-032012, WiseTXGW11-032012, WiseTXSW03-032012, field blanks collected on 3/7/2012 and 3/8/2012, and the equipment blank collected on 3/6/2012. There is a potential negative bias that is taken into account for data usability.
Low Molecular Weight Acids/ Shaw Environmental	Formate was detected above the QL in three of four field blanks collected.	Affected samples (13 of 20) are qualified with “B” (see Appendix B). One field sample (WISETXGW08-032012) is almost 10x associated field blank value; data is usable. WISETXGW06, WISETXGW11, and WISETXSW03 are less than their associated blanks and are unusable. All other field sample values are greater than their field blank values making data usable with caution.

Table A23. Data Usability Summary[1].

Analysis/Lab	Summary of QA/QC Results	Impact on Data/Usability
Dissolved Gases/ Shaw Environmental	All QA/QC criteria were met.	Meets project requirements.
Glycols/ EPA Region 3 Laboratory	The method for glycols was under development. Blank spike recoveries were low. Triethylene glycol 25 ppb blank spike recovery was 56%. For the 5 ppb blank spike, 2-butoxyethanol recovery was 58% recovery.	The QAPP stated these are to be considered screening values until method was validated. Even though the data is considered as screening, it still is usable as on-going QC checks provide confidence that the method can detect glycols. The "J-" qualifier was applied to all samples including field blanks and equipment blanks for 2-butoxyethanol and triethylene glycol indicating a potential negative bias that is taken into account for data usability.
sVOC/ EPA Region 8 Laboratory	No samples were collected for the SVOC matrix spike and matrix spike duplicate pair. One blank spike (LCS) sample had low recovery for 2-butoxyethanol phosphate, squalene, benzo(a) pyrene, chrysene. 2-butoxyethanol phosphate is not reported in the final data summary.	Although other QC checks were used which provided information on data quality, such as surrogates and blank spikes, data should be used with caution. The "J-" qualifier was applied to all data for squalene, benzo(a)pyrene, and chrysene. There is a potential negative bias that is taken into account for data usability.
DRO- GRO/ EPA Region 8 Laboratory	DRO: High matrix spike recovery: Sample WISETXSW02-032012 had a recovery of 112%, slightly outside the 50-110% limits. GRO: All QA/QC criteria were met.	DRO: The "J+" qualifier was applied to affected samples WiseTXSW01-032012, WiseTXSW02-032012, WiseTXSW02-032012 dup and WiseTXSW03-032012 indicating a potential positive bias. The recovery in the matrix spike was only slightly above the upper acceptable limit; data are usable. GRO: Meets project requirements.
O and H Stable Isotopes of water/ Shaw Environmental	All QA/QC criteria were met.	Meets project requirements.
Sr Isotopes/ USGS Laboratory	All QA/QC criteria were met.	Meets project requirements.

Table A23. Data Usability Summary[1].

Analysis/Lab	Summary of QA/QC Results	Impact on Data/Usability
September 2012		
Field Parameters/EPA on-site	Results for ferrous iron and sulfide are considered screening values as they were measured on site with field kits.	All detected results are footnoted in the data summary as estimated. Data usability is unaffected.
Dissolved Gases/ Shaw Environmental	Not analyzed for in this sampling round.	NA
DOC/ORD/NRMRL- Ada	All QA/QC criteria were met.	Meets project requirements.
DIC/ORD/NRMRL- Ada	All QA/QC criteria were met.	Meets project requirements.
Anions/ Ammonia ORD/NRMRL- Ada	Fluoride: Sample WISETXPW01-092012 was highly diluted to allow for chloride measurement; fluoride measurement was thereby compromised.	Fluoride: A footnote was added to WISETXPW01-092012 indicating potential dilution effects. The high sample dilution may have been a factor in fluoride not being detected in the sample. Data is usable with caution with such a high QL (20 mg/L).
Dissolved Metals/ SWRI	Missing Target Analyte**:** S was not analyzed per the QAPP Addendum No. 2.	S in samples is predominantly (if not entirely) in the form of sulfate. Sulfate was measured in samples; thus there is no expected impact.
Total Metals/ SWRI	Missing target analyte: S was not analyzed per the QAPP Addendum No. 2. Total Ni was detected above the QL in the equipment blank and the field blank. It was also detected in a lab preparation blank since the equipment blank and field blank are both qualified with “B”.	S in samples is predominantly (if not entirely) in the form of sulfate. Sulfate was measured in samples; thus there is no expected impact. The “B” qualifier was applied to affected samples WISETXGW01-092012, WISETXGW01dup-092012, and WISETXGW08-092012. The values are <2x equipment blank value; however, total Ni values are similar to the dissolved Ni values (with no blank issues), therefore, data usable with caution.
Charge Balance	The calculated charge balance ranged from 0.6 to 1.72% based on major anions (bicarbonate, chloride, and sulfate) and major cations (dissolved calcium, magnesium, potassium, and sodium).	Meets project requirements.

Table A23. Data Usability Summary[1].

Analysis/Lab	Summary of QA/QC Results	Impact on Data/Usability
Measured SPC Versus Calculated SPC	The measured SPC versus calculate SPC ranged from 12.8 to 16.7%.	All Samples except WISETXPW01 meet project requirements. WISETXPW01 measured SPC versus calculated SPC was 34.8% and slightly outside the desired range and has a high ionic strength and it is likely the calculated SPC is not account for all the SPC measured as would be suggested by the low difference in charge balance. Therefore WISETXPW01 is usable with caution.
VOC/ SWRI	Not analyzed for in this sampling round.	NA
Low Molecular Weight Acids/ Shaw Environmental	Not analyzed for in this sampling round.	NA
Dissolved Gases/ Shaw Environmental	Not analyzed for in this sampling round.	NA
Glycols/ EPA Region 3 Laboratory	Not analyzed for in this sampling round.	NA
sVOC/ EPA Region 8 Laboratory	Not analyzed for in this sampling round.	NA
DRO- GRO/ EPA Region 8 Laboratory	Not analyzed for in this sampling round.	NA
O and H Stable Isotopes of water/ Shaw Environmental	All QA/QC criteria were met.	Meets project requirements.
Sr Isotopes/ USGS Laboratory	All QA/QC criteria were met.	Meets project requirements.
December 2012		
Field Parameters/EPA on-site	Results for ferrous iron and sulfide are considered screening values as they were measured on site with field kits.	All detected results are footnoted in the data summary as estimated. Data usability is unaffected.
DOC/ORD/NRMRL- Ada	DOC was detected above the QL in a field blank collected on 12/3/2012.	The "B" qualifier was applied to affected samples WISETXGW13-122012 and WISETXGW13dup-122012. Results for affected samples were greater than the field blank value; data are usable with caution.
DIC/ORD/NRMRL- Ada	All QA/QC criteria were met.	Meets project requirements.
Anions/ Ammonia ORD/NRMRL- Ada	All QA/QC criteria were met.	Meets project requirements.
Dissolved Metals/ SWRI	Ni: Dissolved Ni equaled the QL in an equipment blank collected on 12/4/2012.	Ni: The "B" qualifier was applied to affected samples WISETXGW04-122012, and WISETXGW08-122012. Sample

Table A23. Data Usability Summary[1].

Analysis/Lab	Summary of QA/QC Results	Impact on Data/Usability
		WISETXGW04 is less than the equipment blank and is unusable. WISETXGW08 is 6x equipment blank value; data is usable with caution.
	Al, Fe, Pb, and V: RPD criteria not met for dissolved Al, Fe, Pb and V in duplicate samples WISETXSW04-122012 and WISETXSW04-122012dup.	Al, Fe, Pb, and V: The "*" qualifier was applied to affected samples WISETXSW04-122012 and WISETXSW04-122012dup indicating precision issues. Positive identifications for dissolved Al, Fe, Pb and V may lack precision; data are usable with caution.
Total Metals/ SWRI	Zn: Zn was detected in the field blank collected on 12/3/12 at the QL.	Zn: WISETXGW01-122012, WISETXGW02-122012, and WISETXGW03-122012 are qualified with a "B". Total Zn in WISETXGW02-122012 is 7x that of field blank; data is usable with caution. Total Zn in other two affected samples is close to field blank value; data is unusable.
	Al: Total Al matrix spike and matrix spike duplicate results (samples WISETXSW04S and WISETXSW04SD) had percent recoveries above limits at 133.5% and 131%, respectively.	The "J+" qualifier was applied for total Al to affected samples WISETXGW01-122012, WISETXGW15-122012, WISETXSW04-122012, and WISETXSW04-122012 DUP indicating a potential positive bias. The data are usable but may be potentially lower than reported.
	Al: RPD for laboratory and field duplicates (WISETXSW04-122012) exceeded the acceptance limits.	Al: The "*" qualifier was applied for total Al to affected samples WISETXGW01-122012, WISETXGW15-122012, WISETXSW04-122012, WISETXSW04-122012 DUP, and the field blank collected on 12/5/2012; Positive identifications may lack precision; data are usable with caution.
	Al: Field blank 3 collected 12/5/12 was above QL.	Al: Affected sample (WISETXGW15-122012) was qualified with a "B". Sample is <3x

Table A23. Data Usability Summary[1].

Analysis/Lab	Summary of QA/QC Results	Impact on Data/Usability
		blank value and is usable with caution.
	Cu: RPD for laboratory and field duplicates (WISETXSW04-122012) exceeded the acceptance limits.	The "*" qualifier was applied for total Cu to affected samples (including field blanks, see Appendix B) with detections above the MDL (13 of 16 samples). Positive identifications may lack precision; data are usable with caution.
	Ni: RPD for laboratory duplicates exceeded the acceptance limits.	Ni: The "*" qualifier was applied for total Ni to all samples (including field blanks). Positive identifications may lack precision; data are usable with caution.
	Ni: Ni was above QL in all field blanks and pump equipment blank 1 as well as the laboratory preparation blank (0.42 ug/L).	Ni: All samples with exception of WISETXGW01-122012 are qualified with a "B". All samples are to close in value to the preparation blank and are unusable, with exception of WISETXSW04-122012 and WISESW03-122012 DUP, which are over 8x blank value and are usable with caution.
	V: V was above QL in two of three field blanks as well as the pump equipment blank 1.	V: Affected samples (WISETXGW04-122012, WISETXGW08-122012, WISETXGW14-12-2012, WISETXGW15-122012, WISETXGW16-122012, WISETXSW04-1220212, and WISETXSW04122012DUP are qualified with a "B". With exception of the surface water, data are similar to blank values and are unusable. WISETXSW04-1220212 and WISETXSW04122012DUP are ~8x the blank value and are usable with caution.
Charge Balance	The calculated charge balance ranged from 0.01 to 2.5% based on major anions (bicarbonate, chloride, and sulfate) and major cations (dissolved calcium, magnesium, potassium, and sodium).	Meets project requirements.

Table A23. Data Usability Summary[1].

Analysis/Lab	Summary of QA/QC Results	Impact on Data/Usability
Measured SPC Versus Calculated SPC	The measured SPC versus calculate SPC ranged from 4.0 to 15.8%.	All Samples except WISETXGW01 meet project requirements. WISETXGW01 measured SPC versus calculated SPC was 15.8% and slightly outside the desired range and is usable with caution.
VOC/ SWRI	Acetone was detected above the QL in two field blanks, pump equipment blank 1, and a trip blank.	The "B" qualifier was applied for acetone to affected samples with detections above the QL (WISETXGW08, WISETXGW14, WISETXSW16, WISETXSW04, and WISETXSW04DUP). WISETXGW08 is greater than the blank value and is usable with caution. Data for remaining affected samples were near or below blank values; data are unusable.
Low Molecular Weight Acids/ Shaw Environmental	Formate presence in field blanks and samples is believed to originate from sample containers.	The "R" qualifier was applied to all formate data indicating data are rejected and unusable.
Dissolved Gases/ Shaw Environmental	All QA/QC criteria were met.	Meets project requirements.
Glycols/ EPA Region 3 Laboratory	The method for glycols was under development.	The QAPP stated these are to be considered screening values until method was validated. Even though the data is considered as screening, it still is usable as on-going QC checks provide confidence that the method can detect glycols.
sVOC/ EPA Region 8 Laboratory	Low matrix spike and matrix spike duplicate recoveries in MS1/MSD1 for all limonene, 1,3-dimethyladamantane, and adamantane analyses. Low matrix spike and matrix spike duplicate recoveries in MS2/MSD2 (WISETXSW04 and WISETXSW04 DUP) for 4-chloroaniline, 3-nitroaniline, 3,3'-dichlorobenzidine and squalene; however MS2/MSD2 samples were diluted by a factor of 4 due to strongly colored extracts; thus results should only be used to qualify the MS/MSD 2 source sample (WISETXSW04 and WISETXSW04 DUP).	The "J-" qualifier was applied for limonene, 1,3-dimethyladamantane, and adamantane to all samples including blanks. There is a potential negative bias that is taken into account for data usability. The "J-" qualifier was applied for 4-chloroaniline, 3-nitroaniline, 3,3'-dichlorobenzidine and squalene to affected samples WISETXSW04 and WISETXSW04 DUP. There is a potential negative bias that is taken into account for data usability.
DRO- GRO/ EPA Region 8 Laboratory	All QA/QC criteria were met.	Meets project requirements.

Table A23. Data Usability Summary[1].

Analysis/Lab	Summary of QA/QC Results	Impact on Data/Usability
O and H Stable Isotopes of water/ Shaw Environmental	All QA/QC criteria were met.	Meets project requirements.
Sr Isotopes/ USGS Laboratory	All QA/QC criteria were met.	Meets project requirements.
May 2013		
Field Parameters/EPA on-site	Results for ferrous iron and sulfide are considered screening values as they were measured on site with field kits. A YSI performance check was not done at mid-day on May 30, 2013. Initial and end of day checks were done and were within acceptance limits.	All detected results are footnoted in the data summary as estimated. Data usability is unaffected. Only two samples collected on May 30, 2013. A mid–day check was not required. No impact to data usability.
Dissolved gases/ Shaw Environmental	Not analyzed for in this sampling round.	NA
DOC/ORD/NRMRL- Ada	All QA/QC criteria were met.	Meets project requirements.
DIC/ORD/NRMRL- Ada	All QA/QC criteria were met.	Meets project requirements.
Anions/ NRMRL ORD-Ada	All QA/QC criteria were met.	Meets project requirements.
Dissolved Metals/ SWRI	Al and Si: RPD for dissolved Al and Si were outside acceptance criteria for field duplicates WISETXSW04 and WISETXSW04DUP. Cu: Dissolved Cu was detected above the QL in an equipment blank collected on 5/28/2013. Mo: Mo was above the QL in pump equipment blank 1. Ni: Dissolved Ni was detected above the QL in a field blank collected on 5/28/2013 and at the QL in pump equipment blank 1 collected on 5/29/2013.	Al and Si: The “*” qualifier was applied for dissolved Al and Si to affected samples WISETXSW04 and WISETXSW04 DUP. Positive identifications may lack precision; data are usable with caution. Cu: The “B” qualifier was applied for dissolved Cu to affected samples WISETXGW01, WISETXGW02, WISETXGW13, and WISETXGW14. The sample values were less than the equipment blank value; data are usable with caution since the dissolved Cu concentrations are similar to the total Cu concentrations. Mo: The “B” qualifier was applied to affected sample WISETXGW08. Blank value is ~10x that of sample; sample data is unusable. Ni: The “B” qualifier was applied for dissolved Ni to affected samples WISETXGW02, WISETXGW08, WISETXGW13, and

Table A23. Data Usability Summary[1].

Analysis/Lab	Summary of QA/QC Results	Impact on Data/Usability
		WISETXGW14. With exception of WISETXGW08, sample results were similar to blank results; data are usable with caution. The concentrations of dissolved Ni are similar to total Ni, which did not have blank issues. WISETXGW08 is ~7x the pump equipment blank and is usable with caution.
	P: Dissolved P was detected above the QL in an equipment blank collected on 5/30/2013.	The "B" qualifier was applied for dissolved P to affected sample WISETXGW15. The result for the affected sample was equal to the value of the blank; data is usable with caution.
	Pb: Dissolved Pb was detected above the QL in an equipment blank collected on 5/28/2013.	Pb: The "B" qualifier was applied for dissolved Pb to affected samples WISETXGW02 and WISETXGW14. Sample results were less than blank value; data are usable with caution since the total Pb had similar concentrations and were not affected by blank contamination.
	Zn: Dissolved Zn was detected above the QL in pump equipment blank 1 collected on 5/29/2013.	Zn: The affected sample WISETXGW08 was qualified with a "B"; data is ~2x the blank and is usable with caution.
Total Metals/ SWRI	Al: Matrix spike recoveries were greater than acceptance limits.	Al: The "J+" qualifier was applied for total Al to affected samples WISETXSW04 and WISETXSW04 DUP. The data may be biased high and should be used with caution.
	Fe: Matrix spike recoveries were greater than acceptance limits.	Fe: The "J+" qualifier was applied for total Fe to affected samples WISETXGW01, WISETXGW04, WISETXGW04dup, WISETXGW08, WISETXPW02, WISETXPW03, WISETXSW04 and WISETXSW04dup. The data may be biased high and should be used with caution.
	Fe: RPD were outside acceptance limits for laboratory duplicates	Fe: The "*" qualifier was applied for total Fe to affected samples WISETXGW01, WISETXGW04,

Table A23. Data Usability Summary[1].

Analysis/Lab	Summary of QA/QC Results	Impact on Data/Usability
		WISETXGW04dup, WISETXGW08, WISETXPW02 and WISETXPW03 indicating a precision issue. Data are usable although values may not be precise.
	Mo, Ni, Zn: Total Mo, Ni, and Zn were detected above the QL in pump equipment blank 1 collected on 5/29/2013.	Mo, Ni, Zn: The "B" qualifier was applied for total Mo, Ni, and Zn to affected sample WISETXGW08. Total Mo and Zn values were less than equipment blank value data are unusable and total Ni was less than 3x equipment blank value; data are usable with caution.
	Ti: RPD criteria for total Ti not met for laboratory duplicates. For samples WISETXSW04 and WISETXSW04dup there was a high % difference for the serial dilution.	Ti: The "*" qualifier was applied for total Ti to affected samples WISETXGW04, WISETXGW04dup, WISETXSW04 and WISETXSW04dup. Positive identifications may lack precision; data are usable with caution. "J" was applied to WISETXSW04 and WISETXSW04dup; data should considered as estimates and used with caution.
	Th: Total Th was detected at the QL in equipment blank collected on 5/28/13.	Th: All associated samples collected on 5/28/13 were <QL, therefore no qualifier was required and no impact to data usability.
	V: Total V detected above the QL in a lab preparation blank.	V: The "B" qualifier was applied for total V to 17 of the 20 samples. Affected sample values were all less than 5x lab preparation blank value; data are usable with caution.
Charge Balance	The calculated charge balance ranged from 0.4 to 24.7% based on major anions (bicarbonate, chloride, and sulfate) and major cations (dissolved calcium, magnesium, potassium, and sodium).	All Samples except WISETXPW03 meet project requirements. WISETXPW03 charge balance was 24.7% and outside the desired range and is unusable.
Measured SPC Versus Calculated SPC	The measured SPC versus calculate SPC ranged from 4.3 to 69.3%.	All Samples except WISETXPW02 and WISETXPW03 meet project requirements. WISETXPW02 measured SPC versus calculated SPC was 15.4% and slightly outside the desired range and is usable with caution.

Table A23. Data Usability Summary[1].

Analysis/Lab	Summary of QA/QC Results	Impact on Data/Usability
		WISETXPW03 measured SPC versus calculated SPC was 69.3% and outside the desired range and is unusable.
VOC/ SWRI	Acetone: Detected above QL in all three field blanks.	Acetone; The "B" qualifier was applied for acetone to 11 of the 13 field samples. Sample values are similar to or less than the blank values are considered unusable.
Low Molecular Weight Acids/ Shaw Environmental	Not analyzed for in this sampling round.	NA
Dissolved Gases/ Shaw Environmental	Not analyzed for in this sampling round.	NA
Glycols/ EPA Region 3 Laboratory	Not analyzed for in this sampling round.	NA
sVOC/ EPA Region 8 Laboratory	Not analyzed for in this sampling round.	NA
DRO- GRO/ EPA Region 8 Laboratory	Not analyzed for in this sampling round.	NA
O and H Stable Isotopes of water/ Shaw Environmental	All QA/QC criteria were met.	Meets project requirements.
Sr Isotopes/ USGS Laboratory	All QA/QC criteria were met.	Meets project requirements.

[1]QA/QC criteria and project requirements were met with exceptions as listed.

Table A24. Data qualifiers and data descriptors.

Qualifier	Definition
U	The analyte was analyzed for, but was not detected above the reported quantitation limit (QL).
J	The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain quality control criteria were not met, or the concentration of the analyte was below the QL).
J+	The result is an estimated quantity, but the result may be biased high.
J-	For both detected and non-detected results, there may be a low bias due to low spike recoveries or sample preservation issues.
B	The analyte is found in a blank sample above the QL and the concentration found in the sample is less than 10 times the concentration found in the blank.
H	The sample was prepared or analyzed beyond the specified holding time. Sample results may be biased low.
*	Relative percent difference of a field or lab duplicate is outside acceptance criteria.
R	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and/or meet quality control criteria. Sample results are not reported. The analyte may or may not be present in the sample.

Data Descriptors

Descriptor	Definition
NA	Not Applicable (See QAPP)
NR	Not Reported by Laboratory or Field Sampling Team
ND	Not Detected
NS	Not Sampled

Table A25. Performance Evaluation sample results returned by EPA ORD/NRMRL (Ada) Laboratory for anions, ammonia, DOC, and DIC.

Reported Value (mg/L)	Certified Value (mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
DOC by EPA Method 9060A (RSKSOP 330v0)					
3.07	2.41	1.97 - 2.90	4	2010	Not Acceptable
1.89	1.80	1.45 - 2.22	1	2011	Acceptable
4.02	3.95	3.29 - 4.62	2	2011	Acceptable
4.30	4.20	3.51 - 4.90	3	2011	Acceptable
1.78	1.77	1.42 - 2.18	4	2011	Acceptable
2.46	2.34	1.91 - 2.82	1	2012	Acceptable
1.52	1.37	1.08 - 1.74	2	2012	Acceptable
3.11	3.16	2.62 - 3.74	3	2012	Acceptable
11.3	11.5	10.2 - 12.6	4	2012	Acceptable
8.02	7.89	7.01 - 8.68	1	2013	Acceptable
11.7	11.8	10.5 -13.0	2	2013	Acceptable
Ammonia and Nitrate + Nitrite by EPA Method 350.1 and 353.2 (RSKSOP 214v5)					
Ammonia					
4.90	4.64	3.36 - 5.96	4	2010	Acceptable
3.40	3.40	2.42 - 4.45	1	2011	Acceptable
8.79	9.03	6.67 - 11.3	2	2011	Acceptable
9.49	9.76	7.22 - 12.2	3	2011	Acceptable
14.9	14.0	10.4 - 17.4	4	2011	Acceptable
6.73	6.86	5.03 - 8.66	1	2012	Acceptable
8.53	8.15	6.00 - 10.2	2	2012	Acceptable
11.0	10.9	8.08 - 13.6	3	2012	Acceptable
3.96	3.86	2.77 - 5.01	4	2012	Acceptable
19.1	18.5	13.8 - 22.8	1	2013	Acceptable
5.48	5.29	2.85 – 6.75	2	2013	Acceptable
Nitrate + Nitrite					
10.5	10.7	8.74 - 12.5	4	2010	Acceptable
9.32	9.29	7.57 - 10.8	1	2011	Acceptable
8.61	9.03	7.36 - 10.4	2	2011	Acceptable
8.99	9.28	7.56 - 10.8	3	2011	Acceptable
18.7	19.3	15.7 - 22.4	4	2011	Acceptable
8.39	8.50	6.92 - 9.89	1	2012	Acceptable
6.63	6.67	5.43 - 7.76	2	2012	Acceptable
4.37	4.35	3.54 - 5.07	3	2012	Acceptable
25.4	26.1	21.3 - 30.3	4	2012	Acceptable
20.7	21.6	17.6 - 25.1	1	2013	Acceptable
19.8	20.2	16.5 23.5	2	2013	Acceptable
Anions by EPA Method 6500 (RSKSOP 276v3)					
Chloride					
56.4	55.4	47.1 - 64.2	4	2010	Acceptable
116	115	98.9 - 131	1	2011	Acceptable
57.2	59.0	50.2 - 68.2	2	2011	Acceptable
83.3	85.0	72.8 - 97.3	3	2011	Acceptable
50.5	50.5	42.8 - 58.7	4	2011	Acceptable

Table A25. Performance Evaluation sample results returned by EPA ORD/NRMRL (Ada) Laboratory for anions, ammonia, DOC, and DIC.

Reported Value (mg/L)	Certified Value (mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
68.5	69.0	58.9 - 79.4	1	2012	Acceptable
78.2	80.1	68.6 - 91.8	2	2012	Acceptable
62.2	62.8	53.5 - 72.5	3	2012	Acceptable
89.1	92.2	79.1 - 105	4	2012	Acceptable
82.4	85.3	73.1 - 97.6	1	2013	Acceptable
39.2	40.7	34.3 – 47.8	2	2013	Acceptable
Sulfate					
43.1	42.9	34.9 - 49.8	4	2010	Acceptable
18.8	20.4	15.9 - 24.4	1	2011	Acceptable
31.8	33.6	27.0 - 39.3	2	2011	Acceptable
18.2	20.0	15.5 - 24.0	3	2011	Acceptable
29.2	28.8	23.0 - 33.9	4	2011	Acceptable
30.3	30.9	24.7 - 36.2	1	2012	Acceptable
30.9	32.5	26.1 - 38.0	2	2012	Acceptable
28.0	28.3	22.5 - 33.3	3	2012	Acceptable
41.8	43.3	35.2 - 50.2	4	2012	Acceptable
28.5	30.3	24.2 - 35.6	1	2013	Acceptable
27.1	28.4	22.6 – 33.4	2	2013	Acceptable
Fluoride					
1.45	1.39	1.09 - 1.69	4	2010	Acceptable
1.64	1.66	1.33 - 1.99	1	2011	Acceptable
2.13	2.02	1.65 - 2.40	2	2011	Acceptable
1.89	2.02	1.65 - 2.40	3	2011	Acceptable
1.54	1.55	1.23 - 1.87	4	2011	Acceptable
3.52	3.72	3.14 - 4.32	1	2012	Acceptable
0.939	0.955	0.713 - 1.20	2	2012	Acceptable
2.53	1.99	1.62 - 2.36	3	2012	Not Acceptable
2.46	2.29	1.88 - 2.70	4	2012	Acceptable
1.34	1.30	1.02 - 1.58	1	2013	Acceptable
2.43	2.52	2.08 – 2.96	2	2013	Acceptable
Bromide (No EPA Method)					
1.72	2.06	1.75 - 2.37	4	2010	Not Acceptable
1.48	1.54	1.31 - 1.77	1	2011	Acceptable
3.57	3.43	2.92 - 3.94	2	2011	Acceptable
9.04	8.93	7.59 - 10.3	3	2011	Acceptable
8.73	8.57	7.28 - 9.86	4	2011	Acceptable
8.04	8.11	6.89 - 9.33	1	2012	Acceptable
2.29	2.22	1.89 - 2.55	2	2012	Acceptable
2.52	2.57	1.96 - 3.12	3	2012	Acceptable
5.06	4.88	4.02 - 5.73	4	2012	Acceptable
1.86	2.08	1.52 - 2.57	1	2013	Acceptable
2.95	2.94	2.29 – 3.54	2	2013	Acceptable

Table A25. Performance Evaluation sample results returned by EPA ORD/NRMRL (Ada) Laboratory for anions, ammonia, DOC, and DIC.

Reported Value (mg/L)	Certified Value (mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
Anions by EPA Method 6500 (RSKSOP 288v3)					
Chloride					
64.5	62.8	53.5 - 72.5	3	2012	Acceptable
91.7	92.2	79.1 - 105	4	2012	Acceptable
83.8	85.3	73.1 - 97.6	1	2013	Acceptable
39.8	40.7	34.3 – 47.8	2	2013	Acceptable
Sulfate					
27.7	28.3	22.5 - 33.3	3	2012	Acceptable
43.0	43.3	35.2 - 50.2	4	2012	Acceptable
29.5	30.3	24.2 - 35.6	1	2013	Acceptable
27.9	28.4	22.6 – 33.4	2	2013	Acceptable
Fluoride					
1.95	1.99	1.62 - 2.36	3	2012	Acceptable
2.36	2.29	1.88 - 2.70	4	2012	Acceptable
1.29	1.30	1.02 - 1.58	1	2013	Acceptable
2.41	2.52	2.08 – 2.96	2	2013	Acceptable
Bromide (No EPA Method)					
2.44	2.57	1.96 - 3.12	3	2012	Acceptable
4.80	4.88	4.02 - 5.73	4	2012	Acceptable
1.98	2.08	1.52 - 2.57	1	2013	Acceptable
2.96	2.94	2.29 – 3.54	2	2013	Acceptable
Bromide by RSKSOP 214v5 (No EPA Method)					
5.14	4.88	4.02 - 5.73	4	2012	Acceptable
1.99	2.08	1.52 - 2.57	1	2013	Acceptable
2.94	2.94	2.29 – 3.54	2	2013	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
ICP OES metals by EPA Method 200.7 (RSKSOP 213v4)					
Aluminum					
394	361	319 - 424	4	2010	Acceptable
1090	1070	823 - 1220	1	2011	Acceptable
1730	1760	1580 - 1940	2	2011	Acceptable
2310	2300	2070 - 2530	3	2011	Acceptable
738	708	644 - 814	4	2011	Acceptable
1270	1300	1160 - 1440	1	2012	Acceptable
626	638	578 - 711	2	2012	Acceptable
2500	2610	2150 - 3030	3	2012	Acceptable
324	292	212 - 376	4	2012	Acceptable
404	456	350 - 564	1	2013	Acceptable
Antimony					
512	514	432 - 574	4	2010	Acceptable
796	805	703 - 872	1	2011	Acceptable
468	465	408 - 506	2	2011	Acceptable
113	121	106 - 136	3	2011	Acceptable
810	842	730 - 915	4	2011	Acceptable
105	110	93.5 - 122	1	2012	Acceptable
809	794	672 - 870	2	2012	Acceptable
694	710	502 - 853	3	2012	Acceptable
660	686	484 - 824	4	2012	Acceptable
374	401	277 - 484	1	2013	Acceptable
Arsenic					
730	721	655 - 780	4	2010	Acceptable
370	377	333 - 421	1	2011	Acceptable
389	394	347 - 440	2	2011	Acceptable
155	165	146 - 184	3	2011	Acceptable
744	763	686 - 820	4	2011	Acceptable
748	759	679 - 815	1	2012	Acceptable
559	574	503 - 619	2	2012	Acceptable
639	639	536 - 748	3	2012	Acceptable
187	182	149 - 215	4	2012	Acceptable
376	376	314 - 441	1	2013	Acceptable
Barium					
331	330	303 - 354	4	2010	Acceptable
976	982	914 - 1070	1	2011	Acceptable
1390	1410	1300 - 1510	2	2011	Acceptable
364	357	324 - 387	3	2011	Acceptable
981	971	884 - 1060	4	2011	Acceptable
1490	1530	1400 - 1640	1	2012	Acceptable
953	948	870 - 1020	2	2012	Acceptable
2100	2160	1880 - 2440	3	2012	Acceptable
2070	2080	1810 - 2350	4	2012	Acceptable
1870	1880	1630 - 2120	1	2013	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
Beryllium					
588	583	525 - 631	4	2010	Acceptable
508	512	480 - 554	1	2011	Acceptable
421	426	395 - 465	2	2011	Acceptable
62	59	53.8 - 64.6	3	2011	Acceptable
109	109	101 - 116	4	2011	Acceptable
513	519	470 - 557	1	2012	Acceptable
440	441	397 - 472	2	2012	Acceptable
700	709	603 - 801	3	2012	Acceptable
176	169	143 - 191	4	2012	Acceptable
556	544	462 - 614	1	2013	Acceptable
Boron					
1500	1500	1360 - 1630	4	2010	Acceptable
1120	1120	1000 - 1260	1	2011	Acceptable
1560	1600	1490 - 1700	2	2011	Acceptable
2030	1920	1740 - 2100	3	2011	Acceptable
1080	1050	990 - 1110	4	2011	Acceptable
1710	1730	1540 - 1920	1	2012	Acceptable
1190	1200	1070 - 1320	2	2012	Acceptable
1820	1840	1500 - 2140	3	2012	Acceptable
1260	1230	1010 - 1430	4	2012	Acceptable
933	930	769 - 1080	1	2013	Acceptable
Cadmium					
225	226	203 - 244	4	2010	Acceptable
356	362	327 - 388	1	2011	Acceptable
226	232	219 - 243	2	2011	Acceptable
524	529	477 - 564	3	2011	Acceptable
77.0	78.9	70.6 - 84.6	4	2011	Acceptable
244	251	222 - 270	1	2012	Acceptable
397	405	361 - 428	2	2012	Acceptable
93.0	95.9	81.1 - 110	3	2012	Acceptable
390	393	335 - 447	4	2012	Acceptable
657	671	573 - 762	1	2013	Acceptable
Chromium					
416	421	382 - 459	4	2010	Acceptable
621	636	578 - 694	1	2011	Acceptable
483	492	456 - 528	2	2011	Acceptable
90	92	83.9 - 100	3	2011	Acceptable
781	794	742 - 843	4	2011	Acceptable
557	571	526 - 611	1	2012	Acceptable
727	734	662 - 794	2	2012	Acceptable
473	481	418 - 544	3	2012	Acceptable
611	611	532 - 691	4	2012	Acceptable
768	779	679 - 880	1	2013	Acceptable
Cobalt					
712	709	658 - 774	4	2010	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
518	521	496 - 557	1	2011	Acceptable
233	233	222 - 253	2	2011	Acceptable
752	741	693 - 819	3	2011	Acceptable
580	581	542 - 632	4	2011	Acceptable
130	130	120 - 145	1	2012	Acceptable
321	315	292 - 351	2	2012	Acceptable
294	283	248 - 318	3	2012	Acceptable
295	290	254 - 326	4	2012	Acceptable
277	276	242 - 310	1	2013	Acceptable
Copper					
860	864	783 - 935	4	2010	Acceptable
638	648	593 - 729	1	2011	Acceptable
759	782	725 - 839	2	2011	Acceptable
642	637	588 - 685	3	2011	Acceptable
764	737	688 - 786	4	2011	Acceptable
837	845	769 - 911	1	2012	Acceptable
624	625	569 * 681	2	2012	Acceptable
728	735	662 - 808	3	2012	Acceptable
573	569	512 - 626	4	2012	Acceptable
250	238	214 - 264	1	2013	Acceptable
Iron					
716	722	660 - 784	4	2010	Acceptable
791	800	745 - 871	1	2011	Acceptable
1740	1790	1620 - 2000	2	2011	Acceptable
775	787	722 - 868	3	2011	Acceptable
1090	1050	978 - 1140	4	2011	Acceptable
1450	1470	1370 - 1600	1	2012	Acceptable
672	670	618 - 749	2	2012	Acceptable
2370	2410	2140 - 2710	3	2012	Acceptable
466	462	406 - 526	4	2012	Acceptable
1060	1070	946 - 1210	1	2013	Acceptable
Lead					
1820	1800	1640 - 1960	4	2010	Acceptable
1390	1400	1280 - 1520	1	2011	Acceptable
1020	1040	956 - 1120	2	2011	Acceptable
1690	1670	1520 - 1850	3	2011	Acceptable
304	310	278 - 342	4	2011	Acceptable
712	722	665 - 793	1	2012	Acceptable
2440	2440	2230 - 2640	2	2012	Acceptable
1320	1320	1160 - 1470	3	2012	Acceptable
259	259	222 - 295	4	2012	Acceptable
296	305	262 - 346	1	2013	Acceptable
Manganese					
600	596	571 - 644	4	2010	Acceptable
336	335	308 - 375	1	2011	Acceptable
1060	1060	992 - 1130	2	2011	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
1560	1540	1450 - 1690	3	2011	Acceptable
625	634	592 - 670	4	2011	Acceptable
1410	1430	1320 - 1540	1	2012	Acceptable
2020	2010	1840 - 2170	2	2012	Acceptable
2120	2090	1880 - 2320	3	2012	Acceptable
1320	1280	1150 - 1420	4	2012	Acceptable
783	767	688 - 852	1	2013	Acceptable
Molybdenum					
512	510	457 - 550	4	2010	Acceptable
148	148	134 - 165	1	2011	Acceptable
418	419	387 - 451	2	2011	Acceptable
279	279	253 - 304	3	2011	Acceptable
303	308	286 - 330	4	2011	Acceptable
558	562	516 - 598	1	2012	Acceptable
128	131	116 - 142	2	2012	Acceptable
500	500	424 - 571	3	2012	Acceptable
332	330	278 - 379	4	2012	Acceptable
200	202	168 - 234	1	2013	Acceptable
Nickel					
751	757	694 - 820	4	2010	Acceptable
680	693	637 - 748	1	2011	Acceptable
2000	2040	1890 - 2180	2	2011	Acceptable
2030	2040	1860 - 2210	3	2011	Acceptable
550	559	506 - 611	4	2011	Acceptable
1650	1680	1520 - 1840	1	2012	Acceptable
943	951	862 - 1030	2	2012	Acceptable
609	617	555 - 691	3	2012	Acceptable
279	279	247 - 315	4	2012	Acceptable
769	765	688 - 855	1	2013	Acceptable
Selenium					
741	737	673 - 801	4	2010	Acceptable
566	573	495 - 635	1	2011	Acceptable
1600	1600	1460 - 1700	2	2011	Acceptable
1170	1170	1020 - 1290	3	2011	Acceptable
484	491	437 - 543	4	2011	Acceptable
502	502	435 - 557	1	2012	Acceptable
117	119	104 - 124	2	2012	Acceptable
1160	1160	923 - 1340	3	2012	Acceptable
1040	1050	835 - 1220	4	2012	Acceptable
634	652	517 - 755	1	2013	Acceptable
Silver					
302	323	292 - 352	4	2010	Acceptable
147	154	138 - 170	1	2011	Acceptable
485	503	463 - 543	2	2011	Acceptable
479	484	452 - 514	3	2011	Acceptable
166	173	155 - 189	4	2011	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
530	552	498 - 603	1	2012	Acceptable
528	541	486 - 596	2	2012	Acceptable
141	152	130 - 174	3	2012	Acceptable
328	333	286 - 382	4	2012	Acceptable
259	257	220 - 294	1	2013	Acceptable
Strontium					
83.0	83.7	75.7 - 91.6	4	2010	Acceptable
163	165	149 - 181	1	2011	Acceptable
151	149	137 - 164	2	2011	Acceptable
126	126	117 - 134	3	2011	Acceptable
167	164	151 - 180	4	2011	Acceptable
230	241	224 - 258	1	2012	Acceptable
116	116	104 - 124	2	2012	Acceptable
85.0	84.7	71.3 - 98.1	3	2012	Acceptable
245	245	213 - 278	4	2012	Acceptable
215	217	188 - 246	1	2013	Acceptable
Thallium					
288	293	259 - 321	4	2010	Acceptable
554	553	470 - 599	1	2011	Acceptable
134	142	128 - 159	2	2011	Acceptable
401	410	372 - 447	3	2011	Acceptable
684	694	634 - 754	4	2011	Acceptable
461	466	413 - 503	1	2012	Acceptable
836	827	738 - 909	2	2012	Acceptable
522	518	417 - 622	3	2012	Acceptable
493	487	390 - 586	4	2012	Acceptable
511	513	412 - 616	1	2013	Acceptable
Vanadium					
1310	1300	1210 -1380	4	2010	Acceptable
738	739	680 - 798	1	2011	Acceptable
246	249	224 - 263	2	2011	Acceptable
472	466	429 - 503	3	2011	Acceptable
1410	1350	1260 - 1420	4	2011	Acceptable
604	603	556 - 637	1	2012	Acceptable
596	584	533 - 619	2	2012	Acceptable
1800	1780	1560 - 1990	3	2012	Acceptable
468	455	398 - 509	4	2012	Acceptable
1420	1420	1240 - 1590	1	2013	Acceptable
Zinc					
848	850	780 - 920	4	2010	Acceptable
189	188	173 - 214	1	2011	Acceptable
1030	1050	974 - 1120	2	2011	Acceptable
412	397	368 - 442	3	2011	Acceptable
1370	1320	1200 - 1440	4	2011	Acceptable
566	563	508 - 618	1	2012	Acceptable
1740	1730	1560 - 1890	2	2012	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
1260	1280	1100 - 1470	3	2012	Acceptable
193	191	162 - 225	4	2012	Acceptable
252	253	216 - 295	1	2013	Acceptable
Metals by ICP MS EPA Method 6020A (RSKSOP 332v1 or RSKSOP 257v3)					
Aluminum					
NA	203	174 - 232	4	2010	Not Evaluated
NA	198	169 - 227	1	2011	Not Evaluated
NA	940	818 - 1020	2	2011	Not Evaluated
NA	1610	1460 - 1720	3	2011	Not Evaluated
NA	810	719 - 895	4	2011	Not Evaluated
NA	1090	940 - 1200	1	2012	Not Evaluated
2180	2270	1980 - 2420	2	2012	Acceptable
Antimony					
12.2	12.5	9.95 - 15.0	4	2010	Acceptable
37.2	39.3	35.4 - 43.2	1	2011	Acceptable
40.4	42.2	34.3 - 50.9	2	2011	Acceptable
16.8	17.0	14.4 - 18.5	3	2011	Acceptable
45.3	45.7	40.0 - 52.3	4	2011	Acceptable
26.9	26.5	24.6 - 28.9	1	2012	Acceptable
8.69	8.73	7.23 - 10.1	2	2012	Acceptable
Arsenic					
23.9	24.4	20.8 - 27.9	4	2010	Acceptable
41.9	43.8	38.7 - 48.2	1	2011	Acceptable
18.8	18.5	15.8 - 21.2	2	2011	Acceptable
26.1	27.1	24.4 - 30.3	3	2011	Acceptable
21.1	21.3	18.3 - 24.0	4	2011	Acceptable
43.5	45.8	38.4 - 50.4	1	2012	Acceptable
14.1	13.8	12.2 - 15.4	2	2012	Acceptable
Barium					
599	601	541 - 661	4	2010	Acceptable
2060	2040	1870 - 2180	1	2011	Acceptable
1220	1270	1110 - 1380	2	2011	Acceptable
1240	1210	1110 - 1310	3	2011	Acceptable
2060	2070	1870 - 2210	4	2011	Acceptable
1340	1360	1250 - 1470	1	2012	Acceptable
2340	2350	2060 - 2560	2	2012	Acceptable
Beryllium					
5.98	6.53	5.38 - 7.68	4	2010	Acceptable
2.32	2.42	2.03 - 2.81	1	2011	Acceptable
5.29	5.42	4.80 - 6.36	2	2011	Acceptable
4.06	4.17	3.45 - 4.89	3	2011	Acceptable
7.30	7.62	6.72 - 8.40	4	2011	Acceptable
3.31	3.31	2.57 - 3.77	1	2012	Acceptable
2.18	2.12	1.82 - 2.42	2	2012	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
Boron					
950	966	859 - 1070	4	2010	Acceptable
1340	1340	1210 - 1470	1	2011	Acceptable
1080	1160	1030 - 1290	2	2011	Acceptable
1130	1140	1040 - 1240	3	2011	Acceptable
1560	1590	1400 - 1760	4	2011	Acceptable
1320	1320	1170 - 1460	1	2012	Acceptable
852	1040	926 - 1150	2	2012	Not Acceptable
Cadmium					
24.0	23.8	20.8 - 26.8	4	2010	Acceptable
22.7	22.9	20.5 - 25.1	1	2011	Acceptable
29.0	28.8	24.7 - 31.8	2	2011	Acceptable
43.8	45.8	41.9 - 49.6	3	2011	Acceptable
9.02	9.06	8.10 - 10.0	4	2011	Acceptable
44.8	46.8	43.9 - 48.6	1	2012	Acceptable
24.6	25.2	22.0 - 26.8	2	2012	Acceptable
Chromium					
166	171	151 - 191	4	2010	Acceptable
22.2	22.7	20.1 - 25.1	1	2011	Acceptable
133	133	118 - 148	2	2011	Acceptable
59	63	58.3 - 66.7	3	2011	Acceptable
184	180	165 - 191	4	2011	Acceptable
158	158	146 - 169	1	2012	Acceptable
118	120	106 - 134	2	2012	Acceptable
Copper					
1210	1220	1100 - 1340	4	2010	Acceptable
438	429	387 - 464	1	2011	Acceptable
213	218	197 - 239	2	2011	Acceptable
644	622	556 - 688	3	2011	Acceptable
360	359	321 - 388	4	2011	Acceptable
341	348	317 - 379	1	2012	Acceptable
418	419	385 - 450	2	2012	Acceptable
Iron					
1090	1070	930 - 1210	4	2010	Acceptable
184	179	156 - 202	1	2011	Acceptable
715	732	679 - 776	2	2011	Acceptable
473	475	419 - 530	3	2011	Acceptable
313	308	272 - 344	4	2011	Acceptable
810	839	796 - 898	1	2012	Acceptable
485	489	454 - 544	2	2012	Acceptable
Lead					
52.3	52.5	44.8 - 60.1	4	2010	Acceptable
19.9	18.0	15.8 - 20.2	1	2011	Acceptable
38.8	38.7	33.1 - 44.3	2	2011	Acceptable
60.6	63.6	56.6 - 70.5	3	2011	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
55.6	53.9	47.4 - 60.4	4	2011	Acceptable
78.6	78.3	71.2 - 85.4	1	2012	Acceptable
85.9	88.2	78.8 - 94.6	2	2012	Acceptable
Manganese					
510	497	450 - 544	4	2010	Acceptable
185	190	175 - 209	1	2011	Acceptable
683	653	608 - 697	2	2011	Acceptable
765	782	714 - 849	3	2011	Acceptable
639	640	595 - 697	4	2011	Acceptable
59.0	59.7	55.5 - 65.1	1	2012	Acceptable
451	459	410 - 498	2	2012	Acceptable
Mercury					
31.4	24.8	19.5 - 30.0	4	2010	Not Acceptable
17.6	17.3	13.8 - 21.1	1	2011	Acceptable
19.2	19.7	18.3 - 22.6	2	2011	Acceptable
8.96	8.14	6.80 - 10.1	3	2011	Acceptable
11.0	11.5	10.5 - 13.0	4	2011	Acceptable
4.36	3.98	3.41 - 4.54	1	2012	Acceptable
4.76	3.98	3.41 - 4.54	2	2012	Not Acceptable
Molybdenum					
92.8	92.7	80.7 - 105	4	2010	Acceptable
71.7	73.8	64.2 - 83.4	1	2011	Acceptable
91.7	94.8	82.5 - 107	2	2011	Acceptable
97.6	99.5	94.0 - 105	3	2011	Acceptable
74.6	73.8	65.3 - 80.5	4	2011	Acceptable
42.3	43.8	40.2 - 47.4	1	2012	Acceptable
17.4	17.0	15.5 - 18.2	2	2012	Acceptable
Nickel					
430	431	385 - 477	4	2010	Acceptable
114	109	97.6 - 119	1	2011	Acceptable
219	223	206 - 240	2	2011	Acceptable
68.8	68.6	61.2 - 76.0	3	2011	Acceptable
205	207	187 - 226	4	2011	Acceptable
38.1	39.7	35.6 - 43.8	1	2012	Acceptable
156	156	142 - 168	2	2012	Acceptable
Selenium					
51.9	52.1	43.3 - 60.9	4	2010	Acceptable
19.5	20.2	17.2 - 23.6	1	2011	Acceptable
82.4	80.7	70.0 - 93.0	2	2011	Acceptable
49.0	50.9	44.6 - 57.2	3	2011	Acceptable
31.5	31.0	27.2 - 35.4	4	2011	Acceptable
56.3	58.0	47.4 - 66.1	1	2012	Acceptable
22.2	22.3	18.9 - 26.1	2	2012	Acceptable
Silver					
186	182	161 - 203	4	2010	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
175	176	160 - 187	1	2011	Acceptable
123	130	121 - 139	2	2011	Acceptable
60.3	62.1	56.8 - 67.3	3	2011	Acceptable
93.9	95.7	85.8 - 104	4	2011	Acceptable
133	140	128 - 152	1	2012	Acceptable
97.8	106	95.2 - 113	2	2012	Acceptable
Thallium					
3.39	3.44	2.66 - 4.22	4	2010	Acceptable
6.68	6.65	5.78 - 7.44	1	2011	Acceptable
3.55	3.61	2.79 - 4.43	2	2011	Acceptable
6.34	6.47	5.57 - 7.38	3	2011	Acceptable
3.02	3.10	2.60 - 3.59	4	2011	Acceptable
8.78	8.84	8.01 - 9.44	1	2012	Acceptable
9.13	9.19	8.17 - 10.2	2	2012	Acceptable
Vanadium					
811	816	752 - 880	4	2010	Acceptable
766	778	717 - 839	1	2011	Acceptable
594	598	551 - 645	2	2011	Acceptable
885	890	820 - 960	3	2011	Acceptable
912	910	824 - 972	4	2011	Acceptable
735	726	674 - 769	1	2012	Acceptable
570	571	526 - 616	2	2012	Acceptable
Zinc					
1160	1180	1070 - 1290	4	2010	Acceptable
725	729	666 - 792	1	2011	Acceptable
1110	1130	1030 - 1260	2	2011	Acceptable
772	789	724 - 854	3	2011	Acceptable
1060	1130	1020 - 1260	4	2011	Acceptable
1130	1160	1070 - 1250	1	2012	Acceptable
1410	1390	1260 - 1510	2	2012	Acceptable
Metals by ICP MS EPA Method 6020A (RSKSOP 332v1)					
Aluminum					
492	475	380 - 570	3	2012	Acceptable
664	645	544 - 742	4	2012	Acceptable
690	688	593 - 803	1	2013	Acceptable
Antimony					
20.9	20.8	14.6 - 27.0	3	2012	Acceptable
27.6	28.7	20.1 - 37.3	4	2012	Acceptable
32.6	35.8	25.1 - 46.5	1	2013	Acceptable
Arsenic					
44.2	44.4	31.1 - 57.7	3	2012	Acceptable
42.8	41.4	29.0 - 53.8	4	2012	Acceptable
15.1	15.9	11.1 - 20.7	1	2013	Acceptable
Barium					
1710	1740	1480 - 2000	3	2012	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
864	883	750 - 1020	4	2012	Acceptable
1290	1350	1150 - 1550	1	2013	Acceptable
Beryllium					
16.3	16.7	14.2 - 49.2	3	2012	Acceptable
4.05	4.46	3.79 - 5.13	4	2012	Acceptable
4.21	4.20	3.57 - 4.83	1	2013	Acceptable
Boron					
1830	1800	1530 - 2070	3	2012	Acceptable
1400	1430	1220 - 1640	4	2012	Acceptable
1100	1090	926 - 1250	1	2013	Acceptable
Cadmium					
16.8	16.9	13.5 - 20.3	3	2012	Acceptable
41.4	42.5	34.0 - 51.0	4	2012	Acceptable
30.5	31.0	24.8 - 37.2	1	2013	Acceptable
Chromium					
184	180	153 - 207	3	2012	Acceptable
149	152	129 - 175	4	2012	Acceptable
122	124	105 - 143	1	2013	Acceptable
Copper					
1360	1300	1170 - 1430	3	2012	Acceptable
360	368	331 - 405	4	2012	Acceptable
490	488	439 - 537	1	2013	Acceptable
Iron					
1430	1510	1280 - 1740	3	2012	Acceptable
1150	1180	1000 - 1360	4	2012	Acceptable
566	572	486 - 658	1	2013	Acceptable
Lead					
20.0	19.8	13.9 - 25.7	3	2012	Acceptable
84.3	84.2	58.9 - 109	4	2012	Acceptable
30.5	32.6	22.8 - 42.4	1	2013	Acceptable
Manganese					
684	722	614 - 830	3	2012	Acceptable
76.1	81.1	68.9 - 93.3	4	2012	Acceptable
76.5	75.8	64.4 - 87.2	1	2013	Acceptable
Mercury					
3.22	3.74	2.32 - 5.19	3	2012	Acceptable
24.1	22.3	13.7 - 30.1	4	2012	Acceptable
7.73	8.31	5.12 - 11.3	1	2013	Acceptable
Molybdenum					
90.2	89.4	76.0 - 103	3	2012	Acceptable
63.3	63.7	54.1 - 73.2	4	2012	Acceptable
38.5	39.6	33.7 - 45.5	1	2013	Acceptable
Nickel					
453	441	375 - 507	3	2012	Acceptable
59.2	61.3	52.1 - 70.5	4	2012	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
355	358	304 - 412	1	2013	Acceptable
Selenium					
63.6	64.1	51.3 - 76.9	3	2012	Acceptable
84.8	82.6	66.1 - 99.1	4	2012	Acceptable
26.6	29.3	23.4 - 35.2	1	2013	Acceptable
Silver					
41.0	41.8	29.3 - 54.3	3	2012	Acceptable
99.9	102	71.4 - 133	4	2012	Acceptable
27.8	28.4	19.9 - 36.9	1	2013	Acceptable
Thallium					
6.03	6.11	4.28 - 7.94	3	2012	Acceptable
6.01	6.11	4.28 - 7.94	4	2012	Acceptable
7.12	7.73	5.41 - 10.0	1	2013	Acceptable
Vanadium					
336	329	280 - 378	3	2012	Acceptable
877	843	716 - 969	4	2012	Acceptable
863	867	737 - 997	1	2013	Acceptable
Zinc					
1510	1420	1210 - 1630	3	2012	Acceptable
549	539	458 - 620	4	2012	Acceptable
440	449	382 - 516	1	2013	Acceptable
Metals by ICP MS EPA Method 6020A (RSKSOP 257v3)					
Aluminum					
506	475	380 - 570	3	2012	Acceptable
656	645	544 - 742	4	2012	Acceptable
650	688	593 - 803	1	2013	Acceptable
Antimony					
20.5	20.8	14.6 - 27.0	3	2012	Acceptable
28.1	28.7	20.1 - 37.3	4	2012	Acceptable
33.5	35.8	25.1 - 46.5	1	2013	Acceptable
Arsenic					
42.4	44.4	31.1 - 57.7	3	2012	Acceptable
42.6	41.4	29.0 - 53.8	4	2012	Acceptable
15.2	15.9	11.1 - 20.7	1	2013	Acceptable
Barium					
1740	1740	1480 - 2000	3	2012	Acceptable
860	883	750 - 1020	4	2012	Acceptable
1380	1350	1150 - 1550	1	2013	Acceptable
Beryllium					
15.6	16.7	14.2 - 49.2	3	2012	Acceptable
4.31	4.46	3.79 - 5.13	4	2012	Acceptable
3.60	4.20	3.57 - 4.83	1	2013	Acceptable
Boron					
1720	1800	1530 - 2070	3	2012	Acceptable
1510	1430	1220 - 1640	4	2012	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
1130	1090	926 - 1250	1	2013	Acceptable
Cadmium					
16.7	16.9	13.5 - 20.3	3	2012	Acceptable
41.0	42.5	34.0 - 51.0	4	2012	Acceptable
28.6	31.0	24.8 - 37.2	1	2013	Acceptable
Chromium					
183	180	153 - 207	3	2012	Acceptable
145	152	129 - 175	4	2012	Acceptable
126	124	105 - 143	1	2013	Acceptable
Copper					
1280	1300	1170 - 1430	3	2012	Acceptable
356	368	331 - 405	4	2012	Acceptable
490	488	439 - 537	1	2013	Acceptable
Iron					
1560	1510	1280 - 1740	3	2012	Acceptable
1200	1180	1000 - 1360	4	2012	Acceptable
553	572	486 - 658	1	2013	Acceptable
Lead					
20.2	19.8	13.9 - 25.7	3	2012	Acceptable
84.4	84.2	58.9 - 109	4	2012	Acceptable
31.6	32.6	22.8 - 42.4	1	2013	Acceptable
Manganese					
692	722	614 - 830	3	2012	Acceptable
78.9	81.1	68.9 - 93.3	4	2012	Acceptable
78.6	75.8	64.4 - 87.2	1	2013	Acceptable
Mercury					
3.52	3.74	2.32 - 5.19	3	2012	Acceptable
24.4	22.3	13.7 - 30.1	4	2012	Acceptable
7.48	8.31	5.12 - 11.3	1	2013	Acceptable
Molybdenum					
92.9	89.4	76.0 - 103	3	2012	Acceptable
65.4	63.7	54.1 - 73.2	4	2012	Acceptable
39.2	39.6	33.7 - 45.5	1	2013	Acceptable
Nickel					
398	441	375 - 507	3	2012	Acceptable
60.2	61.3	52.1 - 70.5	4	2012	Acceptable
370	358	304 - 412	1	2013	Acceptable
Selenium					
64.5	64.1	51.3 - 76.9	3	2012	Acceptable
86.2	82.6	66.1 - 99.1	4	2012	Acceptable
27.0	29.3	23.4 - 35.2	1	2013	Acceptable
Silver					
36.5	41.8	29.3 - 54.3	3	2012	Acceptable
99.8	102	71.4 - 133	4	2012	Acceptable
27.8	28.4	19.9 - 36.9	1	2013	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
Thallium					
6.19	6.11	4.28 - 7.94	3	2012	Acceptable
6.10	6.11	4.28 - 7.94	4	2012	Acceptable
7.34	7.73	5.41 - 10.0	1	2013	Acceptable
Vanadium					
343	329	280 - 378	3	2012	Acceptable
845	843	716 - 969	4	2012	Acceptable
887	867	737 - 997	1	2013	Acceptable
Zinc					
1400	1420	1210 - 1630	3	2012	Acceptable
547	539	458 - 620	4	2012	Acceptable
439	449	382 - 516	1	2013	Acceptable
Volatile Organic Compounds by GC MS EPA Method 5021A + 8260C (RSKSOP 299v1)					
Agilent I					
1,1,1-Trichloroethane					
15.6	17.2	12.4 - 21.3	4	2010	Acceptable
6.62	6.93	4.99 - 8.59	2	2011	Acceptable
13.3	11.3	8.14 - 14.0	3	2011	Acceptable
16.8	15.9	11.4 - 19.7	4	2011	Acceptable
16.6	15.8	11.4 - 19.6	1	2012	Acceptable
7.04	6.44	4.64 - 7.99	2	2012	Acceptable
9.49	8.78	5.27 - 12.3	3	2012	Acceptable
11.4	11.7	9.36 - 14.0	4	2012	Acceptable
3.19	3.05	1.83 - 4.27	1	2013	Acceptable
1,1,2-Trichloroethane					
9.40	9.63	7.43 - 11.8	4	2010	Acceptable
7.17	6.88	5.31 - 8.46	2	2011	Acceptable
16.5	15.8	12.2 - 19.4	3	2011	Acceptable
3.78	2.95	2.28 - 3.63	4	2011	Not Acceptable
14.4	15.1	11.7 - 18.6	1	2012	Acceptable
3.15	3.03	2.34 - 3.73	2	2012	Acceptable
22.0	19.1	15.3 - 22.9	3	2012	Acceptable
4.00	3.94	2.36 - 5.52	4	2012	Acceptable
20.9	18.6	14.9 - 22.3	1	2013	Acceptable
1,1-Dichloroethene					
3.19	3.11	2.15 - 4.07	4	2010	Acceptable
15.1	14.9	10.3 - 19.5	1	2011	Acceptable
14.6	13.8	9.54 - 18.1	2	2011	Acceptable
5.73	4.78	3.30 - 6.26	3	2011	Acceptable
10.6	9.56	6.61 - 12.5	4	2011	Acceptable
7.03	6.56	4.53 - 8.59	1	2012	Acceptable
20.3	18.1	12.5 - 23.7	2	2012	Acceptable
7.85	7.46	4.48 - 10.4	3	2012	Acceptable
7.33	7.06	4.24 - 9.88	4	2012	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
17.0	15.8	12.6 - 19.0	1	2013	Acceptable
1,2,4-Trichlorobenzene					
NA	8.78	5.63 - 11.1	4	2010	Not Evaluated
NA	3.74	2.40 - 4.71	2	2011	Not Evaluated
NA	8.54	5.47 - 10.8	3	2011	Not Evaluated
NA	11.6	7.44 - 14.6	4	2011	Not Evaluated
NA	14.7	9.42 - 18.5	1	2012	Not Evaluated
NA	6.84	4.38 - 8.62	2	2012	Not Evaluated
NA	2.94	1.76 - 4.12	3	2012	Not Evaluated
NA	6.41	3.85 - 8.97	4	2012	Not Evaluated
NA	17.0	13.6 - 20.4	1	2013	Not Evaluated
1,2-Dichlorobenzene					
17.5	17.4	13.3 - 21.2	4	2010	Acceptable
8.58	9.42	7.19 - 11.5	1	2011	Acceptable
16.2	17.3	13.2 - 21.1	2	2011	Acceptable
18.1	16.6	12.7 - 20.2	3	2011	Acceptable
17.3	17.0	13.0 - 20.7	4	2011	Acceptable
17.8	18.7	14.3 - 22.8	1	2012	Acceptable
17.3	18.3	14.0 - 22.3	2	2012	Acceptable
19.5	19.3	15.4 - 23.2	3	2012	Acceptable
14.3	14.2	11.4 - 17.0	4	2012	Acceptable
9.57	9.44	5.66 - 13.2	1	2013	Acceptable
1,2-Dichloroethane					
17.7	18.8	14.6 - 23.5	4	2010	Acceptable
2.79	2.37	1.84 - 2.96	1	2011	Acceptable
4.85	4.27	3.32 - 5.34	2	2011	Acceptable
16.9	14.8	11.5 - 18.5	3	2011	Acceptable
3.46	2.82	2.19 - 3.52	4	2011	Acceptable
17.2	18.5	14.4 - 23.1	1	2012	Acceptable
9.45	8.78	6.82 - 11.0	2	2012	Acceptable
3.44	2.96	1.78 - 4.14	3	2012	Acceptable
7.00	6.71	4.03 - 9.39	4	2012	Acceptable
3.15	2.22	1.33 - 3.11	1	2013	Not Acceptable
1,2-Dichloropropane					
NA	14.5	11.2 - 17.8	4	2010	Not Evaluated
NA	19.1	14.8 - 23.5	1	2011	Not Evaluated
NA	16.7	12.9 - 20.5	2	2011	Not Evaluated
NA	16.5	12.8 - 20.3	3	2011	Not Evaluated
NA	9.17	7.09 - 11.3	4	2011	Not Evaluated
NA	18.2	14.1 - 22.4	1	2012	Not Evaluated
NA	15.0	11.6 - 18.4	2	2012	Not Evaluated
NA	6.77	4.06 - 9.48	3	2012	Not Evaluated
NA	12.5	10.0 - 15.0	4	2012	Not Evaluated
NA	3.26	1.96 - 4.56	1	2013	Not Evaluated
1,4-Dichlorobenzene					
13.0	14.4	10.4 - 17.7	4	2010	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
6.51	7.68	5.53 - 9.45	1	2011	Acceptable
3.40	3.84	2.76 - 4.72	2	2011	Acceptable
15.0	16.4	11.8 - 20.2	3	2011	Acceptable
14.6	15.1	10.9 - 18.6	4	2011	Acceptable
14.5	15.0	10.8 - 18.4	1	2012	Acceptable
6.12	6.72	4.84 - 8.27	2	2012	Acceptable
7.53	8.84	5.30 - 12.4	3	2012	Acceptable
11.0	13.6	10.9 - 16.3	4	2012	Acceptable
15.9	16.0	12.8 - 19.2	1	2013	Acceptable
Benzene					
13.8	15.5	12.2 - 18.8	4	2010	Acceptable
14.6	14.8	11.6 - 17.9	1	2011	Acceptable
14.1	14.0	11.0 - 16.9	2	2011	Acceptable
7.98	7.74	6.08 - 9.36	3	2011	Acceptable
16.5	15.8	12.4 - 19.1	4	2011	Acceptable
8.25	8.15	6.41 - 9.86	1	2012	Acceptable
14.2	14.0	11.0 - 16.9	2	2012	Acceptable
7.48	7.52	4.51 - 10.5	3	2012	Acceptable
12.0	12.5	10.0 - 15.0	4	2012	Acceptable
15.4	15.0	12.0 - 18.0	1	2013	Acceptable
cis-1,2-Dichloroethene					
39.4	40.2	30.1 - 49.4	4	2010	Acceptable
43.4	43.3	32.4 - 53.3	1	2011	Acceptable
6.02	5.89	4.41 - 7.24	2	2011	Acceptable
22.8	22.1	16.6 - 27.2	3	2011	Acceptable
46.1	42.9	32.1 - 52.8	4	2011	Acceptable
45.2	45.3	33.9 - 55.7	1	2012	Acceptable
33.4	31.9	23.9 - 39.2	2	2012	Acceptable
15.4	15.0	12.0 - 18.0	3	2012	Acceptable
24.0	25.0	20.0 - 30.0	4	2012	Acceptable
22.9	21.2	17.0 - 25.4	1	2013	Acceptable
Carbon Tetrachloride					
6.14	6.18	4.24 - 7.79	4	2010	Acceptable
11.9	11.9	8.16 - 15.0	1	2011	Acceptable
8.75	9.27	6.36 - 11.7	2	2011	Acceptable
20.0	16.3	11.2 - 20.5	3	2011	Acceptable
2.94	2.77	1.90 - 3.49	4	2011	Acceptable
15.9	14.9	10.2 - 18.8	1	2012	Acceptable
6.55	5.76	3.95 - 7.26	2	2012	Acceptable
16.7	15.9	12.7 - 19.1	3	2012	Acceptable
11.1	10.9	8.72 - 13.1	4	2012	Acceptable
13.1	12.4	9.92 - 14.9	1	2013	Acceptable
Chlorobenzene					
13.7	14.7	11.5 - 17.9	4	2010	Acceptable
28.9	29.7	23.2 - 36.2	1	2011	Acceptable
23.2	23.8	18.6 - 29.0	2	2011	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
2.72	2.65	2.07 - 3.23	3	2011	Acceptable
40.4	38.3	29.9 - 46.7	4	2011	Acceptable
44.3	45.4	35.5 - 55.4	1	2012	Acceptable
5.38	5.88	4.59 - 7.17	2	2012	Acceptable
21.0	21.6	17.3 - 25.9	3	2012	Acceptable
15.9	16.4	13.1 - 19.7	4	2012	Acceptable
17.6	16.2	13.0 - 19.4	1	2013	Acceptable
Diisopropyl Ether					
8.62	9.26	7.18 - 11.8	4	2010	Acceptable
8.63	9.26	7.18 - 11.8	1	2011	Acceptable
21.2	20.0	15.5 - 25.4	2	2011	Acceptable
22.0	21.7	17.5 - 26.9	4	2011	Acceptable
22.8	22.5	18.1 - 27.9	1	2012	Acceptable
18.3	18.7	15.2 - 23.4	2	2012	Acceptable
33.2	31.4	25.5 - 39.2	3	2012	Acceptable
33.4	31.4	25.5 - 39.2	4	2012	Acceptable
26.3	24.2	19.6 - 30.2	1	2013	Acceptable
Ethylbenzene					
15.0	15.7	11.9 - 19.5	4	2010	Acceptable
7.98	8.43	6.41 - 10.4	1	2011	Acceptable
15.2	15.5	11.8 - 19.2	2	2011	Acceptable
8.40	8.78	6.67 - 10.9	3	2011	Acceptable
20.4	19.3	14.7 - 23.9	4	2011	Acceptable
17.9	16.9	12.8 - 21.0	1	2012	Acceptable
16.2	15.4	11.7 - 19.1	2	2012	Acceptable
18.6	19.2	15.4 - 23.0	3	2012	Acceptable
18.1	19.2	15.4 - 23.0	4	2012	Acceptable
10.6	9.22	5.53 - 12.9	1	2013	Acceptable
Methylene chloride					
9.66	11.6	8.06 - 14.8	4	2010	Acceptable
12.4	12.9	8.97 - 16.5	1	2011	Acceptable
11.9	11.6	8.06 - 14.8	2	2011	Acceptable
19.9	19.2	13.3 - 24.6	3	2011	Acceptable
18.7	17.8	12.4 - 22.8	4	2011	Acceptable
19.7	19.3	13.4 - 24.7	1	2012	Acceptable
19.5	17.9	12.4 - 22.9	2	2012	Acceptable
5.53	5.22	3.13 - 7.31	3	2012	Acceptable
17.8	18.4	14.7 - 22.1	4	2012	Acceptable
18.6	17.8	14.2 - 21.4	1	2013	Acceptable
m-Xylene					
NS	7.64	5.78 - 9.47	4	2010	Not Evaluated
NS	13.5	10.2 - 16.7	2	2011	Not Evaluated
NS	8.8	6.68 - 11.0	3	2011	Not Evaluated
NS	4.52	3.42 - 5.60	4	2011	Not Evaluated
NS	6.70	5.06 - 8.31	1	2012	Not Evaluated
NS	5.77	4.36 - 7.15	2	2012	Not Evaluated

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
NS	4.81	3.64 - 5.96	3	2012	Not Evaluated
NS	2.27	1.72 - 2.81	4	2012	Not Evaluated
NS	13.1	9.90 - 16.2	1	2013	Not Evaluated
o-Xylene					
8.38	8.73	6.60 - 10.8	4	2010	Acceptable
5.85	6.30	4.76 - 7.81	2	2011	Acceptable
6.72	6.48	4.90 - 8.04	3	2011	Acceptable
8.10	7.99	6.04 - 9.91	4	2011	Acceptable
8.16	7.93	6.00 - 9.83	1	2012	Acceptable
10.9	9.97	7.54 - 12.4	2	2012	Acceptable
6.86	7.18	5.43 - 8.90	3	2012	Acceptable
4.39	4.23	3.20 - 5.24	4	2012	Acceptable
15.6	12.6	9.52 - 15.6	1	2013	Acceptable
p-Xylene					
NS	2.46	1.86 - 3.05	4	2010	Not Evaluated
NS	5.54	4.19 - 6.87	2	2011	Not Evaluated
NS	11.1	8.39 - 13.8	3	2011	Not Evaluated
NS	8.13	6.15 - 10.1	4	2011	Not Evaluated
NS	12.2	9.22 - 15.1	1	2012	Not Evaluated
NS	15.5	11.7 - 19.2	2	2012	Not Evaluated
NS	15.8	11.9 - 19.6	3	2012	Not Evaluated
NS	3.48	2.63 - 4.32	4	2012	Not Evaluated
NS	10.7	8.09 - 13.3	1	2013	Not Evaluated
Styrene					
NA	8.59	6.44 - 10.8	4	2010	Not Evaluated
NA	5.72	4.29 - 7.21	2	2011	Not Evaluated
NA	17.6	13.2 - 22.2	3	2011	Not Evaluated
NA	2.99	2.24 - 3.77	4	2011	Not Evaluated
NA	9.12	6.84 - 11.5	1	2012	Not Evaluated
NA	14.0	10.5 - 17.6	2	2012	Not Evaluated
NA	12.3	9.84 - 14.8	3	2012	Not Evaluated
NA	6.01	3.61 - 8.41	4	2012	Not Evaluated
NA	16.5	13.2 - 19.8	1	2013	Not Evaluated
trans-1,2-Dichloroethene					
15.7	17.1	12.7 - 21.4	4	2010	Acceptable
4.68	4.63	3.44 - 5.79	1	2011	Acceptable
16.3	16.1	12.0 - 20.1	2	2011	Acceptable
36.0	33.1	24.6 - 41.4	3	2011	Acceptable
42.8	40.0	29.7 - 50.0	4	2011	Acceptable
9.93	9.40	6.98 - 11.8	1	2012	Acceptable
6.69	6.67	4.96 - 8.34	2	2012	Acceptable
13.0	12.8	10.2 - 15.4	3	2012	Acceptable
14.6	14.2	11.4 - 17.0	4	2012	Acceptable
16.0	15.9	12.7 - 19.1	1	2013	Acceptable
tert-Amyl Methyl Ether					
22.2	21.6	16.4 - 27.4	4	2010	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
25.7	21.6	16.4 - 27.4	1	2011	Acceptable
6.50	7.06	5.37 - 8.97	2	2011	Acceptable
29.3	30.8	22.7 - 39.4	4	2011	Acceptable
30.2	31.4	23.2 - 40.2	1	2012	Acceptable
32.9	36.8	27.6 - 47.1	2	2012	Acceptable
11.1	11.3	8.45 - 14.4	3	2012	Acceptable
9.17	11.3	8.45 - 14.4	4	2012	Acceptable
19.0	18.0	13.5 - 22.9	1	2013	Acceptable
tert-Butyl Alcohol					
28.9	28.7	21.3 - 37.0	4	2010	Acceptable
29.4	28.7	21.3 - 37.0	1	2011	Acceptable
17.0	20.3	15.0 - 26.2	2	2011	Acceptable
25.8	33.3	22.2 - 44.6	4	2011	Acceptable
32.8	40.0	26.6 - 53.6	1	2012	Acceptable
23.5	28.6	17.1 - 39.8	2	2012	Acceptable
34.4	34.8	20.7 - 48.4	3	2012	Acceptable
32.8	34.8	20.7 - 48.4	4	2012	Acceptable
35.1	36.6	21.8 - 50.9	1	2013	Acceptable
tert-Butyl Ethyl Ether					
8.41	8.32	6.35 - 10.9	4	2010	Acceptable
8.48	8.32	6.35 - 10.9	1	2011	Acceptable
13.0	13.2	10.1 - 17.3	2	2011	Acceptable
41.0	41.0	31.9 - 53.3	4	2011	Acceptable
17.4	17.7	13.8 - 23.0	1	2012	Acceptable
28.5	31.3	24.7 - 40.4	2	2012	Acceptable
9.33	9.10	7.19 - 11.7	3	2012	Acceptable
8.30	9.10	7.19 - 11.7	4	2012	Acceptable
10.3	9.98	7.88 - 12.9	1	2013	Acceptable
tert-Butyl Methyl Ether					
27.4	25.7	19.7 - 31.9	4	2010	Acceptable
28.6	25.7	19.7 - 31.9	1	2011	Acceptable
31.3	31.5	24.2 - 39.1	2	2011	Acceptable
22.8	23.7	18.8 - 29.2	4	2011	Acceptable
23.6	24.2	19.2 - 29.8	1	2012	Acceptable
17.1	18.3	14.5 - 22.7	2	2012	Acceptable
45.4	41.4	33.1 - 49.7	3	2012	Acceptable
39.6	41.4	33.1 - 49.7	4	2012	Acceptable
31.6	29.8	23.8 - 35.8	1	2013	Acceptable
Tetrachloroethene					
15.4	16.2	11.1 - 19.6	4	2010	Acceptable
3.27	3.69	2.52 - 4.46	2	2011	Acceptable
3.12	3.02	2.07 - 3.65	3	2011	Acceptable
20.0	19.0	13.0 - 23.0	4	2011	Acceptable
11.4	11.2	7.66 - 13.6	1	2012	Acceptable
12.1	11.0	7.52 - 13.3	2	2012	Acceptable
4.27	3.90	2.34 - 5.46	3	2012	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
14.0	14.2	11.4 - 17.0	4	2012	Acceptable
8.95	8.72	5.23 - 12.2	1	2013	Acceptable
Toluene					
16.4	17.9	13.9 - 21.7	4	2010	Acceptable
4.69	5.13	3.97 - 6.21	2	2011	Acceptable
20.2	19.2	14.9 - 23.2	3	2011	Acceptable
8.25	8.59	6.65 - 10.4	4	2011	Acceptable
7.53	7.40	5.73 - 8.95	1	2012	Acceptable
8.94	8.39	6.49 - 10.2	2	2012	Acceptable
15.8	16.3	13.0 - 19.6	3	2012	Acceptable
18.1	19.2	15.4 - 23.0	4	2012	Acceptable
21.7	18.5	14.8 - 22.2	1	2013	Acceptable
Total Xylenes					
17.9	18.8	14.2 - 23.3	4	2010	Acceptable
24.0	25.3	19.1 - 31.4	2	2011	Acceptable
27.2	26.4	20.0 - 32.7	3	2011	Acceptable
21.2	20.6	15.6 - 25.5	4	2011	Acceptable
28.1	26.8	20.3 - 33.2	1	2012	Acceptable
34.3	31.2	23.6 - 38.7	2	2012	Acceptable
27.0	27.8	21.0 - 34.5	3	2012	Acceptable
10.8	9.98	5.99 - 14.0	4	2012	Acceptable
38.7	36.4	2.91 - 43.7	1	2013	Acceptable
Trichloroethene					
1.72	2.10	1.56 - 2.50	4	2010	Acceptable
3.20	3.64	2.70 - 4.33	2	2011	Acceptable
3.20	3.00	2.22 - 6.57	3	2011	Acceptable
13.6	12.6	9.34 - 15.0	4	2011	Acceptable
2.16	2.18	1.62 - 2.59	1	2012	Acceptable
9.00	8.59	6.36 - 10.2	2	2012	Acceptable
9.45	9.24	5.54 - 12.9	3	2012	Acceptable
20.4	20.0	16.0 - 24.0	4	2012	Acceptable
8.37	8.49	5.09 - 11.9	1	2013	Acceptable
Vinyl Chloride					
9.10	6.22	3.68 - 9.14	4	2010	Acceptable
17.6	16.7	9.87 - 24.6	2	2011	Acceptable
14.5	12.0	7.09 - 17.6	3	2011	Acceptable
16.0	12.8	7.56 - 18.8	4	2011	Acceptable
6.80	6.25	3.69 - 9.19	1	2012	Acceptable
8.91	8.60	5.08 - 12.6	2	2012	Acceptable
9.35	9.00	5.40 - 12.6	3	2012	Acceptable
10.0	8.60	5.16 - 12.0	4	2012	Acceptable
14.7	12.5	7.50 - 17.5	1	2013	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
Agilent II					
1,1,1-Trichloroethane					
6.11	6.44	4.64 - 7.99	2	2012	Acceptable
8.50	8.78	5.27 - 12.3	3	2012	Acceptable
13.2	11.7	9.36 - 14.0	4	2012	Acceptable
3.45	3.05	1.83 - 4.27	1	2013	Acceptable
1,1,2-Trichloroethane					
3.12	3.03	2.34 - 3.73	2	2012	Acceptable
19.2	19.1	15.3 - 22.9	3	2012	Acceptable
4.01	3.94	2.36 - 5.52	4	2012	Acceptable
23.7	18.6	14.9 - 22.3	1	2013	Not Acceptable
1,1-Dichloroethene					
16.5	18.1	12.5 - 23.7	2	2012	Acceptable
7.88	7.46	4.48 - 10.4	3	2012	Acceptable
7.69	7.06	4.24 - 9.88	4	2012	Acceptable
19.0	15.8	12.6 - 19.0	1	2013	Acceptable
1,2,4-Trichlorobenzene					
NA	6.84	4.38 - 8.62	2	2012	Not Evaluated
NA	2.94	1.76 - 4.12	3	2012	Not Evaluated
NA	6.41	3.85 - 8.97	4	2012	Not Evaluated
NA	17.0	13.6 - 20.4	1	2013	Not Evaluated
1,2-Dichlorobenzene					
19.6	18.3	14.0 - 22.3	2	2012	Acceptable
19.6	19.3	15.4 - 23.2	3	2012	Acceptable
14.9	14.2	11.4 - 17.0	4	2012	Acceptable
10.6	9.44	5.66 - 13.2	1	2013	Acceptable
1,2-Dichloroethane					
10.0	8.78	6.82 - 11.0	2	2012	Acceptable
3.26	2.96	1.78 - 4.14	3	2012	Acceptable
7.39	6.71	4.03 - 9.39	4	2012	Acceptable
3.46	2.22	1.33 - 3.11	1	2013	Not Acceptable
1,2-Dichloropropane					
NA	15.0	11.6 - 18.4	2	2012	Not Evaluated
NA	6.77	4.06 - 9.48	3	2012	Not Evaluated
NA	12.5	10.0 - 15.0	4	2012	Not Evaluated
NA	3.26	1.96 - 4.56	1	2013	Not Evaluated
1,4-Dichlorobenzene					
6.09	6.72	4.84 - 8.27	2	2012	Acceptable
8.61	8.84	5.30 - 12.4	3	2012	Acceptable
12.8	13.6	10.9 - 16.3	4	2012	Acceptable
18.2	16.0	12.8 - 19.2	1	2013	Acceptable
Benzene					
13.6	14.0	11.0 - 16.9	2	2012	Acceptable
7.46	7.52	4.51 - 10.5	3	2012	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
13.1	12.5	10.0 - 15.0	4	2012	Acceptable
17.4	15.0	12.0 - 18.0	1	2013	Acceptable
cis-1,2-Dichloroethene					
33.1	31.9	23.9 - 39.2	2	2012	Acceptable
14.8	15.0	12.0 - 18.0	3	2012	Acceptable
27.1	25.0	20.0 - 30.0	4	2012	Acceptable
24.1	21.2	17.0 - 25.4	1	2013	Acceptable
Carbon Tetrachloride					
4.97	5.76	3.95 - 7.26	2	2012	Acceptable
15.7	15.9	12.7 - 19.1	3	2012	Acceptable
12.0	10.9	8.72 - 13.1	4	2012	Acceptable
14.6	12.4	9.92 - 14.9	1	2013	Acceptable
Chlorobenzene					
5.21	5.88	4.59 - 7.17	2	2012	Acceptable
21.2	21.6	17.3 - 25.9	3	2012	Acceptable
16.7	16.4	13.1 - 19.7	4	2012	Acceptable
18.7	16.2	13.0 - 19.4	1	2013	Acceptable
Diisopropyl Ether					
18.6	18.7	15.2 - 23.4	2	2012	Acceptable
34.7	31.4	25.5 - 39.2	3	2012	Acceptable
36.3	31.4	25.5 - 39.2	4	2012	Acceptable
29.2	24.2	19.6 - 30.2	1	2013	Acceptable
Ethylbenzene					
13.5	15.4	11.7 - 19.1	2	2012	Acceptable
19.3	19.2	15.4 - 23.0	3	2012	Acceptable
20.3	19.2	15.4 - 23.0	4	2012	Acceptable
10.6	9.22	5.53 - 12.9	1	2013	Acceptable
Methylene Chloride					
19.7	17.9	12.4 - 22.9	2	2012	Acceptable
5.02	5.22	3.13 - 7.31	3	2012	Acceptable
19.4	18.4	14.7 - 22.1	4	2012	Acceptable
22.4	17.8	14.2 - 21.4	1	2013	Not Acceptable
m-Xylene					
NS	5.77	4.36 - 7.15	2	2012	Not Evaluated
NS	4.81	3.64 - 5.96	3	2012	Not Evaluated
NS	2.27	1.72 - 2.81	4	2012	Not Evaluated
NS	13.1	9.90 - 16.2	1	2013	Not Evaluated
o-Xylene					
9.06	9.97	7.54 - 12.4	2	2012	Acceptable
7.29	7.18	5.43 - 8.90	3	2012	Acceptable
4.23	4.23	3.20 - 5.24	4	2012	Acceptable
17.1	12.6	9.52 - 15.6	1	2013	Not Acceptable
p-Xylene					
NS	15.5	11.7 - 19.2	2	2012	Not Evaluated
NS	15.8	11.9 - 19.6	3	2012	Not Evaluated

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
NS	3.48	2.63 - 4.32	4	2012	Not Evaluated
NS	10.7	8.09 - 13.3	1	2013	Not Evaluated
Styrene					
NA	14.0	10.5 - 17.6	2	2012	Not Evaluated
NA	12.3	9.84 - 14.8	3	2012	Not Evaluated
NA	6.01	3.61 - 8.41	4	2012	Not Evaluated
NA	16.5	13.2 - 19.8	1	2013	Not Evaluated
trans-1,2-Dichloroethene					
5.98	6.67	4.96 - 8.34	2	2012	Acceptable
12.9	12.8	10.2 - 15.4	3	2012	Acceptable
15.4	14.2	11.4 - 17.0	4	2012	Acceptable
18.2	15.9	12.7 - 19.1	1	2013	Acceptable
tert-Amyl Methyl Ether					
33.6	36.8	27.6 - 47.1	2	2012	Acceptable
12.1	11.3	8.45 - 14.4	3	2012	Acceptable
11.2	11.3	8.45 - 14.4	4	2012	Acceptable
18.5	18.0	13.5 - 22.9	1	2013	Acceptable
tert-Butyl Alcohol					
28.9	28.6	17.1 - 39.8	2	2012	Acceptable
32.0	34.8	20.7 - 48.4	3	2012	Acceptable
37.3	34.8	20.7 - 48.4	4	2012	Acceptable
36.5	36.6	21.8 - 50.9	1	2013	Acceptable
tert-Butyl Ethyl Ether					
29.5	31.3	24.7 - 40.4	2	2012	Acceptable
9.94	9.10	7.19 - 11.7	3	2012	Acceptable
9.46	9.10	7.19 - 11.7	4	2012	Acceptable
10.7	9.98	7.88 - 12.9	1	2013	Acceptable
tert-Butyl Methyl Ether					
16.5	18.3	14.5 - 22.7	2	2012	Acceptable
42.6	41.4	33.1 - 49.7	3	2012	Acceptable
46.8	41.4	33.1 - 49.7	4	2012	Acceptable
32.5	29.8	23.8 - 35.8	1	2013	Acceptable
Tetrachloroethene					
10.3	11.0	7.52 - 13.3	2	2012	Acceptable
3.99	3.90	2.34 - 5.46	3	2012	Acceptable
16.1	14.2	11.4 - 17.0	4	2012	Acceptable
10.3	8.72	5.23 - 12.2	1	2013	Acceptable
Toluene					
7.15	8.39	6.49 - 10.2	2	2012	Acceptable
16.3	16.3	13.0 - 19.6	3	2012	Acceptable
20.3	19.2	15.4 - 23.0	4	2012	Acceptable
23.6	18.5	14.8 - 22.2	1	2013	Not Acceptable
Total Xylenes					
29.2	31.2	23.6 - 38.7	2	2012	Acceptable
28.0	27.8	21.0 - 34.5	3	2012	Acceptable

Table A26. Performance Evaluation sample results returned by Shaw Environmental Laboratory (Ada) for ICP-OES metals, ICP-MS metals, and VOCs.

Reported Value (µg/L or mg/L)	Certified Value (µg/L or mg/L)	Acceptance Range	Quarter	Year	Performance Evaluation
10.2	9.98	5.99 - 14.0	4	2012	Acceptable
44.8	36.4	2.91 - 43.7	1	2013	Not Acceptable
Trichloroethene					
8.44	8.59	6.36 - 10.2	2	2012	Acceptable
9.16	9.24	5.54 - 12.9	3	2012	Acceptable
22.4	20.0	16.0 - 24.0	4	2012	Acceptable
10.2	8.49	5.09 - 11.9	1	2013	Acceptable
Vinyl Chloride					
8.60	8.60	5.08 - 12.6	2	2012	Acceptable
10.2	9.00	5.40 - 12.6	3	2012	Acceptable
9.36	8.60	5.16 - 12.0	4	2012	Acceptable
15.8	12.5	7.50 - 17.5	1	2013	Acceptable

Table A27. Performance Evaluation sample results returned by EPA Region 8 Laboratory for semi-volatile organic compounds, diesel range organic compounds, and gasoline range organic compounds.

Reported Value	Assigned Value	Acceptance Limits	Performance Period	Performance Evaluation
(µg/L)	(µg/L)	(µg/L)		
Gasoline Range Organics (GRO) EPA Method 8015D (ORGM-506 r1.0)				
2860	2890	1120 - 5100	Fall 2010	Acceptable
2760	2930	1140 – 5170	Spring 2011	Acceptable
3350	3130	1200 – 5470	Fall 2011	Acceptable
2270	2530	949 – 4440	Spring 2012	Acceptable
4260	3780	1470 – 6590	Fall 2012	Acceptable
3500	3290	1270 – 5750	Spring 2013	Acceptable
Diesel Range Organics (DRO) EPA Method 8015D (ORGM-508 r1.0)				
1820	2630	623 - 3410	Fall 2010	Acceptable
1320	1970	440 – 2580	Spring 2011	Acceptable
799	1030	103 - 1460	Fall 2011	Acceptable
6940	5390	1530 – 6670	Spring 2012	Not Acceptable
2240	2960	651 – 3770	Fall 2012	Acceptable
2220	2300	412 – 2980	Spring 2013	Acceptable
Semi Volatile Organic Compounds (sVOC) by EPA Method 8270D (ORGM 515 r1.1)				
1,2,4-Trichlorobenzene				
148	150	34.2 - 176	Fall 2010	Acceptable
68.4	73	15.3 - 88.8	Spring 2011	Acceptable
41.6	67.8	14.0 - 82.9	Fall 2011	Acceptable
< 10	< 5.00	0.00 - 5.00	Spring 2012	Acceptable
89.9	93.9	20.4 - 113	Fall 2012	Acceptable
50.4	55.6	11.0 - 69.0	Spring 2013	Acceptable
1,2-Dichlorobenzene				
< 5	0	---	Fall 2010	Acceptable
< 10	0	---	Spring 2011	Acceptable
36.3	90	10.7 - 108	Fall 2011	Acceptable
< 10	< 3.00	0.00 - 3.00	Spring 2012	Acceptable
74.2	82.5	9.56 - 99.8	Fall 2012	Acceptable
< 10	< 3.00	0.00 - 3.00	Spring 2013	Acceptable
1,3-Dichlorobenzene				
30.3	32.1	4.73 - 40.0	Fall 2010	Acceptable
65.4	74.6	9.48 - 88.0	Spring 2011	Acceptable
17.6	48.2	6.53 - 58.2	Fall 2011	Acceptable
120	145	17.4 - 168	Spring 2012	Acceptable
36.6	42.6	5.91 - 51.9	Fall 2012	Acceptable
29	32.5	4.78 - 40.5	Spring 2013	Acceptable
1,4-Dichlorobenzene				
< 5	0	---	Fall 2010	Acceptable

Table A27. Performance Evaluation sample results returned by EPA Region 8 Laboratory for semi-volatile organic compounds, diesel range organic compounds, and gasoline range organic compounds.

Reported Value	Assigned Value	Acceptance Limits	Performance Period	Performance Evaluation
< 10	0	---	Spring 2011	Acceptable
< 2.5	< 3.00	0.00 - 3.00	Fall 2011	Acceptable
< 10	< 3.00	0.00 - 3.00	Spring 2012	Acceptable
116	133	13.3 - 157	Fall 2012	Acceptable
< 10	< 3.00	0.00 - 3.00	Spring 2013	Acceptable
2,3,4,6-Tetrachlorophenol				
< 5	0	---	Fall 2010	Acceptable
139	138	31.0 - 186	Spring 2011	Acceptable
87.5	121	42.2 - 160	Fall 2011	Acceptable
42.2	43.7	15.2 - 57.8	Spring 2012	Acceptable
116	121	42.2 - 160	Fall 2012	Acceptable
70.9	76.4	26.6 - 101	Spring 2013	Acceptable
2,4,5-Trichlorophenol				
99.5	108	38.5 - 138	Fall 2010	Acceptable
188	165	57.0 - 208	Spring 2011	Acceptable
129	175	60.3 - 221	Fall 2011	Acceptable
81	88.1	32.0 - 114	Spring 2012	Acceptable
108	112	39.8 - 143	Fall 2012	Acceptable
97.8	111	39.5 - 142	Spring 2013	Acceptable
2,4,6-Trichlorophenol				
77.2	88.4	28.2 - 112	Fall 2010	Acceptable
< 10	0	---	Spring 2011	Acceptable
148	198	63.3 - 244	Fall 2011	Acceptable
89.4	93.1	29.7 - 118	Spring 2012	Acceptable
152	154	49.2 - 191	Fall 2012	Acceptable
96.4	99.7	31.8 - 126	Spring 2013	Acceptable
2,4-Dichlorophenol				
69.2	77.6	24.2 - 97.8	Fall 2010	Acceptable
125	126	40.9 - 155	Spring 2011	Acceptable
77.9	99.7	31.8 - 124	Fall 2011	Acceptable
77.3	82.3	25.8 - 103	Spring 2012	Acceptable
56.5	57.6	17.3 - 74.2	Fall 2012	Acceptable
44	47.5	13.8 - 62.3	Spring 2013	Acceptable
2,4-Dimethylphenol				
145	144	31.8 - 188	Fall 2010	Acceptable
86.2	88.4	18.0 - 116	Spring 2011	Acceptable
86.7	111	23.6 - 146	Fall 2011	Acceptable
< 10	< 10.0	0.00 - 10.0	Spring 2012	Acceptable
92.9	108	22.9 - 142	Fall 2012	Acceptable
87.9	95.5	19.8 - 126	Spring 2013	Acceptable

Table A27. Performance Evaluation sample results returned by EPA Region 8 Laboratory for semi-volatile organic compounds, diesel range organic compounds, and gasoline range organic compounds.

Reported Value	Assigned Value	Acceptance Limits	Performance Period	Performance Evaluation
2,4-Dinitrophenol				
96.9	132	13.2 - 183	Fall 2010	Acceptable
103	103	10.3 - 149	Spring 2011	Acceptable
112	166	16.6 - 222	Fall 2011	Acceptable
92.3	131	13.1 - 181	Spring 2012	Acceptable
< 30	< 10.0	0.00 - 10.0	Fall 2012	Acceptable
98.9	110	11.0 - 157	Spring 2013	Acceptable
2,4-Dinitrotoluene				
95.1	116	43.3 - 143	Fall 2010	Acceptable
102	127	47.7 - 156	Spring 2011	Acceptable
48.6	62.4	22.1 - 79.5	Fall 2011	Acceptable
17.3	39.6	13.1 - 52.5	Spring 2012	Acceptable
< 10	< 5.30	0.00 - 5.30	Fall 2012	Acceptable
66.4	77.1	27.9 - 96.9	Spring 2013	Acceptable
2,6-Dinitrotoluene				
134	160	67.2 - 200	Fall 2010	Acceptable
68.4	88.1	36.2 - 110	Spring 2011	Acceptable
103	129	53.8 - 161	Fall 2011	Acceptable
< 10	< 6.70	0.00 - 6.70	Spring 2012	Acceptable
< 10	< 6.70	0.00 - 6.70	Fall 2012	Acceptable
< 10	< 6.70	0.00 - 6.70	Spring 2013	Acceptable
2-Chloronaphthalene				
35.2	38.3	11.1 - 47.4	Fall 2010	Acceptable
157	164	50.6 - 197	Spring 2011	Acceptable
< 2.5	< 5.40	0.00 - 5.40	Fall 2011	Acceptable
18.8	28	7.91 - 35.2	Spring 2012	Acceptable
77.3	78.3	23.7 - 95.1	Fall 2012	Acceptable
82.7	89.4	27.2 - 108	Spring 2013	Acceptable
2-Chlorophenol				
69.4	76.8	23.1 - 97.1	Fall 2010	Acceptable
81	84.1	25.0 - 106	Spring 2011	Acceptable
133	156	44.1 - 196	Fall 2011	Acceptable
95.2	99.6	29.2 - 125	Spring 2012	Acceptable
116	119	34.3 - 150	Fall 2012	Acceptable
86.6	92.2	27.2 - 116	Spring 2013	Acceptable
2-Methylnaphthalene				
118	115	23.0 - 132	Fall 2010	Acceptable
66.2	71.3	13.0 - 86.4	Spring 2011	Acceptable
47.8	64.2	11.4 - 79.0	Fall 2011	Acceptable
< 10	< 3.50	0.00 - 3.50	Spring 2012	Acceptable

Table A27. Performance Evaluation sample results returned by EPA Region 8 Laboratory for semi-volatile organic compounds, diesel range organic compounds, and gasoline range organic compounds.

Reported Value	Assigned Value	Acceptance Limits	Performance Period	Performance Evaluation
< 10	< 3.50	0.00 - 3.50	Fall 2012	Acceptable
31.7	32.1	4.01 - 45.7	Spring 2013	Acceptable
2-Methylphenol				
75.9	80.4	15.2 - 100	Fall 2010	Acceptable
97.8	97.8	18.4 - 121	Spring 2011	Acceptable
92.9	114	21.5 - 141	Fall 2011	Acceptable
114	112	21.1 - 138	Spring 2012	Acceptable
67	67.4	12.8 - 84.6	Fall 2012	Acceptable
49.8	51.4	9.78 - 65.2	Spring 2013	Acceptable
2-Nitroaniline				
< 5	0	---	Fall 2010	Acceptable
< 10	0	---	Spring 2011	Acceptable
< 2.5	< 10.0	0.00 - 10.0	Fall 2011	Acceptable
< 10	< 10.0	0.00 - 10.0	Spring 2012	Acceptable
< 10	< 10.0	0.00 - 10.0	Fall 2012	Acceptable
< 10	< 10.0	0.00 - 10.0	Spring 2013	Acceptable
2-Nitrophenol				
75.7	88.6	23.2 - 114	Fall 2010	Acceptable
< 10	0	---	Spring 2011	Acceptable
61.2	80.5	21.8 - 103	Fall 2011	Acceptable
89.3	94.9	24.4 - 122	Spring 2012	Acceptable
82.9	86.6	22.9 - 111	Fall 2012	Acceptable
54.2	57.5	17.6 - 72.1	Spring 2013	Acceptable
3,3'-Dichlorobenzidine				
< 5	0	---	Fall 2010	Acceptable
< 10	0	---	Spring 2011	Acceptable
< 5.0	< 60.0	0.00 - 60.0	Fall 2011	Acceptable
< 20	< 10.0	0.00 - 10.0	Spring 2012	Acceptable
< 10	< 10.0	0.00 - 10.0	Fall 2012	Acceptable
< 10	< 10.0	0.00 - 10.0	Spring 2013	Acceptable
3-Nitroaniline				
< 5	0	---	Fall 2010	Acceptable
< 10	0	---	Spring 2011	Acceptable
< 2.5	< 10.0	0.00 - 10.0	Fall 2011	Acceptable
< 20	< 10.0	0.00 - 10.0	Spring 2012	Acceptable
< 30	< 10.0	0.00 - 10.0	Fall 2012	Acceptable
< 30	< 10.0	0.00 - 10.0	Spring 2013	Acceptable
4,6-Dinitro-2-methylphenol				
70.9	84.1	24.6 - 116	Fall 2010	Acceptable
190	193	71.6 - 278	Spring 2011	Acceptable

Table A27. Performance Evaluation sample results returned by EPA Region 8 Laboratory for semi-volatile organic compounds, diesel range organic compounds, and gasoline range organic compounds.

Reported Value	Assigned Value	Acceptance Limits	Performance Period	Performance Evaluation
116	149	52.6 - 212	Fall 2011	Acceptable
73.3	82.6	23.9 - 114	Spring 2012	Acceptable
131	154	54.7 - 220	Fall 2012	Acceptable
172	195	72.4 - 281	Spring 2013	Acceptable
4-Bromophenyl-phenylether				
197	191	60.6 - 253	Fall 2010	Acceptable
137	143	45.9 - 190	Spring 2011	Acceptable
77.7	85.8	28.3 - 115	Fall 2011	Acceptable
< 10	< 8.10	0.00 - 8.10	Spring 2012	Acceptable
163	157	50.2 - 209	Fall 2012	Acceptable
86.5	95.4	31.3 - 128	Spring 2013	Acceptable
4-Chloro-3-methylphenol				
36.5	38.4	13.6 - 49.5	Fall 2010	Acceptable
52	55.8	20.7 - 71.8	Spring 2011	Acceptable
77.3	112	43.5 - 144	Fall 2011	Acceptable
94.1	95.6	36.9 - 123	Spring 2012	Acceptable
171	175	69.2 - 225	Fall 2012	Acceptable
35.8	37.2	13.1 - 48.0	Spring 2013	Acceptable
4-Chloroaniline				
< 5	0	---	Fall 2010	Acceptable
< 10	0	---	Spring 2011	Acceptable
< 5.0	< 10.0	0.00 - 10.0	Fall 2011	Acceptable
< 20	< 10.0	0.00 - 10.0	Spring 2012	Acceptable
< 30	< 10.0	0.00 - 10.0	Fall 2012	Acceptable
< 30	< 10.0	0.00 - 10.0	Spring 2013	Acceptable
4-Chlorophenyl-phenylether				
161	160	59.6 - 198	Fall 2010	Acceptable
< 10	0	---	Spring 2011	Acceptable
< 2.5	< 9.90	0.00 - 9.90	Fall 2011	Acceptable
64.2	98	36.8 - 122	Spring 2012	Acceptable
47.1	42	16.2 - 54.3	Fall 2012	Acceptable
174	177	65.9 - 218	Spring 2013	Acceptable
4-Methylphenol				
64.2	62.2	6.22 - 82.6	Fall 2010	Acceptable
117	112	11.2 - 145	Spring 2011	Acceptable
151	184	18.4 - 236	Fall 2011	Acceptable
169	159	15.9 - 204	Spring 2012	Acceptable
< 50	< 5.00	0.00 - 5.00	Fall 2012	Acceptable
68.1	65.5	6.55 - 86.8	Spring 2013	Acceptable

Table A27. Performance Evaluation sample results returned by EPA Region 8 Laboratory for semi-volatile organic compounds, diesel range organic compounds, and gasoline range organic compounds.

Reported Value	Assigned Value	Acceptance Limits	Performance Period	Performance Evaluation
4-Nitroaniline				
< 5	0	---	Fall 2010	Acceptable
< 10	0	---	Spring 2011	Acceptable
< 2.5	< 10.0	0.00 - 10.0	Fall 2011	Acceptable
< 10	< 10.0	0.00 - 10.0	Spring 2012	Acceptable
< 30	< 10.0	0.00 - 10.0	Fall 2012	Acceptable
< 30	< 10.0	0.00 - 10.0	Spring 2013	Acceptable
4-Nitrophenol				
91.5	106	10.6 - 144	Fall 2010	Acceptable
149	177	17.7 - 237	Spring 2011	Acceptable
83.6	133	13.3 - 179	Fall 2011	Acceptable
76.9	116	11.6 - 157	Spring 2012	Acceptable
145	162	16.2 - 217	Fall 2012	Acceptable
103	125	12.5 - 169	Spring 2013	Acceptable
Acenaphthene				
69	75.4	30.3 - 90.4	Fall 2010	Acceptable
41.4	46.6	19.5 - 56.9	Spring 2011	Acceptable
78.7	108	42.6 - 128	Fall 2011	Acceptable
30.2	52.3	21.6 - 63.5	Spring 2012	Acceptable
65	66.6	27.0 - 80.1	Fall 2012	Acceptable
27.4	29.2	12.9 - 36.7	Spring 2013	Acceptable
Acenaphthylene				
< 5	0	---	Fall 2010	Acceptable
23.8	26.4	9.67 - 33.9	Spring 2011	Acceptable
81.3	106	42.2 - 128	Fall 2011	Acceptable
23.6	41.1	15.7 - 51.4	Spring 2012	Acceptable
< 10	< 3.00	0.00 - 3.00	Fall 2012	Acceptable
25	26.4	9.67 - 33.9	Spring 2013	Acceptable
Aniline				
< 5	0	---	Fall 2010	Acceptable
< 20	0	---	Spring 2011	Acceptable
< 5.0	< 10.0	0.00 - 10.0	Fall 2011	Acceptable
< 10	< 10.0	0.00 - 10.0	Spring 2012	Acceptable
< 10	< 10.0	0.00 - 10.0	Fall 2012	Acceptable
< 10	< 10.0	0.00 - 10.0	Spring 2013	Acceptable
Anthracene				
109	105	44.2 - 131	Fall 2010	Acceptable
17.4	21.8	9.79 - 29.2	Spring 2011	Acceptable
89.3	109	45.8 - 136	Fall 2011	Acceptable
< 10	< 4.90	0.00 - 4.90	Spring 2012	Acceptable

Table A27. Performance Evaluation sample results returned by EPA Region 8 Laboratory for semi-volatile organic compounds, diesel range organic compounds, and gasoline range organic compounds.

Reported Value	Assigned Value	Acceptance Limits	Performance Period	Performance Evaluation
83.5	81.6	34.5 - 102	Fall 2012	Acceptable
103	107	45.0 - 133	Spring 2013	Acceptable
Benzo(a)anthracene				
62	68.7	31.1 - 87.3	Fall 2010	Acceptable
< 10	0	---	Spring 2011	Acceptable
< 2.5	< 3.90	0.00 - 3.90	Fall 2011	Acceptable
< 10	14.1	5.84 - 18.7	Spring 2012	Acceptable
36.3	38.3	17.0 - 49.1	Fall 2012	Acceptable
19.1	20.6	8.84 - 26.9	Spring 2013	Acceptable
Benzo(a)pyrene				
33.3	40.8	12.4 - 53.6	Fall 2010	Acceptable
< 10	29.8	9.26 - 40.2	Spring 2011	Not Acceptable
< 2.5	< 6.40	0.00 - 6.40	Fall 2011	Acceptable
16.8	26.9	8.42 - 36.6	Spring 2012	Acceptable
23.8	26.3	8.25 - 35.9	Fall 2012	Acceptable
23.2	25.3	7.96 - 34.7	Spring 2013	Acceptable
Benzo(b)fluoranthene				
31.9	36.4	12.5 - 50.3	Fall 2010	Acceptable
< 10	0	---	Spring 2011	Acceptable
< 2.5	< 5.80	0.00 - 5.80	Fall 2011	Acceptable
15.7	23.3	7.19 - 33.2	Spring 2012	Acceptable
< 10	< 5.80	0.00 - 5.80	Fall 2012	Acceptable
23.8	24.6	7.71 - 34.9	Spring 2013	Acceptable
Benzo(g,h,i)perylene				
< 5	0	---	Fall 2010	Acceptable
17.6	24.2	4.81 - 36.5	Spring 2011	Acceptable
< 2.5	< 2.90	0.00 - 2.90	Fall 2011	Acceptable
17.9	29.4	7.15 - 43.3	Spring 2012	Acceptable
< 10	< 2.90	0.00 - 2.90	Fall 2012	Acceptable
< 10	< 2.90	0.00 - 2.90	Spring 2013	Acceptable
Benzo(k)fluoranthene				
34.6	40	9.17 - 60.6	Fall 2010	Acceptable
< 10	0	---	Spring 2011	Acceptable
59.8	75.4	18.5 - 109	Fall 2011	Acceptable
23.7	35.2	7.90 - 54.0	Spring 2012	Acceptable
36.6	37.7	8.56 - 57.4	Fall 2012	Acceptable
< 10	< 5.00	0.00 - 5.00	Spring 2013	Acceptable
Benzoic acid				
< 5	0	---	Fall 2010	Acceptable
< 25	0	---	Spring 2011	Acceptable

Table A27. Performance Evaluation sample results returned by EPA Region 8 Laboratory for semi-volatile organic compounds, diesel range organic compounds, and gasoline range organic compounds.

Reported Value	Assigned Value	Acceptance Limits	Performance Period	Performance Evaluation
< 25	< 30.0	0.00 - 30.0	Fall 2011	Acceptable
< 25	< 30.0	0.00 - 30.0	Spring 2012	Acceptable
< 30	< 30.0	0.00 - 30.0	Fall 2012	Acceptable
< 30	< 30.0	0.00 - 30.0	Spring 2013	Acceptable
Benzyl alcohol				
< 5	0	---	Fall 2010	Acceptable
< 20	0	---	Spring 2011	Acceptable
< 2.5	< 10.0	0.00 - 10.0	Fall 2011	Acceptable
< 10	< 10.0	0.00 - 10.0	Spring 2012	Acceptable
< 10	< 10.0	0.00 - 10.0	Fall 2012	Acceptable
< 10	< 10.0	0.00 - 10.0	Spring 2013	Acceptable
bis(2-Chloroethoxy)methane				
< 5	0	---	Fall 2010	Acceptable
102	119	47.0 - 141	Spring 2011	Acceptable
46.2	61.3	24.0 - 73.7	Fall 2011	Acceptable
< 10	< 3.60	0.00 - 3.60	Spring 2012	Acceptable
< 10	< 3.60	0.00 - 3.60	Fall 2012	Acceptable
< 10	< 3.60	0.00 - 3.60	Spring 2013	Acceptable
bis(2-Chloroethyl)ether				
104	105	28.5 - 128	Fall 2010	Acceptable
26.6	29.2	9.58 - 39.4	Spring 2011	Acceptable
16.9	21	7.53 - 29.8	Fall 2011	Acceptable
122	163	43.0 - 196	Spring 2012	Acceptable
93.5	103	28.0 - 126	Fall 2012	Acceptable
< 10	< 4.80	0.00 - 4.80	Spring 2013	Acceptable
bis(2-Chloroisopropyl)ether				
91	95.2	23.9 - 117	Fall 2010	Acceptable
45.4	47.6	13.4 - 61.1	Spring 2011	Acceptable
47.2	71.4	18.7 - 88.9	Fall 2011	Acceptable
56.1	70.8	18.6 - 88.2	Spring 2012	Acceptable
63.6	65.4	17.4 - 81.9	Fall 2012	Acceptable
37.8	37.6	11.2 - 49.4	Spring 2013	Acceptable
bis(2-Ethylhexyl)phthalate				
44	54.8	16.6 - 78.5	Fall 2010	Acceptable
41.8	48.6	14.9 - 70.4	Spring 2011	Acceptable
42.2	48.6	14.9 - 70.4	Fall 2011	Acceptable
55	85.4	25.4 - 118	Spring 2012	Acceptable
74.7	78.5	23.4 - 109	Fall 2012	Acceptable
< 20	< 6.60	0.00 - 6.60	Spring 2013	Acceptable

Table A27. Performance Evaluation sample results returned by EPA Region 8 Laboratory for semi-volatile organic compounds, diesel range organic compounds, and gasoline range organic compounds.

Reported Value	Assigned Value	Acceptance Limits	Performance Period	Performance Evaluation
Butylbenzylphthalate				
141	150	30.8 - 212	Fall 2010	Acceptable
55.4	63.4	7.98 - 94.3	Spring 2011	Acceptable
86.4	113	21.0 - 161	Fall 2011	Acceptable
113	165	34.7 - 232	Spring 2012	Acceptable
103	106	19.2 - 152	Fall 2012	Acceptable
72	80.6	12.5 - 118	Spring 2013	Acceptable
Carbazole				
< 5	0	---	Fall 2010	Acceptable
< 10	0	---	Spring 2011	Acceptable
< 2.5	< 10.0	0.00 - 10.0	Fall 2011	Acceptable
< 10	< 10.0	0.00 - 10.0	Spring 2012	Acceptable
< 30	< 10.0	0.00 - 10.0	Fall 2012	Acceptable
< 30	< 10.0	0.00 - 10.0	Spring 2013	Acceptable
Chrysene				
20.3	24	10.5 - 34.2	Fall 2010	Acceptable
30.6	33.8	14.2 - 46.5	Spring 2011	Acceptable
28	36	15.1 - 49.3	Fall 2011	Acceptable
17.4	27	11.6 - 38.0	Spring 2012	Acceptable
40.9	41.7	17.2 - 56.4	Fall 2012	Acceptable
29.1	29.3	12.5 - 40.9	Spring 2013	Acceptable
Dibenz(a,h)anthracene				
< 5	0		Fall 2010	Acceptable
25	33.8	8.95 - 49.4	Spring 2011	Acceptable
21.8	28.2	7.33 - 41.9	Fall 2011	Acceptable
< 10	< 4.90	0.00 - 4.90	Spring 2012	Acceptable
31.9	33.9	8.98 - 49.5	Fall 2012	Acceptable
27	25.1	6.43 - 37.7	Spring 2013	Acceptable
Dibenzofuran				
38.1	39.7	15.0 - 52.6	Fall 2010	Acceptable
31.8	33.6	13.0 - 45.4	Spring 2011	Acceptable
29.8	35.8	13.8 - 48.0	Fall 2011	Acceptable
66.8	105	36.7 - 130	Spring 2012	Acceptable
51.8	45.8	17.1 - 59.8	Fall 2012	Acceptable
< 10	< 11.0	0.00 - 11.0	Spring 2013	Acceptable
Diethylphthalate				
120	119	22.0 - 163	Fall 2010	Acceptable
94.4	97.6	17.6 - 135	Spring 2011	Acceptable
94.6	114	21.0 - 156	Fall 2011	Acceptable
92.5	146	27.6 - 198	Spring 2012	Acceptable

Table A27. Performance Evaluation sample results returned by EPA Region 8 Laboratory for semi-volatile organic compounds, diesel range organic compounds, and gasoline range organic compounds.

Reported Value	Assigned Value	Acceptance Limits	Performance Period	Performance Evaluation
97	94.9	17.0 - 132	Fall 2012	Acceptable
< 10	< 10.0	0.00 - 10.0	Spring 2013	Acceptable
Dimethylphthalate				
155	150	15.0 - 216	Fall 2010	Acceptable
149	157	15.7 - 225	Spring 2011	Acceptable
< 2.5	< 10.0	0.00 - 10.0	Fall 2011	Acceptable
< 10	< 10.0	0.00 - 10.0	Spring 2012	Acceptable
< 10	< 10.0	0.00 - 10.0	Fall 2012	Acceptable
< 10	< 10.0	0.00 - 10.0	Spring 2013	Acceptable
Di-n-butylphthalate				
< 5	0	---	Fall 2010	Acceptable
< 10	0	---	Spring 2011	Acceptable
83.5	91.9	30.2 - 121	Fall 2011	Acceptable
58.9	86.8	28.7 - 115	Spring 2012	Acceptable
51.8	51.9	17.8 - 72.1	Fall 2012	Acceptable
< 10	< 14.0	0.00 - 14.0	Spring 2013	Acceptable
Di-n-octylphthalate				
41.3	51.3	15.5 - 78.0	Fall 2010	Acceptable
76	82	19.7 - 122	Spring 2011	Acceptable
107	123	25.2 - 181	Fall 2011	Acceptable
81.3	132	26.4 - 194	Spring 2012	Acceptable
< 10	< 14.0	0.00 - 14.0	Fall 2012	Acceptable
55.5	68.4	17.8 - 103	Spring 2013	Acceptable
Fluoranthene				
144	153	66.8 - 181	Fall 2010	Acceptable
51.2	55.7	25.5 - 69.9	Spring 2011	Acceptable
153	178	77.4 - 210	Fall 2011	Acceptable
75.9	113	49.8 - 135	Spring 2012	Acceptable
< 10	< 14.0	0.00 - 14.0	Fall 2012	Acceptable
64.6	69.6	31.4 - 85.8	Spring 2013	Acceptable
Fluorene				
104	104	45.1 - 124	Fall 2010	Acceptable
83.6	82.6	35.1 - 99.7	Spring 2011	Acceptable
116	138	61.1 - 162	Fall 2011	Acceptable
94.5	151	67.2 - 176	Spring 2012	Acceptable
80.6	77.8	32.8 - 94.3	Fall 2012	Acceptable
64.8	67.2	27.9 - 82.5	Spring 2013	Acceptable
Hexachlorobenzene				
78.7	80	34.5 - 99.0	Fall 2010	Acceptable
150	149	65.4 - 181	Spring 2011	Acceptable

Table A27. Performance Evaluation sample results returned by EPA Region 8 Laboratory for semi-volatile organic compounds, diesel range organic compounds, and gasoline range organic compounds.

Reported Value	Assigned Value	Acceptance Limits	Performance Period	Performance Evaluation
95.5	107	46.6 - 131	Fall 2011	Acceptable
18.7	29.4	11.9 - 39.1	Spring 2012	Acceptable
59.7	59.7	25.5 - 75.0	Fall 2012	Acceptable
44.1	46.7	19.6 - 59.6	Spring 2013	Acceptable
Hexachlorobutadiene				
65.9	67.8	6.78 - 83.9	Fall 2010	Acceptable
< 10	0	---	Spring 2011	Acceptable
< 5.0	< 5.00	0.00 - 5.00	Fall 2011	Acceptable
97.5	128	15.3 - 151	Spring 2012	Acceptable
102	112	13.0 - 133	Fall 2012	Acceptable
67.7	71.2	7.17 - 87.6	Spring 2013	Acceptable
Hexachlorocyclopentadiene				
< 5	0	---	Fall 2010	Acceptable
< 10	152	15.2 - 196	Spring 2011	Not Acceptable
102	146	14.6 - 189	Fall 2011	Acceptable
< 10	< 10.0	0.00 - 10.0	Spring 2012	Acceptable
106	133	13.3 - 173	Fall 2012	Acceptable
< 10	< 10.0	0.00 - 10.0	Spring 2013	Acceptable
Hexachloroethane				
145	150	15.9 - 175	Fall 2010	Acceptable
134	150	15.9 - 175	Spring 2011	Acceptable
22.8	65.8	6.69 - 78.7	Fall 2011	Acceptable
97.4	115	12.1 - 135	Spring 2012	Acceptable
84.2	97.1	10.1 - 114	Fall 2012	Acceptable
83.4	120	12.6 - 141	Spring 2013	Acceptable
Indeno(1,2,3-cd)pyrene				
< 5	0	---	Fall 2010	Acceptable
32.6	40.7	8.06 - 56.4	Spring 2011	Acceptable
< 2.5	< 4.30	0.00 - 4.30	Fall 2011	Acceptable
< 10	< 4.30	0.00 - 4.30	Spring 2012	Acceptable
< 10	< 4.30	0.00 - 4.30	Fall 2012	Acceptable
28.9	33.7	5.60 - 48.2	Spring 2013	Acceptable
Isophorone				
< 5	0	---	Fall 2010	Acceptable
< 10	0	---	Spring 2011	Acceptable
90.3	115	44.9 - 148	Fall 2011	Acceptable
43.1	63.3	25.3 - 82.4	Spring 2012	Acceptable
< 10	< 13.0	0.00 - 13.0	Fall 2012	Acceptable
41.8	42.3	17.4 - 55.7	Spring 2013	Acceptable

Table A27. Performance Evaluation sample results returned by EPA Region 8 Laboratory for semi-volatile organic compounds, diesel range organic compounds, and gasoline range organic compounds.

Reported Value	Assigned Value	Acceptance Limits	Performance Period	Performance Evaluation
Naphthalene				
< 5	0	---	Fall 2010	Acceptable
58	62.6	18.0 - 76.6	Spring 2011	Acceptable
< 2.5	< 10.0	0.00 - 10.0	Fall 2011	Acceptable
96.1	130	33.8 - 154	Spring 2012	Acceptable
160	169	43.0 - 198	Fall 2012	Acceptable
101	112	29.6 - 133	Spring 2013	Acceptable
Nitrobenzene				
< 5	0	---	Fall 2010	Acceptable
< 10	0	---	Spring 2011	Acceptable
113	147	45.4 - 177	Fall 2011	Acceptable
< 10	< 7.20	0.00 - 7.20	Spring 2012	Acceptable
115	118	36.7 - 143	Fall 2012	Acceptable
< 10	< 7.20	0.00 - 7.20	Spring 2013	Acceptable
N-Nitrosodiethylamine				
---	0	---	Fall 2010	Not Reported
---	0	---	Spring 2011	Not Reported
---	< 10.0	0.00 - 10.0	Fall 2011	Not Reported
---	< 10.0	0.00 - 10.0	Spring 2012	Not Reported
---	< 10.0	0.00 - 10.0	Fall 2012	Not Reported
---	< 10.0	0.00 - 10.0	Spring 2013	Not Reported
N-Nitrosodimethylamine				
---	170	17.0 - 198	Fall 2010	Not Reported
81.4	97.3	9.73 - 116	Spring 2011	Acceptable
121	146	14.6 - 171	Fall 2011	Acceptable
145	156	15.6 - 183	Spring 2012	Acceptable
156	170	17.0 - 198	Fall 2012	Acceptable
82.7	94.7	9.47 - 113	Spring 2013	Acceptable
N-Nitroso-di-n-propylamine				
117	131	40.6 - 164	Fall 2010	Acceptable
111	125	38.5 - 157	Spring 2011	Acceptable
80.9	121	37.1 - 152	Fall 2011	Acceptable
39.4	58.4	14.9 - 78.9	Spring 2012	Acceptable
< 10	< 4.80	0.00 - 4.80	Fall 2012	Acceptable
< 10	< 4.80	0.00 - 4.80	Spring 2013	Acceptable
Pentachlorophenol				
54.5	64.4	14.1 - 89.0	Fall 2010	Acceptable
153	150	41.1 - 207	Spring 2011	Acceptable
131	193	54.6 - 267	Fall 2011	Acceptable
74.2	82.7	19.9 - 114	Spring 2012	Acceptable

Table A27. Performance Evaluation sample results returned by EPA Region 8 Laboratory for semi-volatile organic compounds, diesel range organic compounds, and gasoline range organic compounds.

Reported Value	Assigned Value	Acceptance Limits	Performance Period	Performance Evaluation
133	137	37.0 - 189	Fall 2012	Acceptable
105	113	29.4 - 156	Spring 2013	Acceptable
		Phenanthrene		
40.4	40.5	20.2 - 51.8	Fall 2010	Acceptable
64.8	70.1	33.1 - 85.9	Spring 2011	Acceptable
< 2.5	< 15.0	0.00 - 15.0	Fall 2011	Acceptable
< 10	< 15.0	0.00 - 15.0	Spring 2012	Acceptable
38.3	39	19.5 - 50.0	Fall 2012	Acceptable
48.1	51.3	24.9 - 64.2	Spring 2013	Acceptable
		Phenol		
< 5	0	---	Fall 2010	Acceptable
139	137	13.7 - 184	Spring 2011	Acceptable
83.6	111	11.1 - 150	Fall 2011	Acceptable
155	161	16.1 - 216	Spring 2012	Acceptable
128	136	13.6 - 183	Fall 2012	Acceptable
113	114	11.4 - 154	Spring 2013	Acceptable
		Pyrene		
67.2	73.3	24.2 - 101	Fall 2010	Acceptable
41.2	43.8	14.2 - 62.9	Spring 2011	Acceptable
25.9	32.8	10.5 - 48.6	Fall 2011	Acceptable
27	41.2	13.4 - 59.5	Spring 2012	Acceptable
58.4	57.3	18.8 - 80.5	Fall 2012	Acceptable
71.6	76.4	25.2 - 105	Spring 2013	Acceptable
		Pyridine		
---	0	---	Fall 2010	Not Reported
< 25	0	---	Spring 2011	Acceptable
< 2.5	< 10.0	0.00 - 10.0	Fall 2011	Acceptable
< 10	< 10.0	0.00 - 10.0	Spring 2012	Acceptable
< 10	< 10.0	0.00 - 10.0	Fall 2012	Acceptable
< 10	< 10.0	0.00 - 10.0	Spring 2013	Acceptable

Table A28. Field QC Data for YSI Electrode Measurements.

Parameter	Electrode Reading	Acceptance Range	Performance Evaluation
September 2011			
September 19, 2011 initial/ mid-day			
Specific Conductance	7826	7630 - 8010	Acceptable
ORP	224.2	212 -242	Acceptable
pH	7.00	6.8 - 7.2	Acceptable
September 19, 2011 end of day			
Specific Conductance	7921	7130 - 8010	Acceptable
ORP	221.6	212 – 242	Acceptable
pH	7.01	6.8 – 7.2	Acceptable
September 20, 2011 initial			
Specific Conductance	8003	7630 – 8010	Acceptable
ORP	229.3	212 – 242	Acceptable
pH	7.01	6.8 – 7.2	Acceptable
September 20, 2011 mid-day			
Specific Conductance	7996	7690 – 8080	Acceptable
ORP	245.9	204 - 254	Acceptable
pH	6.99	6.8 – 7.2	Acceptable
September 20, 2011 end of day			
Specific Conductance	8043	7690 – 8080	Acceptable
ORP	233.4	204 – 234	Acceptable
pH	7.02	6.8 – 7.2	Acceptable
September 21, 2011 initial			
Specific Conductance	8048	7690 – 8080	Acceptable
ORP	232.1	204 – 235	Acceptable
pH	6.98	6.8 – 7.2	Acceptable
September 21, 2011 mid-day			
Specific Conductance	7994	7690 – 8080	Acceptable
ORP	233.8	204 – 234	Acceptable
pH	6.98	6.8 – 7.2	Acceptable
September 21, 2011 end of day			
Specific Conductance	7924	7630 – 8010	Acceptable
ORP	225.6	212 – 242	Acceptable
pH	6.95	6.8 – 7.2	Acceptable
September 22, 2011 initial			
Specific Conductance	7919	7630 – 8010	Acceptable
ORP	226.6	212 – 242	Acceptable
pH	6.96	6.8 – 7.2	Acceptable
September 22, 2011 mid-day			
Specific Conductance	7829	7630 – 8010	Acceptable
ORP	230.6	212 – 242	Acceptable
pH	7.04	6.8 – 7.2	Acceptable

Table A28. Field QC Data for YSI Electrode Measurements.

Parameter	Electrode Reading	Acceptance Range	Performance Evaluation
September 22, 2011 end day			
Specific Conductance	7856	7690 – 8080	Acceptable
ORP	229.3	204 – 234	Acceptable
pH	7.01	6.8 – 7.2	Acceptable
March 2012			
March 5, 2012 initial			
Specific Conductance	7727	7600 - 7950	Acceptable
ORP	232.5	229 – 261	Acceptable
pH	6.97	6.8 – 7.2	Acceptable
March 5, 2012 mid-day			
Specific Conductance	7856	7630 – 7970	Acceptable
ORP	223.5	222 – 252	Acceptable
pH	7.07	6.8 – 7.2	Acceptable
March 5, 2012 end day			
Specific Conductance	7684	7630 – 8010	Acceptable
ORP	220.3	212 – 242	Acceptable
pH	7.07	6.8 – 7.2	Acceptable
March 6, 2012 initial			
Specific Conductance	7865	7600 – 7950	Acceptable
ORP	241.1	229 – 261	Acceptable
pH	7.01	6.8 – 7.2	Acceptable
March 6, 2012 mid-day			
Specific Conductance	7637	7630 – 7970	Acceptable
ORP	233.6	222 – 252	Acceptable
pH	7.05	6.8 – 7.2	Acceptable
March 6, 2012 end day			
Specific Conductance	7703	7630 – 7970	Acceptable
ORP	231.6	222 – 252	Acceptable
pH	6.95	6.8 – 7.2	Acceptable
March 7, 2012 initial			
Specific Conductance	7952	7630 – 7970	Acceptable
ORP	241.7	222 – 252	Acceptable
pH	7.02	6.8 – 7.2	Acceptable
March 7, 2012 mid-day			
Specific Conductance	7892	7630 – 7970	Acceptable
ORP	239.8	222 – 252	Acceptable
pH	7.06	6.8 – 7.2	Acceptable
March 7, 2012 end day			
Specific Conductance	7787	7630 – 7970	Acceptable
ORP	237.9	222 – 252	Acceptable
pH	7.06	6.8 – 7.2	Acceptable

Table A28. Field QC Data for YSI Electrode Measurements.

Parameter	Electrode Reading	Acceptance Range	Performance Evaluation
March 8, 2012 initial			
Specific Conductance	7667	7630 -7970	Acceptable
ORP	235.9	222 – 252	Acceptable
pH	7.04	6.8 – 7.2	Acceptable
March 8, 2012 end day			
Specific Conductance	7786	7630 -7970	Acceptable
ORP	242.8	222 – 252	Acceptable
pH	7.06	6.8 – 7.2	Acceptable
September 2012			
September 17, 2012 initial			
Specific Conductance	8001	7630 – 8010	Acceptable
ORP	229.9	212 – 242	Acceptable
pH	7.06	6.8 – 7.2	Acceptable
September 17, 2012 mid-day			
Specific Conductance	7995	7690 – 8080	Acceptable
ORP	214.4	204 – 234	Acceptable
pH	7.11	6.8 – 7.2	Acceptable
September 17, 2012 end day			
Specific Conductance	7925	7690 – 8080	Acceptable
ORP	222.4	204 – 234	Acceptable
pH	7.07	6.8 – 7.2	Acceptable
December 2012			
December 3, 2012 initial			
Specific Conductance	7994	7630 – 8010	Acceptable
ORP	233.4	222 – 252	Acceptable
pH	6.96	6.8 – 7.2	Acceptable
December 3, 2012 mid-day			
Specific Conductance	7977	7630 – 8010	Acceptable
ORP	230.5	212 – 242	Acceptable
pH	6.99	6.8 – 7.2	Acceptable
December 3, 2012 end day			
Specific Conductance	7891	7630 – 8010	Acceptable
ORP	226.8	212 -242	Acceptable
pH	6.98	6.8 – 7.2	Acceptable
December 4, 2012 initial			
Specific Conductance	8004	7630 – 8010	Acceptable
ORP	252.1	212 – 242	Acceptable
pH	6.99	6.8 – 7.2	Acceptable
December 4, 2012 mid-day			
Specific Conductance	7910	7630 – 8010	Acceptable

Table A28. Field QC Data for YSI Electrode Measurements.

Parameter	Electrode Reading	Acceptance Range	Performance Evaluation
ORP	233.5	212 – 242	Acceptable
pH	6.97	6.8 – 7.2	Acceptable
December 4, 2012 end day			
Specific Conductance	7937	7630 – 8010	Acceptable
ORP	233.5	212 - 242	Acceptable
pH	6.96	6.8 – 7.2	Acceptable
December 5, 2012 initial			
Specific Conductance	7662	7630 – 7970	Acceptable
ORP	235.4	222 – 252	Acceptable
pH	6.96	6.8 – 7.2	Acceptable
December 5, 2012 mid-day			
Specific Conductance	7742	7630 – 7970	Acceptable
ORP	237.9	222 – 252	Acceptable
pH	6.98	6.8 – 7.2	Acceptable
December 5, 2012 end day			
Specific Conductance	7705	7630 – 7970	Acceptable
ORP	236.0	222 – 252	Acceptable
pH	6.94	6.8 – 7.2	Acceptable
May 2013			
May 28, 2013 initial			
Specific Conductance	7817	7690 -8080	Acceptable
ORP	223.8	204 – 234	Acceptable
pH	6.96	6.8 – 7.2	Acceptable
May 28, 2013 end day			
Specific Conductance	7741	7690 – 8080	Acceptable
ORP	223.4	204 – 234	Acceptable
pH	6.99	6.8 – 7.2	Acceptable
May 29, 2013 initial[1]			
Specific Conductance[2]	7640	7630 – 8010	Acceptable
ORP[3]	237.5	212 - 242	Acceptable
pH[4]	7.09	6.8 – 7.2	Acceptable
May 29, 2013 initial			
Specific Conductance	7684	7630 – 8080	Acceptable
ORP	229.4	212 – 242	Acceptable
pH	6.96	6.8 – 7.2	Acceptable
May 29, 2013 end day[1]			
Specific Conductance	7730	7630 – 8010	Acceptable
ORP	220	212 – 242	Acceptable
pH	7.01	6.8 – 7.2	Acceptable
May 29, 2013 mid-day			
Specific Conductance	7751	7690 – 8080	Acceptable

Table A28. Field QC Data for YSI Electrode Measurements.

Parameter	Electrode Reading	Acceptance Range	Performance Evaluation
ORP	224.1	204 – 234	Acceptable
pH	7.03	6.8 – 7.2	Acceptable
May 29 , 2013 end day			
Specific Conductance	7720	7690 -8080	Acceptable
ORP	223.7	204 – 234	Acceptable
pH	7.03	6.8 – 7.2	Acceptable
May 30, 2013 initial			
Specific Conductance	7738	7630 – 8010	Acceptable
ORP	230.3	212 – 242	Acceptable
pH	6.98	6.8 – 7.2	Acceptable
May 30, 2013 end day			
Specific Conductance	7754	7630 – 8010	Acceptable
ORP	228.9	212 – 242	Acceptable
pH	7.00	6.8 – 7.2	Acceptable

[1]YSI was not used to measure field parameters in the produced water sample to reduce possibility of cross contamination.
[2]Oakton Acorn Series CON 6 conductivity meter.
[3]Oakton pH 110 series meter with ORP electrode.
[4]Oakton pH 110 series meter with pH electrode.

Table A29. Tentatively Identified Compounds (TICs) for sVOCs.

Sample	Compound (CAS Number)	Estimated Concentration (µg/L)
September 2011 Sampling Event		
Field Blank 9/19/2011	2-nonanone (821-55-6)	0.40
	2-undecanone (112-12-9)	1.64
Equipment Blank 9/19/2011	2-nonanone (821-55-6)	0.44
	2-undecanone (112-12-9)	1.77
	2.4-bis(1,1-dimethylethyl)phenol (96-76-4)	0.69
	Diisobutyl phthalate (84-69-5)	3.35
	Butylcyclohexyl phthalate (84-64-0)	0.44
WISETXGW06-092011	Diisobutyl phthalate (84-69-5)	1.56
WISETXGW07-092011	Diisobutyl phthalate (84-69-5)	0.71
WISETXGW08-092011	Butyl isobutyl phthalate (017851-53-5)	0.87
Equipment Blank 9/20/2011	2-undecanone (112-12-9)	1.25
	2.4-bis(1,1-dimethylethyl)phenol (96-76-4)	1.49
	4-(1,1,3,3-tetramethylbutyl) phenol (140-66-9)	0.26
	Diisobutyl phthalate (84-69-5)	2.89
	Tridecanoic acid (638-53-9)	0.83
	Octadecanoic acid	0.36
WISETXGW02-092011	3-hexanone (589-38-8)	0.62
	2-hexanone (591-78-6)	0.97
	3-heptanone (106-35-4)	0.76
	Acetophenone (983-86-2)	0.32
	Diisobutyl phthalate (84-69-5)	0.50
WISETXGW03-092011	3-hexanone (589-38-8)	0.39
	2-hexanone (591-78-6)	0.59
	3-heptanone (106-35-4)	0.36
WISETXGW12-092011	Butyl isobutyl phthalate (017851-53-5)	1.01
Field Blank 9/21/2011	2-nonanone (821-55-6)	0.37
	2-undecanone (112-12-9)	1.52
Equipment Blank 9/21/2011	2-nonanone (821-55-6)	0.45
	2-undecanone (112-12-9)	1.49
	2.4-bis(1,1-dimethylethyl)phenol (96-76-4)	1.45
WISETXGW05-092011	Butyl isobutyl phthalate (017851-53-5)	1.84
	Butyl citrate (77-94-1)	0.94
WISETXGW09-092011	Butyl isobutyl phthalate (017851-53-5)	0.98
WISETXGW11-092011	Hexamethyl Cyclosiloxane (541-05-9)	0.66
	Butyl isobutyl phthalate (017851-53-5)	0.60
WISETXSW01-092011	2,4-bis(1,1-dimethylethyl)phenol (96-76-4)	0.75
	Pentadecanoic acid (001002-84-2)	0.30

Table A29. Tentatively Identified Compounds (TICs) for sVOCs.

Sample	Compound (CAS Number)	Estimated Concentration (µg/L)
WISETXSW02-092011	1,3,5,7-cyclooctatetraene (629-20-9)	0.26
	2,4-bis(1,1-dimethylethyl)phenol (96-76-4)	0.63
	Pentadecanoic acid (001002-84-2)	0.34
WISETXSW02-092011 DUP	Heptadecane (629-78-7)	0.26
	2,4-bis(1,1-dimethylethyl)phenol (96-76-4)	0.78
	n-hexadecanoic acid (57-10-3)	0.41
Field Blank 9/22/2011	2-nonanone (821-55-6)	0.70
	2,4-bis(1,1-dimethylethyl)phenol (96-76-4)	0.78
	n-hexadecanoic acid (57-10-3)	0.41
Equipment Blank 9/22/2011	2-nonanone (821-55-6)	0.57
	2-undecanone (112-12-9)	1.65
	2,4-bis(1,1-dimethylethyl)phenol (96-76-4)	1.04
	Butyl isobutyl phthalate (017851-53-5)	0.27
WISETXSW03-092011	2,4-bis(1,1-dimethylethyl)phenol (96-76-4)	0.72
	n-hexadecanoic acid (57-10-3)	0.31
	Diisooctyl phthalate	0.29
Field Blank 9/20/2011	3-Hexanone (589-39-8)	0.39
	2- Hexanone (591-78-6)	0.75
	3-Heptanone (106-35-4)	0.62
	2-Nonanone (821-55-6)	0.52
	Decanal (112-12-9)	0.25
	2-Undecanone (112-12-9)	2.07
March 2012 Sampling Event		
WISETXGW01-032012	n-hexadecanoic acid (57-10-3)	1.66
	Octadecanoic acid (57-11-4)	1.04
Field Blank 1 3/5/2012	2-undecanone (112-12-9)	1.07
Field Blank 2 3/6/2012	2-undecanone (112-12-9)	1.19
WISETXGW05-032012	Nonanal (124-19-6)	0.76
	9Z-octadecenamide (301-02-0)	1.45
WISETXSW01-032012	2,6-dichlorobenzoic acid (50-30-6)	27.21
WISETXSW02-032012	2,6-dichlorobenzoic acid (50-30-6)	20.6
WISETXSW02-032012 DUP	2,6-dichlorobenzoic acid (50-30-6)	18.98
Field Blank 3 3/7/2012	2-undecanone (112-12-9)	1.09
WISETXSW03-032012	2,6-dichlorobenzoic acid (50-30-6)	29.52
	Brassicasterol (474-67-9)	0.53
Field Blank 4 3/8/2012	2-undecanone (112-12-9)	1.61
WISETXGW07-032012	Decanal (112-31-2)	0.58

Table A29. Tentatively Identified Compounds (TICs) for sVOCs.

Sample	Compound (CAS Number)	Estimated Concentration (µg/L)
September 2012		
No sVOC analysis this event		
December 2012		
Field Blank 1-122012	2-undecanone (112-12-9)	1.59
WISETXGW04-122012	Butyl citrate	0.100
WISETXSW04-122012	γ-Sitosterol (83-47-6)	2.48
	Trans-1,2-cyclohexanediol (1460-57-7)	10.3
	(3-ß)-cholest-5en-3-ol (57-88-5)	3.28
	Cyclohexadecane (295-65-8)	2.96
	2-hydroxy-cyclohexanone (533-60-8)	1.52
	Phytol (150-86-7)	0.680
	Stigmasterol (83-48-7)	3.04
WISETXSW04-122012 DUP	2-hydroxy-cyclohexanone (533-60-8)	1.76
	γ-Sitosterol (83-47-6)	4.88
	(3-ß)- 3-hydroxy- 27-Norcholest-5-en-25-one (7494-34-0)	3.24
	3,7,11,15-Tetramethyl-2-Hexadecen-1-ol (102608-53-7)	1.56
	cis-1,2-Cyclohexanediol (1792-81-0)	12.4
	Hexadecane (544-76-3)	0.640
	3,5-dedihydro-stigmastan-6,22-dien (107304-12-1)	2.92
	Androst-5,15-dien-3-ol acetate (1000251-88-0)	1.24
Field Blank 2-122012	2-undecanone (112-12-9)	0.690
	3,5-Di-tert-butyl-4-hydroxybenzaldehyde (1620-98-0)	0.180
Pump Equipment Blank 1-122012	2-nonanone (821-55-6)	0.350
	2-undecanone (112-12-9)	1.41
WISETXGW08-122012	Tert-butyl-benzene (98-06-6	0.200
	1-ethyl-3methyl-benzene	0.220
WISETXGW16-122012	1,2,3-Trichloro-1-propene (13116-57-9)	1.56
Field Blank 3-122012	2-undecanone (112-12-9)	0.730
	3,5-di-tert-butyl-4-hydroxy-benzaldehyde (1620-98-0)	0.150
May 2013		
No sVOC analysis this event		

Table A30. QA/QC Narrative Associated with the EPA Region 8 Laboratories TSA.

Finding/Observation	QC Narrative	Response
Number, Type, and Frequency of Field QA/QC Samples	The Region 8 laboratory would like clarification on the field QA/QC samples to expect. Table 9 of the QAPP identifies a basic frequency, but it is not completely clear to which analytical methods the frequency applies other than Trip Blanks for VOCs and Dissolved Gases.	Clarification was provided to the lab and the QAPP will be revised to make this more clear
Region VIII Laboratory QA/QC Measurement Criteria	Table 14 of the QAPP differs in some respects from the actual limits used by the laboratory.	An updated table was provided by the laboratory and the QAPP Table 14 will be revised.

Table A31. QA/QC Narrative Associated with the RSKERC Laboratories TSA.

Finding/Observation	QC Narrative	Response
Calibration Check Gas Sources for Dissolved Gases Analysis	The SOP (RSKSOP-194v4) includes the use of a second source (SS) gas standard, to be analyzed for each target analyte after the first continuing calibration check (CC) standard is run. The laboratory has two NIST traceable gas standards, identified as 15DB (used for the CCC) and 2DB (used as the SS). These standards are used directly from the cylinders, with no prior dilution. However, the concentrations of all analytes in both calibration standards are identical, based upon the certification documents. The laboratory personnel then asked if the gas standards were from separate lots and learned they were not, and were from the same source. The laboratory already had on order new calibration standards that are confirmed from separate lots. This new source (separate lot) will be used as an SS in the future. Use of NIST certified gas standards that are not diluted prior to use ensures accuracy. However, a second source should be procured as an added level of quality assurance.	Shaw received NIST certified gas standards which contain analytes in different concentrations and thus different lots on August 2, 2011. These standards were installed on August 3, 2011 and are currently in use as a Calibration Check Standard and a Second Source Standard.
Pressure Gauge Check for the Dissolved Gases Analysis	Section 11.a of the SOP used for Dissolved Gas Preparation (RSKSOP-175v5) includes the use of a calibrated gauge that is certified against a NIST standard annually. Before using the gauge for each queue (batch) of samples, it is checked using helium gas supply set at 20 psi to ensure it is within 5%. This gauge check is performed by the laboratory before each batch of samples is analyzed. However, the gauge reading is not routinely recorded in the notebook. The pressure check should be recorded and included in the notebook with	Shaw staff started recording the gauge reading routinely on August 2, 2011 in the analyst's laboratory notebook preceding every batch of samples analyzed according to RSKSOP-175v5.

Table A31. QA/QC Narrative Associated with the RSKERC Laboratories TSA.

Finding/Observation	QC Narrative	Response
	the sample analytical data to document this QA check.	

Table A32. QA/QC Narrative Associated with the Southwest Research Institute (SwRI) Analytical Laboratory TSA.

Finding/Observation	QC Narrative	Response
True second source standards were not used for t-butyl alcohol and isopropyl alcohol.	A true second source standard had not yet been purchased by the laboratory for theRaton Basin samples because of the short time frame required between project initiation and sample analysis. For this reason the laboratory used the same standard source as the calibration, but the dilution from the stock solution was prepared by a different analyst. The laboratory noted that they would purchase a true second source for these compounds for the remainder of the project.	The QA Team will contact the Project Officer to ensure that appropriate standards have been purchased and are in use. If the same calibration curve is still in use for VOAs, we will determine whether it has been successfully confirmed with a true second source standard. SwRI was contacted and they confirmed that they have "true" second source standards for t-butyl alcohol and isopropyl alcohol. The calibration curves for these compounds used for the samples from Wise were verified with these true second source standards. The calibration curves for these compounds which were used for the samples from Raton Basin were not directly verified. However, the same calibration standards were used to prepare the curves in both instances, so there is an independent verification of the calibration standards. In addition, for the Raton Basin samples, a second analyst independently prepared a "second source" from the calibration standards. VOC analysis was not performed by SwRI on the Sept 2011 data set. No impact on VOC data quality.
VOC samples from Raton Basin Round 3 were received above the specified temperature.	Although one would normally expect a shipping company to deliver a shipment at its scheduled time, there may be additional measures that could be taken to ensure that the integrity of a whole batch of samples would not be compromised due to a late delivery.	For follow-up with shipping companies and laboratories: If the lab does not notify the PI that a shipment has arrived when expected, the PI or a designee could contact the lab for confirmation or contact the shipping company to determine if alternate delivery arrangements can be made for a more timely delivery. For implementation in the spreadsheet for effected data sets: All VOC results for the Raton Basin Round 3 samples received at the elevated

Table A32. QA/QC Narrative Associated with the Southwest Research Institute (SwRI) Analytical Laboratory TSA.

Finding/Observation	QC Narrative	Response
		temperature of 15 degrees C for Raton Basin Round 3 should be qualified with a J- to indicate the potential low bias due to delivery at elevated temperature. The affected samples are: RBDW06-1112, RBDW09-1112, RBDW10-1112, RBDW10-1112 DUP, RBDW14-1112, RBDW15-1112, RBEqBlk04-1112, RBFBlk04-1112, and RBTripBlk04-1112. Does not apply to the Wise data set. No impact on data quality.

Table A33. QA/QC Narrative Associated with the Wise Field TSA.

Finding/Observation	QC Narrative	Response
Field measurements for alkalinity, ferrous iron, sulfide, and turbidity did not include blanks and duplicates at specific intervals as described in the QAPP.	Blanks are to be performed at beginning of the day, midday, and end of day. Duplicate are to be performed once a day or every 10th sample.	The PI will ensure the blanks and duplicates are collected and analyzed at required intervals.
Pump Flow Control for Sample WISETXGW01-0911, 9/20/11: Per the PI interview and the project field notebook, an out-of-specification wellhead configuration was encountered at the well that yielded sample ID WISETXGWL#01-0911. The auditor was not present during the sampling but understood that despite several pre-mobilization communications with the well owner who indicated a valve would be installed at the wellhead for flow control and sampling, no valve was installed, and the well pump was only able to be operated at an open discharge flow rate of approximately 30 gallons per minute. The NRMRL field team directed the discharge to a 1 liter graduated cylinder to collect the water used to then direct into bottles for laboratory analysis or field parameters.	Reasonable effort was made in advance of mobilization to ensure that the well was suitably configured to meet project objectives. Outside the control of the NRMRL team, these conditions were not encountered. The need to collect samples in the 1 liter graduated cylinder should be noted with the data at this location.	The configuration of wells is outside the control of the sampling team. The property owner does not wish to modify the well. The 2014 report will note the deviation from the sampling procedure in the appropriate QA section.

Appendix B
Sample Results
Retrospective Case Study in Wise County, Texas

U.S. Environmental Protection Agency
Office of Research and Development
Washington, DC

May 2015
EPA/600/R-14/090

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Appendix B. Sample Results. Legend (Wise County, Texas)

Data Qualifiers

<	The analyte concentration is less than the quantitation limit (QL).
U	The analyte was analyzed for, but was not detected above the reported QL.
J	The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain quality control criteria were not met, or the concentration of the analyte was below the QL).
J+	The result is an estimated quantity, but the result may be biased high.
J-	For both detected and non-detected results, the result is estimated but may be biased low.
B	The analyte is found in a blank sample above the QL and the concentration found in the sample is less than 10 times the concentration found in the blank.
H	The sample was prepared or analyzed beyond the specified holding time. Sample results may be biased low.
*	Relative percent difference of a field or lab duplicate is outside acceptance criteria.
R	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and/or meet quality control criteria. Sample results are not reported. The analyte may or may not be present in the sample.

Notes

Table B-1	Total Dissolved Solids (TDS) is estimated based on Specific Conductance (SPC): TDS(mg/L) = SPC(mS/cm) * 650.
	Field-determined concentrations of ferrous iron and hydrogen sulfide are screening values.
Table B-2	†Round 3 - Due to extremely high concentrations of Cl in the sample the analysis was conducted using RSKSOP-214v5(Lachat FIA & Standard Methods 4500-Br) D; MDL= 0.09 mg/L and QL= 0.50 mg/L for PW01 only.
	§ Round 3 - Due to extremely high concentrations of Cl the sample analysis was conducted using RSKSOP-288v3; MDL= 0.16 mg/L and QL= 1.00 mg/L for PW01 only.
	‡ Round 3 - Due to extremely high concentrations of Cl the sample had to be diluted to a point where the concentration of F could not be accurately obtained for PW01 only.
Table B-3	Rounds 1 and 2 - Data rejected because of known bromide interference on the Se mass analyzed.
	Round 1.- Data rejected for Sb because of potential spectral (mass or emission) interference.
Table B-4	R. Rounds 1 and 2- Data rejected. 1,1,2-trichloroethane is subject to alkaline hydrolysis to 1,1-dichloroethene. This reaction could be supported by the sample preservative (trisodium phosphate).
Table B-5	The method used for glycol analysis is under development.
	Round 4 - R. Data rejected. Formate contamination in Field Blanks.
Table B-6	No matrix spike or matrix spike duplicate (MS/MSD) samples were collected and analyzed for the SVOC analytical suite for Round 2.

Appendix B. Sample Results - Legend (Wise County, Texas)

Acronyms

CAS	Chemical Abstracts Service
DIC	Dissolved Inorganic Carbon
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
DRO	Diesel Range Organics
GRO	Gasoline Range Organics
NA	Not Applicable (See QAPP)
ND	Not Detected
NR	Not Reported by Laboratory or Field Sampling Team
NS	Not Sampled
ORP	Oxidation reduction potential
SPC	Specific Conductance
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TPH	Total Petroleum Hydrocarbons
Gross Alpha	Gross alpha particle activity
Gross Beta	Gross beta particle activity

Units

BTU	British thermal unit
^{o}C	Degrees Celsius
µg/L	Micrograms per liter
mg/L	Milligrams per liter
mS/cm	Millisiemens per centimeter at 25^{o}C
pCi/L	Picocuries per liter

Key

PW	Production Well
GW	Ground water sample
SW	Surface water sample
04	Sampling location
d	Field Duplicate

Appendix B. Sample Results_ Legend (Wise County, Texas)

Metals and Isotopes

Ag	Silver	Hg	Mercury	Sb	Antimony	δ^2H	$[(^2H/H)$ Sample/$(^2H/H)$ Standard] * 1000
Al	Aluminum	K	Potassium	Se	Selenium	$\delta^{18}O$	$[(^{18}O/^{16}O)$ Sample/$(^{18}O/^{16}O)$ Standard] * 1000
As	Arsenic	Li	Lithium	Si	Silicon		
B	Boron	Mg	Magnesium	Sr	Strontium		
Ba	Barium	Mn	Manganese	Th	Thorium		
Be	Beryllium	Mo	Molybdenum	Ti	Titanium		
Ca	Calcium	Na	Sodium	Tl	Thallium		
Cd	Cadmium	Ni	Nickel	U	Uranium		
Co	Cobalt	P	Phosphorus	V	Vanadium		
Cr	Chromium	Pb	Lead	Zn	Zinc		
Cu	Copper	Rb	Rubidium				
Fe	Iron	S	Sulfur				

Table B-1 Sample Results - Field Parameters (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW01 9/20/11 Round 1	GW01 3/5/12 Round 2	GW01 9/20/12 Round 3	GW01 12/3/12 Round 4	GW01 5/28/13 Round 5	GW02 9/20/11 Round 1	GW02 3/5/12 Round 2	GW02 12/3/12 Round 4	GW02 5/28/13 Round 5
Temperature	^oC	20.7	20.7	20.7	20.7	20.7	23.8	19.0	20.4	21.5
SPC	mS/cm	3.096	6.556	2.579	6.614	6.542	0.986	0.955	1.045	1.004
TDS	mg/L	2012	4262	1675	4302	4252	641	621	679	653
DO	mg/L	2.28	3.31	1.90	2.96	2.37	2.20	0.15	0.50	0.62
pH		8.01	7.57	8.31	7.54	7.48	8.55	8.45	8.50	8.35
ORP	mV	-123	-99	-132.3	-82.2	-79.9	336	186	208.3	80.0
Turbidity	NTU	2.0	8.0	1.19	2.50	8.30	0.5	0.4	0.32	0.65
Alkalinity	mg $CaCO_3$/L	168	116	217	115	116	261	272	293	298
Ferrous Iron	mg Fe^{2+}/L	0.06 J	0.25 J	<0.03 U	0.29 J	0.08 J	<0.03 U	<0.03 U	<0.03 U	<0.03 U
Hydrogen Sulfide	mg S/L	0.07 J	0.02 J	<0.01 U	<0.01 U	0.02 J	<0.01 U	<0.01 U	<0.01 U	<0.01 U

Table B-1 Sample Results - Field Parameters (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW03 9/20/11 Round 1	GW03 3/5/12 Round 2	GW03 12/3/12 Round 4	GW04 9/22/11 Round 1	GW04 3/6/12 Round 2	GW04 12/4/12 Round 4	GW04 5/29/13 Round 5	GW05 9/22/11 Round 1	GW05 3/6/12 Round 2
Temperature	^{o}C	22.8	20.7	21.1	20.5	19.4	20.0	21.0	19.5	19.9
SPC	mS/cm	0.859	0.756	0.759	0.730	0.718	0.744	0.712	1.245	0.889
TDS	mg/L	558	478	493	475	467	484	463	809	578
DO	mg/L	1.30	0.64	0.76	0.22	0.04	0.11	0.19	0.60	0.11
pH		8.14	8.12	8.09	8.79	8.83	8.76	8.42	7.09	7.38
ORP	mV	330	124	136.4	333	85	227.9	182.5	367	59
Turbidity	NTU	0.5	0.3	0.29	0.2	0.2	2.72	7.17	0.4	0.2
Alkalinity	mg $CaCO_3$/L	223	256	248	229	247	237	225	393	289
Ferrous Iron	mg Fe^{2+}/L	<0.03 U	<0.03 U	<0.03 U	<0.03 U	<0.03 U	0.05 J	0.05 J	<0.03 U	<0.03 U
Hydrogen Sulfide	mg S/L	0.01 J	<0.01 U	<0.01 U	<0.01 U	<0.01 U	0.02 J	0.05 J	0.02 J	<0.01 U

Table B-1 Sample Results - Field Parameters (Wise County, Texas)

	Sample	GW06	GW06	GW07	GW07	GW08	GW08	GW08	GW08	GW08
	Sample Date	9/19/11	3/7/12	9/19/11	3/8/12	9/20/11	3/5/12	9/20/12	12/4/12	5/29/13
Parameter	Unit	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2	Round 3	Round 4	Round 5
Temperature	^{o}C	27.1	19.5	24.3	17.2	21.8	15.4	22.8	22.0	22.4
SPC	mS/cm	1.213	1.177	0.674	0.662	5.401	6.267	3.335	2.940	3.520
TDS	mg/L	789	765	438	430	3510	4074	2166	1910	2288
DO	mg/L	0.58	0.15	0.77	0.08	0.14	2.51	0.23	0.14	0.06
pH		6.87	6.82	7.02	6.91	8.27	8.10	8.38	8.15	8.49
ORP	mV	90	6	139	3	309	202	30.7	117.5	-263.1
Turbidity	NTU	3.2	14.1	17	11.7	0.9	1.0	1.39	1.46	1.57
Alkalinity	mg $CaCO_3$/L	327	366	251	281	214	231	270	247	268
Ferrous Iron	mg Fe^{2+}/L	0.34 J	0.30 J	0.38 J	0.13 J	<0.03 U	<0.03 U	0.09 J	<0.03 U	<0.03 U
Hydrogen Sulfide	mg S/L	0.07 J	0.01 J	<0.01 U	0.04 J	<0.01 U	<0.01 U	0.01 J	0.01 J	0.02 J

Table B-1 Sample Results - Field Parameters (Wise County, Texas)

	Sample	GW09	GW09	GW10	GW10	GW11	GW11	GW12
	Sample Date	9/21/11	3/7/12	9/22/11	3/7/12	9/22/11	3/7/12	9/21/11
Parameter	Unit	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2	Round 1
Temperature	^{o}C	23.8	15.9	21.3	19.4	19.4	18.5	20.9
SPC	mS/cm	0.640	0.623	0.560	0.550	0.642	0.639	0.578
TDS	mg/L	416	405	364	358	417	415	376
DO	mg/L	0.55	0.44	0.07	0.06	0.14	0.13	0.40
pH		8.97	9.11	8.00	8.03	7.48	7.45	7.55
ORP	mV	333	121	284	-17	253	-32	201
Turbidity	NTU	0.7	0.4	0.1	0.8	0.2	0.4	0.5
Alkalinity	mg $CaCO_3$/L	242	259	241	243	278	27	232
Ferrous Iron	mg Fe^{2+}/L	<0.03 U	<0.03 U	<0.03 U	<0.03 U	<0.03 U	<0.03 U	<0.03 U
Hydrogen Sulfide	mg S/L	<0.01 U	0.01 J	<0.01 U	0.01 J	<0.01 U	0.01 J	0.01 J

Table B-1 Sample Results - Field Parameters (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW13 3/5/12 Round 2	GW13 12/3/12 Round 4	GW13 5/28/13 Round 5	GW14 3/5/12 Round 2	GW14 12/5/12 Round 4	GW14 5/28/13 Round 5	GW15 3/6/12 Round 2	GW15 12/5/12 Round 4	GW15 5/30/13 Round 5
Temperature	^oC	20.2	20.3	20.5	20.8	20.6	21.3	18.8	20.0	21.6
SPC	mS/cm	0.779	0.792	0.744	0.786	0.767	0.768	0.881	0.874	0.946
TDS	mg/L	507	516	484	511	498	499	573	568	615
DO	mg/L	4.39	3.14	2.55	0.90	0.80	0.70	0.08	0.08	0.13
pH		8.81	8.75	8.23	8.76	8.79	8.41	8.81	8.68	8.61
ORP	mV	82	112.6	52.7	133	201.3	165.8	154	129.0	208.4
Turbidity	NTU	0.3	0.48	0.31	0.5	0.36	0.52	1.6	1.82	0.30
Alkalinity	mg $CaCO_3$/L	229	255	233	227	248	251	242	273	251
Ferrous Iron	mg Fe^{2+}/L	<0.03 U	0.03 U	<0.03 U	<0.03 U	<0.03 U	<0.03 U	<0.03 U	<0.03 U	0.03 J
Hydrogen Sulfide	mg S/L	0.01 J	<0.01 U	<0.01 U	0.01 J	0.01 J	<0.01 U	<0.01 U	0.02 J	<0.01 U

Table B-1 Sample Results - Field Parameters (Wise County, Texas)

	Sample	GW16	GW16	GW16	PW01	PW02	PW03	SW01	SW01
	Sample Date	3/6/12	12/5/12	5/30/13	9/20/12	5/29/13	5/29/13	9/21/11	3/6/12
Parameter	Unit	Round 2	Round 4	Round 5	Round 3	Round 5	Round 5	Round 1	Round 2
Temperature	^oC	20.9	20.0	22.5	20.5	21.36	22.49	25.90	15.60
SPC	mS/cm	0.777	0.783	0.805	218.9	0.287	184.2	0.24	0.247
TDS	mg/L	505	509	525	142300	187	119730	156	160
DO	mg/L	0.21	0.22	0.25	0.62	6.28	1.19	10.30	9.55
pH		8.51	8.48	8.27	5.36	5.90	5.68	8.65	8.50
ORP	mV	149	250.2	172.8	-0.7	-69.4	75.0	339.00	144
Turbidity	NTU	0.2	0.10	0.10	28.6	199.00	269.00	2.0	2.2
Alkalinity	mg $CaCO_3$/L	268	245	264	81	74	96	81	101
Ferrous Iron	mg Fe^{2+}/L	<0.03 U	<0.03 U	0.03 J	NA	1.82 J	3.30 J	<0.03 U	0.03 J
Hydrogen Sulfide	mg S/L	<0.01 U	0.01 U	0.02 J	NA	0.23 J	0.80 J	0.08 J	<0.01 U

Table B-1 Sample Results - Field Parameters (Wise County, Texas)

Parameter	Sample Sample Date Unit	SW02 9/21/11 Round 1	SW02 3/6/12 Round 2	SW03 9/22/11 Round 1	SW03 3/7/12 Round 2	SW04 12/4/12 Round 4	SW04 5/29/13 Round 5
Temperature	^{o}C	26.10	15.60	24.20	15.50	16.29	24.43
SPC	mS/cm	0.24	0.246	0.24	0.252	0.34	0.328
TDS	mg/L	154	160	159	164	219	213
DO	mg/L	10.60	9.65	8.34	6.57	5.67	5.02
pH		8.63	8.65	8.47	8.44	7.89	7.43
ORP	mV	317.00	120	321.00	159	305.0	230.9
Turbidity	NTU	2.5	1.7	2.2	2.0	39.10	41.80
Alkalinity	mg $CaCO_3$/L	72	103	80	98	145	136
Ferrous Iron	mg Fe^{2+}/L	<0.03 U	<0.03 U	<0.03 U	0.03 J	0.4 J	0.36 J
Hydrogen Sulfide	mg S/L	0.01 J	<0.01 U	<0.01 U	0.02 J	0.14 J	0.13 J

Table B-2 Sample Results - Anions and Ammonia (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW01 9/20/11 Round 1	GW01 3/5/12 Round 2	GW01 9/20/12 Round 3	GW01 12/3/12 Round 4	GW01 5/28/13 Round 5	GW02 9/20/11 Round 1	GW02 3/5/12 Round 2	GW02 12/3/12 Round 4	GW02 5/28/13 Round 5
Anion-Cation Balance	%	2.98	3.1	0.061	0.2	1.1	2.05	1.4	0.3	0.4
DOC	mg/L	<0.50 U	0.43 B	0.77	<0.50 U	0.55	<0.50 U	0.32 B	<0.50 U	0.60
DIC	mg/L	50.1	29.4	55.5	29.5	28.8	67.6	67.6	70.5	70.4
Nitrate + Nitrite	mg N/L	0.01 J	<0.10 U	<0.10 U	<0.10 U	<0.10 U	0.10 J	0.27	0.15	0.11
Ammonia	mg N/L	1.77	3.62	1.56	3.51	3.65	0.78	0.55	0.63	0.66
Bromide	mg N/L	3.91 H	10.1	2.43	7.73	13.7	0.20 J,H	0.47 J	<1.00 U	<1.00 U
Chloride	mg/L	788	1950	553	1910	1970	59.2	67.4	62.5	65.5
Sulfate	mg/L	72.7	149	58.7	157	155	106	89.9	113	108
Fluoride	mg/L	<0.60 U	<0.20 U	0.34	<0.20 U	<0.20 U	<0.20 U	0.12 J	<0.20 U	0.11 J
Iodide	µg/L	NA	NA	96.1	343	368	NA	NA	19.5	20.0

Table B-2 Sample Results - Anions and Ammonia (Wise County, Texas)

	Sample	GW03	GW03	GW03	GW04	GW04	GW04	GW04	GW05	GW05
	Sample Date	9/20/11	3/5/12	12/3/12	9/22/11	3/6/12	12/4/12	5/29/13	9/22/11	3/6/12
Parameter	Unit	Round 1	Round 2	Round 4	Round 1	Round 2	Round 4	Round 5	Round 1	Round 2
Anion-Cation Balance	%	2.58	3.0	0.6	0.95	0.4	0.01	1.1	2.54	4.5
DOC	mg/L	<0.50 U	0.26 B	<0.50 U	<0.50 U	0.31 B	<0.50 U	0.47 J	0.96 B	0.38 B
DIC	mg/L	63.3	63.8	63.9	55.2	55.2	56.0	55.2	98.0	73.0
Nitrate + Nitrite	mg N/L	0.03 J	<0.10 U	0.02 J	<0.10 U	<0.10 U	0.01 J	0.02 J	0.10	<0.10 U
Ammonia	mg N/L	0.77	0.66	0.62	0.63	0.57	0.58	0.57	0.63	0.63
Bromide	mg N/L	0.32 J,H	0.38 J	<1.00 U	0.10 J,H	<1.00 U	<1.00 U	<1.00 U	0.35 J,H	0.48 J
Chloride	mg/L	87.6	51.6	58.3	34.6	35.0	34.8	35.3	72.5	67.1
Sulfate	mg/L	29.5	24.8	25.3	67.3	64.2	66.3	64.8	147	61.2
Fluoride	mg/L	0.22	0.19 J	0.152 J	0.09 J	0.09 J	0.05 J	0.09 J	0.22	0.22
Iodide	µg/L	NA	NA	20.9	NA	NA	15.1	17.6	NA	NA

Table B-2 Sample Results - Anions and Ammonia (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW06 9/19/11 Round 1	GW06 3/7/12 Round 2	GW07 9/19/11 Round 1	GW07 3/8/12 Round 2	GW08 9/20/11 Round 1	GW08 3/5/12 Round 2	GW08 9/20/12 Round 3	GW08 12/4/12 Round 4	GW08 5/29/13 Round 5
Anion-Cation Balance	%	2.4	8.7	2.3	6.1	2.5	1.7	0.17	2.5	1.8
DOC	mg/L	0.77	0.59 B	0.85	0.74	<0.50 U	0.52 B	0.83	0.57	0.43 J
DIC	mg/L	111	105	75.6	78.1	58.5	60.6	64.8	63.8	63.4
Nitrate + Nitrite	mg N/L	<0.10 U	<0.10 U	0.03 J	<0.10 U	0.20	0.28	0.47	0.30	<0.10 U
Ammonia	mg N/L	0.10	0.11	<0.10 U	0.03 J	1.57	1.39	0.51	0.59	1.06
Bromide	mg N/L	0.17 J,H	<1.00 U	0.27 J,H	0.44 J	6.98 H	7.18	4.07	2.64 J	3.89 J
Chloride	mg/L	30.0	29.6	25.6	25.9	1480	1610	756	619	854
Sulfate	mg/L	214	224	24.1	25.4	183	206	152	143	151
Fluoride	mg/L	0.09 J	0.22	0.27	0.38	<0.20 U	0.10 J	0.14 J	0.070 J	<0.20 U
Iodide	µg/L	NA	NA	NA	NA	NA	NA	124	119	160

Table B-2 Sample Results - Anions and Ammonia (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW09 9/21/11 Round 1	GW09 3/7/12 Round 2	GW10 9/22/11 Round 1	GW10 3/7/12 Round 2	GW11 9/22/11 Round 1	GW11 3/7/12 Round 2	GW12 9/21/11 Round 1
Anion-Cation Balance	%	0.3	2.0	0.6	2.8	0.5	1.5	1.2
DOC	mg/L	<0.50 U	0.44 B	<0.50 U	0.36 B	<0.50 U	1.37 B	<0.50 U
DIC	mg/L	65.1	65.4	60.7	60.7	71.7	71.9	62.8
Nitrate + Nitrite	mg N/L	0.02 J	<0.10 U	<0.10 U	<0.10 U	0.04 J	<0.10 U	0.03 J
Ammonia	mg N/L	0.44	0.40	1.05	0.92	1.79	1.66	1.74
Bromide	mg N/L	<1.00 U,H	<1.00 U	<1.00 U,H	<1.00 U	<1.00 U,H	0.13 J	<1.00 U,H
Chloride	mg/L	4.62	4.56	5.53	5.66	7.07	6.98	6.19
Sulfate	mg/L	24.6	24.3	26.4	26.3	39.2	38.7	31.1
Fluoride	mg/L	0.13 J	0.09 J	0.10 J	<0.20 U	0.15 J	0.09 J	0.17 J
Iodide	µg/L	NA	NA	NA	NA	NA	NA	NA

Table B-2 Sample Results - Anions and Ammonia (Wise County, Texas)

	Sample	GW13	GW13	GW13	GW14	GW14	GW14	GW15	GW15	GW15
	Sample Date	3/5/12	12/3/12	5/28/13	3/5/12	12/5/12	5/28/13	3/6/12	12/5/12	5/30/13
Parameter	Unit	Round 2	Round 4	Round 5	Round 2	Round 4	Round 5	Round 2	Round 4	Round 5
Anion-Cation Balance	%	2.2	0.7	0.4	1.7	0.02	1.1	2.2	0.5	0.5
DOC	mg/L	0.44 B	0.78 B	0.75	0.34 B	<0.50 U	0.44 J	0.42 B	<0.50 U	0.49 J
DIC	mg/L	59.1	61.2	59.3	57.9	58.4	58.5	61.0	61.7	61.6
Nitrate + Nitrite	mg N/L	<0.10 U	<0.10 U	0.01 J	<0.10 U	0.07 J	0.07 J	<0.10 U	0.01 J	0.02 J
Ammonia	mg N/L	0.70	0.62	0.63	0.67	0.62	0.61	0.73	0.63	0.64
Bromide	mg N/L	0.26 J	<1.00 U	<1.00 U	0.28 J	<1.00 U	<1.00 U	<1.00 U	0.65 J	<1.00 U
Chloride	mg/L	39.3	39.7	43.8	44.6	43.8	44.5	57.8	54.5	60.2
Sulfate	mg/L	67.0	69.6	61.0	65.5	65.4	64.6	91.0	84.3	106
Fluoride	mg/L	0.10 J	<0.20 U	0.06 J	0.11 J	<0.20 U	<0.20 U	0.10 J	0.100 J	0.05 J
Iodide	µg/L	NA	16.5	19.0	NA	16.6	18.6	NA	16.7	18.3

Table B-2 Sample Results - Anions and Ammonia (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW16 3/6/12 Round 2	GW16 12/5/12 Round 4	GW16 5/30/13 Round 5	PW01 9/20/12 Round 3	PW02 5/29/13 Round 5	PW03 5/29/13 Round 5	SW01 9/21/11 Round 1	SW01 3/6/12 Round 2
Anion-Cation Balance	%	1.4	0.3	0.4	1.72	6.1	24.7	4.1	7.5
DOC	mg/L	0.29 B	<0.50 U	0.29 J	45.7	40.0	236	6.90	6.33 B
DIC	mg/L	63.2	64.9	64.2	27.2	17.8	33.1	18.7	22.3
Nitrate + Nitrite	mg N/L	<0.10 U	0.03 J	0.03 J	<0.10 U	0.03 J	<0.10 U	0.03 J	<0.10 U
Ammonia	mg N/L	0.74	0.70	0.69	286	5.42	314	<0.10 U	<0.10 U
Bromide	mg N/L	0.27 J	<1.00 U	0.42 J	886†	2.85	903	<1.00 U,H	<1.00 U
Chloride	mg/L	68.1	67.6	70.5	143400	3.14	110100	11.1	7.24
Sulfate	mg/L	25.8	26.1	25.6	285§	0.18 J	358	11.5	14.6
Fluoride	mg/L	0.14 J	0.14 J	0.13 J	<20 U‡	0.12 J	<0.20 U	0.16 J	0.06 J
Iodide	µg/L	NA	21.5	24.9	57800	11.0	126000	NA	NA

Table B-2 Sample Results - Anions and Ammonia (Wise County, Texas)

	Sample	SW02	SW02	SW03	SW03	SW04	SW04
	Sample Date	9/21/11	3/6/12	9/22/11	3/7/12	12/4/12	5/29/13
Parameter	Unit	Round 1	Round 2	Round 1	Round 2	Round 4	Round 5
Anion-Cation Balance	%	4.7	7.2	4.1	7.9	2.0	0.8
DOC	mg/L	6.93	6.25 B	7.05	6.33 B	22.5	17.6
DIC	mg/L	17.3	22.1	18.4	22.4	35.6	33.3
Nitrate + Nitrite	mg N/L	<0.10 U	<0.10 U	0.03 J	<0.10 U	<0.10 U	0.04 J
Ammonia	mg N/L	<0.10 U	<0.10 U	<0.10 U	<0.10 U	0.08 J	0.98
Bromide	mg N/L	<1.00 U,H	<1.00 U	<1.00 U,H	<1.00 U	<1.00 U	<1.00 U
Chloride	mg/L	10.9	7.25	11.4	7.03	7.34	10.7
Sulfate	mg/L	11.6	14.1	11.7	13.7	6.96	3.92
Fluoride	mg/L	0.14 J	0.09 J	0.17 J	0.08 J	0.07 J	0.14 J
Iodide	µg/L	NA	NA	NA	NA	28.2	25.2

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW01 9/20/11 Round 1	GW01 3/5/12 Round 2	GW01 9/20/12 Round 3	GW01 12/3/12 Round 4	GW01 5/28/13 Round 5
Dissolved Ag	µg/L	<14 U	<10 U	<10 U	<10 U	<10 U
Total Ag	µg/L	<16 U	<10 U	<10 U	<10 U	<10 U
Dissolved Al	µg/L	<494 U	122 J	<20 U	<20 U	<20 U
Total Al	µg/L	<548 U	175 J	<20 U	32 *,J+	198
Dissolved As	µg/L	<20 U	5.1	0.7	0.5	0.5
Total As	µg/L	<22 U	4.8	0.8	0.6	0.7
Dissolved B	µg/L	262 J	480	222	479	488
Total B	µg/L	255 J	441	249	490	494
Dissolved Ba	µg/L	64 J	132 J	39	115	110
Total Ba	µg/L	64 J	124 J	41	114	116
Dissolved Be	µg/L	<10 U	<5 U	<5 U	<5 U	<5 U
Total Be	µg/L	<11 U	<5 U	<3 U	<3 U	<3 U
Dissolved Ca	mg/L	47.0	135	31.5	117	121
Total Ca	mg/L	47.8 J	128	35.4	116	116
Dissolved Cd	µg/L	<4 U	<1.0 U	<0.20 U	<0.20 U	<0.2 U
Total Cd	µg/L	<4 U	<1.0 U	<0.20 U	<0.20 U	<0.2 U
Dissolved Co	µg/L	<4 U	<50 U	<5 U	<5 U	<5 U
Total Co	µg/L	<4 U	<50 U	<3 U	<3 U	<3 U
Dissolved Cr	µg/L	<7 U	<2.0 U	0.6 J	<2.0 U	<2 U
Total Cr	µg/L	<8 U	<2.0 U	<2 U	<2.0 U	<2 U
Dissolved Cu	µg/L	<20 U	<2.0 U	0.7	2.2	1.3 B
Total Cu	µg/L	<22 U	<2.0 U	<0.5 U	0.92 *	1.0
Dissolved Fe	µg/L	45 J	220 J-	112	228	273
Total Fe	µg/L	115 J	259 J-	69	275	363 J+,*
Dissolved Hg	µg/L	NA	NA	NA	<0.2 U	<0.2 U
Total Hg	µg/L	NA	NA	NA	<0.2 U	<0.2 U
Dissolved K	mg/L	3.94 J	10.1	3.1	8.1	7.9
Total K	mg/L	4.11 J	9.25	3.4	8.2	8.1
Dissolved Li	µg/L	NA	NR	56	152	152
Total Li	µg/L	NA	NR	64	154	154
Dissolved Mg	mg/L	21.7	61.4	14.6	55.7	58.5

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

Parameter	Sample / Sample Date / Unit	GW02 9/20/11 Round 1	GW02 3/5/12 Round 2	GW02 12/3/12 Round 4	GW02 5/28/13 Round 5	GW03 9/20/11 Round 1	GW03 3/5/12 Round 2	GW03 12/3/12 Round 4
Dissolved Ag	µg/L	<14 U	<10 U	<10 U	<10 U	<14 U	<10 U	<10 U
Total Ag	µg/L	<16 U	<10 U	<10 U	<10 U	<16 U	<10 U	<10 U
Dissolved Al	µg/L	<494 U	<200 U	<20 U	<20 U	<494 U	<200 U	<20 U
Total Al	µg/L	<548 U	<200 U	<20 U	<20 U	<548 U	<200 U	<20 U
Dissolved As	µg/L	<20 U	<1.0 U	0.4	0.4	<20 U	1.6	0.9
Total As	µg/L	<22 U	1.1	0.5	0.5	<22 U	1.5	1.0
Dissolved B	µg/L	186 J	172	176	175	172 J	154	145
Total B	µg/L	189 J	169	196	194	170 J	148	162
Dissolved Ba	µg/L	23 J	<200 U	25.8	25	11 J	<200 U	12
Total Ba	µg/L	23 J	<200 U	25	25	11 J	<200 U	12
Dissolved Be	µg/L	<10 U	<5 U	<5 U	<5 U	<10 U	<5 U	<5 U
Total Be	µg/L	<11 U	<5 U	<3 U	<3 U	<11 U	<5 U	<3 U
Dissolved Ca	mg/L	4.12	5.22	4.9	4.5	7.21	6.93	6.6
Total Ca	mg/L	4.29 J	5.25	4.9	4.4	7.48 J	6.78	6.68
Dissolved Cd	µg/L	<4 U	<1.0 U	<0.20 U	<0.2 U	<4 U	<1.0 U	<0.20 U
Total Cd	µg/L	<4 U	<1.0 U	<0.20 U	<0.2 U	<4 U	<1.0 U	<0.20 U
Dissolved Co	µg/L	<4 U	<50 U	<5 U	<5 U	<4 U	<50 U	<5 U
Total Co	µg/L	<4 U	<50 U	<3 U	<3 U	<4 U	<50 U	<3 U
Dissolved Cr	µg/L	<7 U	<2.0 U	3.1	<2 U	<7 U	<2.0 U	2.3
Total Cr	µg/L	<8 U	<2.0 U	<2.0 U	<2 U	<8 U	<2.0 U	<2.0 U
Dissolved Cu	µg/L	<20 U	<2.0 U	0.7	0.5 J,B	<20 U	<2.0 U	1.6
Total Cu	µg/L	<22 U	2.30	1.4 *	0.8	<22 U	<2.0 U	2.1 *
Dissolved Fe	µg/L	<67 U	<100 U,J-	<100 U	<100 U	<67 U	<100 U,J-	<100 U
Total Fe	µg/L	<74 U	<100 U,J-	31 J	<50 U	<74 U	<100 U,J-	<50 U
Dissolved Hg	µg/L	NA	NA	<0.2 U	<0.2 U	NA	NA	<0.2 U
Total Hg	µg/L	NA	NA	<0.2 U	<0.2 U	NA	NA	<0.2 U
Dissolved K	mg/L	1.27 J	1.56 J	1.5	1.3	1.73 J	1.94 J	1.8
Total K	mg/L	1.37 J	1.49 J	1.4	1.3	1.83 J	1.85 J	1.8
Dissolved Li	µg/L	NA	NR	60	58	NA	NR	29
Total Li	µg/L	NA	NR	59	57	NA	NR	29
Dissolved Mg	mg/L	1.81	2.19 J	2.11	1.93	3.20	2.97 J	2.99

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

	Sample	GW04	GW04	GW04	GW04	GW05	GW05	GW06	GW06
	Sample Date	9/22/11	3/6/12	12/4/12	5/29/13	9/22/11	3/6/12	9/19/11	3/7/12
Parameter	Unit	Round 1	Round 2	Round 4	Round 5	Round 1	Round 2	Round 1	Round 2
Dissolved Ag	µg/L	<14 U	<10 U	<10 U	<10 U	<14 U	<10 U	<14 U	<10 U
Total Ag	µg/L	<16 U	<10 U	<10 U	<10 U	<16 U	<10 U	<16 U	<10 U
Dissolved Al	µg/L	<494 U	<200 U	<20 U	21	<494 U	<200 U	<494 U	123 J
Total Al	µg/L	<548 U	<200 U	<20 U	337	<548 U	<200 U	<548 U	116 J
Dissolved As	µg/L	<20 U	1.0	0.4	0.4	<20 U	1.9	<20 U	1.3
Total As	µg/L	<22 U	1.1	0.5	0.5	<22 U	2.0	<22 U	<1.0 U
Dissolved B	µg/L	194 J	180	171	167	229 J	194	<333 U	83 J
Total B	µg/L	182 J	178	195	192	211 J	185	<370 U	78 J
Dissolved Ba	µg/L	16 J	<200 U	16	16	102 J	62 J	40 J	<200 U
Total Ba	µg/L	15 J	<200 U	16	16	95 J	60 J	39 J	<200 U
Dissolved Be	µg/L	<10 U	<5 U	<5 U	<5 U	<10 U	<5 U	<10 U	<5 U
Total Be	µg/L	<11 U	<5 U	<3 U	<3 U	<11 U	<5 U	<11 U	<5 U
Dissolved Ca	mg/L	2.10	2.16 J	2.1	2.1	79.2	37.6	135	152
Total Ca	mg/L	2.13 J	2.16 J	2.18	2.2	81.6 J	37.2	138 J	143
Dissolved Cd	µg/L	<4 U	<1.0 U	<0.20 U	<0.2 U	<4 U	<1.0 U	<4 U	<1.0 U
Total Cd	µg/L	<4 U	<1.0 U	<0.20 U	<0.2 U	<4 U	<1.0 U	<4 U	<1.0 U
Dissolved Co	µg/L	<4 U	<50 U	<5 U	<5 U	<4 U	<50 U	<4 U	<50 U
Total Co	µg/L	<4 U	<50 U	<3 U	<3 U	<4 U	<50 U	<4 U	<50 U
Dissolved Cr	µg/L	<7 U	<2.0 U	<2.0 U	<2 U	<7 U	<2.0 U	<7 U	<2.0 U
Total Cr	µg/L	<8 U	<2.0 U	<2.0 U	<2 U	<8 U	<2.0 U	<8 U	<2.0 U
Dissolved Cu	µg/L	<20 U	<2.0 U	<0.5 U	1.2	<20 U	<2.0 U	<20 U	<2.0 U
Total Cu	µg/L	<22 U	<2.0 U	1.8 *	1.4	<22 U	<2.0 U	<22 U	<2.0 U
Dissolved Fe	µg/L	<67 U	<100 U,J-	<100 U	<100 U	<67 U	<100 U,J-	154	403 J-
Total Fe	µg/L	<74 U	<100 U,J-	<50 U	114 J+,*	<74 U	<100 U,J-	429 J	1380 J-
Dissolved Hg	µg/L	NA	NA	<0.2 U	<0.2 U	NA	NA	NA	NA
Total Hg	µg/L	NA	NA	<0.2 U	<0.2 U	NA	NA	NA	NA
Dissolved K	mg/L	0.93 J	1.09 J	1.0	1.1	2.08 J	2.53 J	3.66 J	4.33 J
Total K	mg/L	0.98 J	1.07 J	1.0	1.0	2.13 J	2.45 J	3.82 J	4.00 J
Dissolved Li	µg/L	NA	NR	42	42	NA	NR	NA	NR
Total Li	µg/L	NA	NR	43	41	NA	NR	NA	NR
Dissolved Mg	mg/L	0.79	<5.00 U	0.76	0.8	31.3	15.0	60.6	64.8

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW07 9/19/11 Round 1	GW07 3/8/12 Round 2	GW08 9/20/11 Round 1	GW08 3/5/12 Round 2	GW08 9/20/12 Round 3	GW08 12/4/12 Round 4	GW08 5/29/13 Round 5	GW09 9/21/11 Round 1	GW09 3/7/12 Round 2
Dissolved Ag	µg/L	<14 U	<10 U	<14 U	<10 U	<10 U	<10 U	<10 U	<14 U	<10 U
Total Ag	µg/L	<16 U	<10 U	<16 U	<10 U	<10 U	<10 U	<10 U	<16 U	<10 U
Dissolved Al	µg/L	<494 U	62 J	<494 U	64 J	<20 U	<20 U	<20 U	<494 U	<200 U
Total Al	µg/L	1360 J	400	<548 U	60 J	<20 U	<20 U	<20 U	<548 U	<200 U
Dissolved As	µg/L	<20 U	<1.0 U	<20 U	3.9	0.5	0.6	0.4	<20 U	<1.0 U
Total As	µg/L	<22 U	1.0	<22 U	4.3	0.7	0.6	0.6	<22 U	<1.0 U
Dissolved B	µg/L	<333 U	78 J	603 J	642	374	358	427	125 J	123
Total B	µg/L	<370 U	75 J	596 J	644	420	388	448	123 J	120
Dissolved Ba	µg/L	58 J	60 J	14 J	<200 U	7.6	7.4	14	9 J	<200 U
Total Ba	µg/L	60 J	62 J	14 J	<200 U	8.7	7.7	15	9 J	<200 U
Dissolved Be	µg/L	<10 U	<5 U	<10 U	<5 U	<5 U	<5 U	<5 U	<10 U	<5 U
Total Be	µg/L	<11 U	<5 U	<11 U	<5 U	<3 U	<3 U	<3 U	<11 U	<5 U
Dissolved Ca	mg/L	64.9	71.9	57.4	69.1	25.7	22	35	1.07	1.18 J
Total Ca	mg/L	67.9 J	74.4	59.2 J	70.8	28.6	22.8	34	1.13 J	1.20 J
Dissolved Cd	µg/L	<4 U	<1.0 U	<4 U	<1.0 U	<0.20 U	<0.20 U	<0.2 U	<4 U	<1.0 U
Total Cd	µg/L	<4 U	<1.0 U	<4 U	<1.0 U	<0.20 U	<0.20 U	0.3	<4 U	<1.0 U
Dissolved Co	µg/L	<4 U	<50 U	<4 U	<50 U	<5 U	<5 U	<5 U	<4 U	<50 U
Total Co	µg/L	<4 U	<50 U	<4 U	<50 U	<3 U	<3 U	<3 U	<4 U	<50 U
Dissolved Cr	µg/L	<7 U	<2.0 U	<7 U	<2.0 U	0.5 J	2.9	<2 U	<7 U	<2.0 U
Total Cr	µg/L	<8 U	0.54 J	<8 U	<2.0 U	<2 U	<2.0 U	<2 U	<8 U	<2.0 U
Dissolved Cu	µg/L	<20 U	<2.0 U	<20 U	2.10	0.4 J	0.6	0.8	10 J	0.66 J
Total Cu	µg/L	<22 U	3.40	<22 U	3.20	0.68	0.67 *	0.7	<22 U	<2.0 U
Dissolved Fe	µg/L	133	166 J-	50 J	<100 U,J-	<100 U	<100 U	135	<67 U	<100 U,J-
Total Fe	µg/L	589 J	484 J-	88 J	98 J-	146	37 J	203 J+,*	<74 U	<100 U,J-
Dissolved Hg	µg/L	NA	NA	NA	NA	NA	<0.2 U	<0.2 U	NA	NA
Total Hg	µg/L	NA	NA	NA	NA	NA	<0.2 U	<0.2 U	NA	NA
Dissolved K	mg/L	2.14 J	2.34 J	3.14 J	4.60 J	1.8	1.8	2.0	0.50 J	<5.00 U
Total K	mg/L	2.48 J	2.40 J	3.19 J	4.54 J	2.1	1.8	2.0	0.54 J	<5.00 U
Dissolved Li	µg/L	NA	NR	NA	NR	77	76	85	NA	NR
Total Li	µg/L	NA	NR	NA	NR	86	77	85	NA	NR
Dissolved Mg	mg/L	28.7	29.4	24.8	26.9	11.7	10.2	14.8	0.32	<5.00 U

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW10 9/22/11 Round 1	GW10 3/7/12 Round 2	GW11 9/22/11 Round 1	GW11 3/7/12 Round 2	GW12 9/21/11 Round 1	GW13 3/5/12 Round 2	GW13 12/3/12 Round 4	GW13 5/28/13 Round 5
Dissolved Ag	µg/L	<14 U	<10 U	<14 U	<10 U	<14 U	<10 U	<10 U	<10 U
Total Ag	µg/L	<16 U	<10 U	<16 U	<10 U	<16 U	<10 U	<10 U	<10 U
Dissolved Al	µg/L	<494 U	<200 U	<494 U	<200 U	<494 U	<200 U	<20 U	<20 U
Total Al	µg/L	<548 U	<200 U	<548 U	46 J	<548 U	<200 U	<20 U	<20 U
Dissolved As	µg/L	<20 U	<1.0 U	<20 U	<1.0 U	<20 U	1.4	0.4	0.6
Total As	µg/L	<22 U	<1.0 U	<22 U	<1.0 U	<22 U	1.3	0.5	0.7
Dissolved B	µg/L	120 J	117	<333 U	86 J	107 J	195	174	169
Total B	µg/L	112 J	119	<370 U	85 J	<370 U	181	203	187
Dissolved Ba	µg/L	72 J	72 J	134 J	141 J	83 J	<200 U	15	12
Total Ba	µg/L	68 J	75 J	133 J	144 J	83 J	<200 U	14	12
Dissolved Be	µg/L	<10 U	<5 U	<10 U	<5 U	<10 U	<5 U	<5 U	<5 U
Total Be	µg/L	<11 U	<5 U	<11 U	<5 U	<11 U	<5 U	<3 U	<3 U
Dissolved Ca	mg/L	11.7	12.5	31.3	35.7	25.1	2.21 J	2.0	3.3
Total Ca	mg/L	11.8 J	13.0	32.2 J	36.5	26.2 J	2.15 J	2.0	3.3
Dissolved Cd	µg/L	<4 U	<1.0 U	<4 U	<1.0 U	<4 U	<1.0 U	<0.20 U	<0.2 U
Total Cd	µg/L	<4 U	<1.0 U	<4 U	<1.0 U	<4 U	<1.0 U	<0.20 U	<0.2 U
Dissolved Co	µg/L	<4 U	<50 U	<4 U	<50 U	<4 U	<50 U	<5 U	<5 U
Total Co	µg/L	<4 U	<50 U	<4 U	<50 U	<4 U	<50 U	<3 U	<3 U
Dissolved Cr	µg/L	<7 U	<2.0 U	<7 U	<2.0 U	<7 U	<2.0 U	2.1	<2 U
Total Cr	µg/L	<8 U	<2.0 U	<8 U	<2.0 U	<8 U	<2.0 U	<2.0 U	<2 U
Dissolved Cu	µg/L	<20 U	2.50	<20 U	2.60	7 J	<2.0 U	<0.5 U	0.3 J,B
Total Cu	µg/L	10 J	3.10	10 J	3.10	<22 U	<2.0 U	0.52 *	0.3 J
Dissolved Fe	µg/L	<67 U	<100 U,J-	47 J	<100 U,J-	27 J	<100 U,J-	<100 U	<100 U
Total Fe	µg/L	<74 U	<100 U,J-	48 J	54 J-	<74 U	<100 U,J-	<50 U	<50 U
Dissolved Hg	µg/L	NA	NA	NA	NA	NA	NA	<0.2 U	<0.2 U
Total Hg	µg/L	NA	NA	NA	NA	NA	NA	<0.2 U	<0.2 U
Dissolved K	mg/L	1.62 J	1.89 J	3.04 J	3.41 J	2.56 J	1.24 J	1.0	1.2
Total K	mg/L	1.71 J	1.93 J	3.24 J	3.45 J	2.71 J	1.08 J	1.0	1.2
Dissolved Li	µg/L	NA	NR	NA	NR	NA	NR	44	39
Total Li	µg/L	NA	NR	NA	NR	NA	NR	45	38
Dissolved Mg	mg/L	5.06	5.09	11.6	12.3	8.84	<5.00 U	0.75	1.43

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW14 3/5/12 Round 2	GW14 12/5/12 Round 4	GW14 5/28/13 Round 5	GW15 3/6/12 Round 2	GW15 12/5/12 Round 4	GW15 5/30/13 Round 5	GW16 3/6/12 Round 2	GW16 12/5/12 Round 4	GW16 5/30/13 Round 5
Dissolved Ag	µg/L	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Total Ag	µg/L	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U	<10 U
Dissolved Al	µg/L	<200 U	<20 U	<20 U	<200 U	<20 U	<20 U	<200 U	<20 U	<20 U
Total Al	µg/L	<200 U	<20 U	<20 U	68 J	51 *,B,J+	<20 U	<200 U	<20 U	<20 U
Dissolved As	µg/L	<1.0 U	0.3	0.4	1.0	0.5	0.4	1.3	0.7	0.7
Total As	µg/L	<1.0 U	0.5	0.5	1.1	0.6	0.5	1.5	0.8	0.8
Dissolved B	µg/L	189	173	178	196	180	187	183	167	171
Total B	µg/L	179	200	195	170	205	212	167	191	191
Dissolved Ba	µg/L	<200 U	18	17	<200 U	19	20	<200 U	16	16
Total Ba	µg/L	<200 U	17	17	<200 U	20	20	<200 U	16	16
Dissolved Be	µg/L	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U
Total Be	µg/L	<5 U	<3 U	<3 U	<5 U	<3 U	<3 U	<5 U	<3 U	<3 U
Dissolved Ca	mg/L	2.53 J	2.4	2.4	2.61 J	2.4	2.6	3.53 J	3.5	3.6
Total Ca	mg/L	2.63 J	2.4	2.3	2.47 J	2.5	2.6	3.61 J	3.5	3.5
Dissolved Cd	µg/L	<1.0 U	<0.20 U	<0.2 U	<1.0 U	<0.20 U	<0.2 U	<1.0 U	<0.20 U	<0.2 U
Total Cd	µg/L	<1.0 U	<0.20 U	<0.2 U	<1.0 U	<0.20 U	<0.2 U	<1.0 U	<0.20 U	<0.2 U
Dissolved Co	µg/L	<50 U	<5 U	<5 U	<50 U	<5 U	<5 U	<50 U	<5 U	<5 U
Total Co	µg/L	<50 U	<3 U	<3 U	<50 U	<3 U	<3 U	<50 U	<3 U	<3 U
Dissolved Cr	µg/L	<2.0 U	2.2	<2 U	<2.0 U	<2.0 U	<2 U	<2.0 U	2.3	<2 U
Total Cr	µg/L	<2.0 U	<2.0 U	<2 U	<2.0 U	<2.0 U	<2 U	<2.0 U	<2.0 U	<2 U
Dissolved Cu	µg/L	<2.0 U	<0.5 U	0.4 J,B	<2.0 U	<0.5 U	0.6	8.5	1.1	1.4
Total Cu	µg/L	<2.0 U	1.2 *	1.0	<2.0 U	0.89 *	0.6	9.00	3.7 *	1.8
Dissolved Fe	µg/L	<100 U,J-	<100 U	<100 U	<100 U,J-	<100 U	<100 U	<100 U,J-	<100 U	<100 U
Total Fe	µg/L	<100 U,J-	<50 U	<50 U	34 J-	31 J	<50 U	<100 U,J-	<50 U	<50 U
Dissolved Hg	µg/L	NA	<0.2 U	<0.2 U	NA	<0.2 U	<0.2 U	NA	<0.2 U	<0.2 U
Total Hg	µg/L	NA	<0.2 U	<0.2 U	NA	<0.2 U	<0.2 U	NA	<0.2 U	<0.2 U
Dissolved K	mg/L	1.26 J	1.1	1.1	1.36 J	1.1	1.1	1.62 J	1.4	1.4
Total K	mg/L	1.19 J	1.1	1.0	1.16 J	1.1	<0.3 U	1.47 J	1.4	1.3
Dissolved Li	µg/L	NR	45	45	NR	46	50	NR	30	31
Total Li	µg/L	NR	46	44	NR	47	51	NR	31	30
Dissolved Mg	mg/L	<5.00 U	0.93	0.95	1.12 J	1.13	1.21	1.01 J	1.01	1.07

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

	Sample	PW01	PW02	PW03	SW01	SW01	SW02	SW02
	Sample Date	9/20/12	5/29/13	5/29/13	9/21/11	3/6/12	9/21/11	3/6/12
Parameter	Unit	Round 3	Round 5	Round 5	Round 1	Round 2	Round 1	Round 2
Dissolved Ag	µg/L	<50 U	<10 U	<100 U	<14 U	<10 U	<14 U	<10 U
Total Ag	µg/L	<100 U	<10 U	<50 U	<16 U	<10 U	<16 U	<10 U
Dissolved Al	µg/L	<20000 U	<40 U	<2000 U	<494 U	49 J	<494 U	46 J
Total Al	µg/L	<20000 U	97	<2000 U	<548 U	79 J	<548 U	79 J
Dissolved As	µg/L	<40 U	0.4 J	2.1 J	<20 U	1.7	<20 U	1.7
Total As	µg/L	<40 U	1.3	13	<22 U	1.7	<22 U	1.8
Dissolved B	µg/L	27100	109	25800	<333 U	<100 U	<333 U	<100 U
Total B	µg/L	27500	119	25300	<370 U	<100 U	<370 U	<100 U
Dissolved Ba	µg/L	12300	82	8510	56 J	<200 U	53 J	48 J
Total Ba	µg/L	11800	85	9430	58 J	<200 U	54 J	48 J
Dissolved Be	µg/L	<25 U	<5 U	<50 U	<10 U	<5 U	<10 U	<5 U
Total Be	µg/L	<15 U	<5 U	<50 U	<11 U	<5 U	<11 U	<5 U
Dissolved Ca	mg/L	21200	1.7	16200	27.8	42.3	26.0	43.7
Total Ca	mg/L	20400	1.8	15900	29.0 J	39.7	26.9 J	43.2
Dissolved Cd	µg/L	<40 U	<0.4 U	<20 U	<4 U	<1.0 U	<4 U	<1.0 U
Total Cd	µg/L	<40 U	0.5	<20 U	<4 U	<1.0 U	<4 U	<1.0 U
Dissolved Co	µg/L	37	<5 U	<50 U	<4 U	<50 U	<4 U	<50 U
Total Co	µg/L	22 J	<3 U	<50 U	<4 U	<50 U	<4 U	<50 U
Dissolved Cr	µg/L	91 J	<4 U	<200 U	<7 U	<2.0 U	<7 U	<2.0 U
Total Cr	µg/L	<400 U	9	<2 U	<8 U	<2.0 U	<8 U	<2.0 U
Dissolved Cu	µg/L	70 J	2.0	54	<20 U	<2.0 U	<20 U	<2.0 U
Total Cu	µg/L	<100 U	47	45 J	<22 U	<2.0 U	<22 U	<2.0 U
Dissolved Fe	µg/L	46600	47000	93200	<67 U	33 J-	<67 U	30 J-
Total Fe	µg/L	41800	60900 J+,*	42700 J+,*	137 J	77 J-	<74 U	86 J-
Dissolved Hg	µg/L	NA	<0.2 U	<0.2 U	NA	NA	NA	NA
Total Hg	µg/L	NA	0.15 J	<0.2 U	NA	NA	NA	NA
Dissolved K	mg/L	1780	<0.5 U	928	6.51 J	4.99 J	6.43 J	5.13
Total K	mg/L	1640	<0.3 U	891	7.01 J	4.67 J	6.85 J	4.96 J
Dissolved Li	µg/L	30100	<10 U	25900	NA	NR	NA	NR
Total Li	µg/L	25000	<10 U	25000	NA	NR	NA	NR
Dissolved Mg	mg/L	2410	0.12	1860	3.63	2.96 J	3.55	3.10 J

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

Parameter	Sample Sample Date Unit	SW03 9/22/11 Round 1	SW03 3/7/12 Round 2	SW04 12/4/12 Round 4	SW04 5/29/13 Round 5
Dissolved Ag	µg/L	<14 U	<10 U	<10 U	<10 U
Total Ag	µg/L	<16 U	<10 U	<10 U	<10 U
Dissolved Al	µg/L	<494 U	48 J	97 *	477 *
Total Al	µg/L	<548 U	88 J	976 *,J+	1170 J+
Dissolved As	µg/L	<20 U	1.8	2.6	3.7
Total As	µg/L	<22 U	2.1	3.5	4.4
Dissolved B	µg/L	<333 U	<100 U	45	<40 U
Total B	µg/L	<370 U	<100 U	68	60.6
Dissolved Ba	µg/L	54 J	<200 U	453	340
Total Ba	µg/L	54 J	49 J	481	342
Dissolved Be	µg/L	<10 U	<5 U	<5 U	<5 U
Total Be	µg/L	<11 U	<5 U	<3 U	<3 U
Dissolved Ca	mg/L	27.2	42.4	46	43
Total Ca	mg/L	28.0 J	44.8	47	40
Dissolved Cd	µg/L	<4 U	<1.0 U	<0.20 U	<0.2 U
Total Cd	µg/L	<4 U	<1.0 U	<0.20 U	<0.2 U
Dissolved Co	µg/L	<4 U	<50 U	2 J	<5 U
Total Co	µg/L	<4 U	<50 U	2 J	<3 U
Dissolved Cr	µg/L	<7 U	<2.0 U	<2.0 U	<2 U
Total Cr	µg/L	<8 U	<2.0 U	<2.0 U	<2 U
Dissolved Cu	µg/L	<20 U	<2.0 U	1.0	1.2
Total Cu	µg/L	<22 U	<2.0 U	1.9 *	1.5
Dissolved Fe	µg/L	<67 U	<100 U,J-	838 *	2180
Total Fe	µg/L	<74 U	83 J-	1950	2520 J+
Dissolved Hg	µg/L	NA	NA	<0.2 U	<0.2 U
Total Hg	µg/L	NA	NA	0.01 J	0.02 J
Dissolved K	mg/L	6.43 J	4.94 J	18.5	24
Total K	mg/L	6.97 J	5.09	18.7	23
Dissolved Li	µg/L	NA	NR	<10 U	<10 U
Total Li	µg/L	NA	NR	<5 U	<5 U
Dissolved Mg	mg/L	3.57	3.01 J	5.15	4.84

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

	Sample	GW01	GW01	GW01	GW01	GW01
	Sample Date	9/20/11	3/5/12	9/20/12	12/3/12	5/28/13
Parameter	Unit	Round 1	Round 2	Round 3	Round 4	Round 5
Total Mg	mg/L	21.9 J	56.9	16.6	56.8	56.8
Dissolved Mn	µg/L	62	93	36	84	82
Total Mn	µg/L	62 J	88	40	87	84
Dissolved Mo	µg/L	<17 U	<20 U	0.6	0.58	0.6
Total Mo	µg/L	<19 U	<20 U	0.7	0.61	1.6
Dissolved Na	mg/L	506 J	1200	428	1130	1180
Total Na	mg/L	537 J	1120	461	1160	1140
Dissolved Ni	µg/L	<84 U	<1.0 U	1.2	5.6	5.0
Total Ni	µg/L	<93 U	<1.0 U	1.4 B	6.3 *	5.4
Dissolved P	mg/L	<0.06 U	NR	0.0375 J	0.97	0.41
Total P	mg/L	<0.07 U	NR	0.02 J	<0.03 U	<0.03 U
Dissolved Pb	µg/L	<17 U	<1.0 U	<0.2 U	0.52	<0.20 U
Total Pb	µg/L	<19 U	<1.0 U	<0.2 U	0.26	<0.20 U
Dissolved S	mg/L	28.0 J	66.7	NA	NA	NA
Total S	mg/L	26.4 J	63.7	NA	NA	NA
Dissolved Sb	µg/L	R	<60 U	<0.2 U	<0.20 U	<0.2 U
Total Sb	µg/L	R	<60 U	<0.2 U	<0.20 U	<0.2 U
Dissolved Se	µg/L	<30 U	R	<2 U	<2 U	1.1 J
Total Se	µg/L	<33 U	R	<2 U	0.8 J	<2 U
Dissolved Si	mg/L	7.22 J	6.05	6.1	5.4	5.4
Total Si	mg/L	6.86 J	5.70	6.7	5.7	5.79
Dissolved Sr	µg/L	4850	13900	3320	12100	13100
Total Sr	µg/L	4960 J	12900	3510	13200	13100
Dissolved Th	µg/L	NA	NR	<0.2 U	<0.20 U	<0.2 U
Total Th	µg/L	NA	NR	<0.2 U	<0.20 U	<0.2 U
Dissolved Ti	µg/L	<7 U	12	<5 U	<5 U	<5 U
Total Ti	µg/L	<8 U	12	<3 U	<3 U	<3 U
Dissolved Tl	µg/L	<17 U	<1.0 U	<0.2 U	<0.20 U	<0.20 U
Total Tl	µg/L	<19 U	<1.0 U	<0.2 U	<0.20 U	<0.20 U
Dissolved U	µg/L	16 J	<1.0 U	<0.2 U	<0.20 U	<0.20 U
Total U	µg/L	<56 U	<1.0 U	<0.2 U	<0.20 U	<0.20 U

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

	Sample	GW02	GW02	GW02	GW02	GW03	GW03	GW03
	Sample Date	9/20/11	3/5/12	12/3/12	5/28/13	9/20/11	3/5/12	12/3/12
Parameter	Unit	Round 1	Round 2	Round 4	Round 5	Round 1	Round 2	Round 4
Total Mg	mg/L	1.81 J	2.21 J	2.18	1.88	3.28 J	2.85 J	3.05
Dissolved Mn	µg/L	6 J	8 J	7.4	7.1	8 J	6 J	7.2
Total Mn	µg/L	7 J	8 J	7.8	7	9 J	6 J	7.3
Dissolved Mo	µg/L	<17 U	<20 U	0.84	0.9	<17 U	<20 U	0.50
Total Mo	µg/L	<19 U	<20 U	0.83	0.9	<19 U	<20 U	0.51
Dissolved Na	mg/L	203 J	200	222	222	166 J	162	159
Total Na	mg/L	213 J	200	227	227	173 J	156	162
Dissolved Ni	µg/L	<84 U	<1.0 U	0.26	0.3 B	<84 U	0.42 J	0.60 B
Total Ni	µg/L	<93 U	<1.0 U	0.57 *,B	0.3	<93 U	0.57 J	0.88 *,B
Dissolved P	mg/L	<0.06 U	NR	<0.05 U	0.05	<0.06 U	NR	<0.05 U
Total P	mg/L	<0.07 U	NR	<0.03 U	<0.03 U	<0.07 U	NR	<0.03 U
Dissolved Pb	µg/L	<17 U	<1.0 U	0.23	0.2 B	<17 U	<1.0 U	0.23
Total Pb	µg/L	<19 U	<1.0 U	0.60	0.26	<19 U	<1.0 U	0.14 J
Dissolved S	mg/L	35.1 J	29.7	NA	NA	10.3 J	9.63	NA
Total S	mg/L	32.8 J	29.4	NA	NA	9.32 J	9.49	NA
Dissolved Sb	µg/L	R	<60 U	<0.20 U	<0.2 U	R	<60 U	<0.20 U
Total Sb	µg/L	R	<60 U	<0.20 U	<0.2 U	R	<60 U	<0.20 U
Dissolved Se	µg/L	<30 U	R	<2 U	0.4 J	<30 U	R	<2 U
Total Se	µg/L	<33 U	R	<2 U	<2 U	<33 U	R	<2 U
Dissolved Si	mg/L	5.96 J	5.98	6.1	6.1	7.07 J	7.20	7.1
Total Si	mg/L	6.12 J	5.94	6.3	5.96	6.62 J	6.84	7.3
Dissolved Sr	µg/L	491	599	581	540	585	475	475
Total Sr	µg/L	501 J	603	562	512	590 J	469	476
Dissolved Th	µg/L	NA	NR	<0.20 U	<0.2 U	NA	NR	<0.20 U
Total Th	µg/L	NA	NR	<0.20 U	<0.2 U	NA	NR	<0.20 U
Dissolved Ti	µg/L	<7 U	<10 U	<5 U	<5 U	<7 U	<10 U	<5 U
Total Ti	µg/L	<8 U	<10 U	<3 U	<3 U	<8 U	<10 U	<3 U
Dissolved Tl	µg/L	<17 U	<1.0 U	<0.20 U	<0.20 U	<17 U	<1.0 U	<0.20 U
Total Tl	µg/L	<19 U	<1.0 U	<0.20 U	<0.20 U	<19 U	<1.0 U	<0.20 U
Dissolved U	µg/L	<50 U	<1.0 U	<0.20 U	0.06 J	<50 U	<1.0 U	0.18 J
Total U	µg/L	<56 U	<1.0 U	<0.20 U	0.06 J	<56 U	<1.0 U	0.16 J

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW04 9/22/11 Round 1	GW04 3/6/12 Round 2	GW04 12/4/12 Round 4	GW04 5/29/13 Round 5	GW05 9/22/11 Round 1	GW05 3/6/12 Round 2	GW06 9/19/11 Round 1	GW06 3/7/12 Round 2
Total Mg	mg/L	0.79 J	<5.00 U	0.81	0.86	31.6 J	14.7	61.0 J	61.0
Dissolved Mn	µg/L	<14 U	4 J	4.2 J	5	22	34	61	75
Total Mn	µg/L	<16 U	4 J	4.5	7.2	18 J	33	57 J	70
Dissolved Mo	µg/L	<17 U	<20 U	0.73	0.7	<17 U	<20 U	<17 U	<20 U
Total Mo	µg/L	<19 U	<20 U	0.67	0.6	<19 U	<20 U	<19 U	<20 U
Dissolved Na	mg/L	156 J	161	160	159	140 J	147	29.9 J	33.4
Total Na	mg/L	167 J	161	165	159	147 J	142	30.9 J	31.3
Dissolved Ni	µg/L	<84 U	<1.0 U	0.11 B	<0.2 U	<84 U	0.29 J	<84 U	<1.0 U
Total Ni	µg/L	<93 U	<1.0 U	0.38 *,B	0.3	<93 U	0.28 J	<93 U	<1.0 U
Dissolved P	mg/L	<0.06 U	NR	<0.05 U	<0.05 U	0.03 J	NR	<0.06 U	NR
Total P	mg/L	<0.07 U	NR	<0.03 U	<0.03 U	0.04 J	NR	<0.07 U	NR
Dissolved Pb	µg/L	<17 U	<1.0 U	0.28	0.14 J	<17 U	<1.0 U	<17 U	<1.0 U
Total Pb	µg/L	<19 U	<1.0 U	0.44	0.31	<19 U	<1.0 U	<19 U	<1.0 U
Dissolved S	mg/L	22.6 J	21.4	NA	NA	52.5 J	21.1	71.2 J	79.0
Total S	mg/L	19.9 J	21.7	NA	NA	45.9 J	21.2	68.3 J	74.5
Dissolved Sb	µg/L	R	<60 U	<0.20 U	<0.2 U	R	<60 U	R	<60 U
Total Sb	µg/L	R	<60 U	<0.20 U	<0.2 U	R	<60 U	R	<60 U
Dissolved Se	µg/L	<30 U	R	<2 U	<2 U	<30 U	R	<30 U	R
Total Se	µg/L	<33 U	R	<2 U	<2 U	<33 U	R	<33 U	R
Dissolved Si	mg/L	5.96 J	5.77	5.8	5.9	18.2 J	10.7	11.5 J	10.6
Total Si	mg/L	5.95 J	5.67	6.1	6.31	17.0 J	10.8	11.1 J	10.0
Dissolved Sr	µg/L	243	245	238	223	3360	2120	6720	7280
Total Sr	µg/L	244 J	249	249	236	3230 J	2110	6690 J	6900
Dissolved Th	µg/L	NA	NR	<0.20 U	<0.2 U	NA	NR	NA	NR
Total Th	µg/L	NA	NR	<0.20 U	<0.2 U	NA	NR	NA	NR
Dissolved Ti	µg/L	<7 U	<10 U	<5 U	<5 U	<7 U	6 J	<7 U	11
Total Ti	µg/L	<8 U	<10 U	<3 U	3 *	<8 U	5 J	<8 U	11
Dissolved Tl	µg/L	<17 U	<1.0 U	<0.20 U	<0.20 U	<17 U	<1.0 U	<17 U	<1.0 U
Total Tl	µg/L	<19 U	<1.0 U	<0.20 U	<0.20 U	<19 U	<1.0 U	<19 U	<1.0 U
Dissolved U	µg/L	<50 U	<1.0 U	<0.20 U	<0.20 U	19 J	2.00	20 J	<1.0 U
Total U	µg/L	<56 U	<1.0 U	<0.20 U	<0.20 U	<56 U	2.00	24 J	<1.0 U

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

	Sample	GW07	GW07	GW08	GW08	GW08	GW08	GW08	GW09	GW09
	Sample Date	9/19/11	3/8/12	9/20/11	3/5/12	9/20/12	12/4/12	5/29/13	9/21/11	3/7/12
Parameter	Unit	Round 1	Round 2	Round 1	Round 2	Round 3	Round 4	Round 5	Round 1	Round 2
Total Mg	mg/L	29.5 J	30.1	24.7 J	27.2	13.0	10.8	14.5	0.34 J	<5.00 U
Dissolved Mn	µg/L	51	54	19	22	13	12	21	<14 U	<15 U
Total Mn	µg/L	53 J	59	19 J	23	20	20	53	<16 U	<15 U
Dissolved Mo	µg/L	<17 U	<20 U	<17 U	<20 U	1.0	0.85	0.8 B	<17 U	<20 U
Total Mo	µg/L	<19 U	<20 U	<19 U	<20 U	1.2	0.90	0.8 B	<19 U	<20 U
Dissolved Na	mg/L	25.0 J	26.5	990 J	1170	632	576	708	144 J	153
Total Na	mg/L	26.2 J	27.1	1040 J	1190	668	575	680	152 J	154
Dissolved Ni	µg/L	<84 U	<1.0 U	<84 U	0.26 J	1.2	1.2 B	1.5 B	<84 U	<1.0 U
Total Ni	µg/L	<93 U	0.40 J	<93 U	<1.0 U	1.8 B	1.5 *,B	1.5 B	<93 U	<1.0 U
Dissolved P	mg/L	<0.06 U	NR	<0.06 U	NR	0.07	0.04 J	0.13	0.03 J	NR
Total P	mg/L	<0.07 U	NR	<0.07 U	NR	0.04	0.04	<0.03 U	0.04 J	NR
Dissolved Pb	µg/L	<17 U	<1.0 U	<17 U	0.43 J	<0.2 U	0.14 J	<0.20 U	<17 U	0.33 J
Total Pb	µg/L	<19 U	<1.0 U	<19 U	<1.0 U	0.3	0.28	0.32	<19 U	<1.0 U
Dissolved S	mg/L	7.56 J	9.39	70.2 J	80.6	NA	NA	NA	8.64 J	9.44
Total S	mg/L	6.89 J	10.0	66.1 J	83.9	NA	NA	NA	7.79 J	9.65
Dissolved Sb	µg/L	R	<60 U	R	<60 U	0.12 J	0.11 J	<0.2 U	R	<60 U
Total Sb	µg/L	R	<60 U	R	<60 U	0.12 J	0.12 J	<0.2 U	R	<60 U
Dissolved Se	µg/L	<30 U	R	<30 U	R	<2 U	<2 U	0.4 J	<30 U	R
Total Se	µg/L	<33 U	R	<33 U	R	<2 U	<2 U	<2 U	<33 U	R
Dissolved Si	mg/L	12.2 J	10.5	5.90 J	5.61	5.1	5.6	5.8	4.85 J	4.93
Total Si	mg/L	15.7 J	11.4	5.47 J	5.39	5.7	6.0	5.69	4.8 J	4.89
Dissolved Sr	µg/L	2500	2660	6400	7480	3020	312	3920	49	52
Total Sr	µg/L	2530 J	2770	6610 J	7770	3250	2660	3880	51 J	54
Dissolved Th	µg/L	NA	NR	NA	NR	<0.2 U	<0.20 U	<0.2 U	NA	NR
Total Th	µg/L	NA	NR	NA	NR	<0.2 U	<0.20 U	0.1 J	NA	NR
Dissolved Ti	µg/L	<7 U	8 J	<7 U	8 J	<5 U	<5 U	<5 U	<7 U	<10 U
Total Ti	µg/L	52	9 J	<8 U	9 J	<3 U	<3 U	<3 U	<8 U	<10 U
Dissolved Tl	µg/L	<17 U	<1.0 U	<17 U	<1.0 U	<0.2 U	<0.20 U	<0.20 U	<17 U	<1.0 U
Total Tl	µg/L	<19 U	<1.0 U	<19 U	<1.0 U	<0.2 U	<0.20 U	<0.20 U	<19 U	<1.0 U
Dissolved U	µg/L	<50 U	<1.0 U	21 J	<1.0 U	<0.2 U	<0.20 U	0.06 J	<50 U	<1.0 U
Total U	µg/L	<56 U	<1.0 U	19 J	<1.0 U	<0.2 U	<0.20 U	0.055 J	<56 U	<1.0 U

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW10 9/22/11 Round 1	GW10 3/7/12 Round 2	GW11 9/22/11 Round 1	GW11 3/7/12 Round 2	GW12 9/21/11 Round 1	GW13 3/5/12 Round 2	GW13 12/3/12 Round 4	GW13 5/28/13 Round 5
Total Mg	mg/L	4.98 J	5.24	11.8 J	12.5	8.90 J	<5.00 U	0.79	1.39
Dissolved Mn	µg/L	16	18	25	27	20	8 J	7.0	<5 U
Total Mn	µg/L	16 J	18	24 J	27	20 J	7 J	7.1	4.8
Dissolved Mo	µg/L	<17 U	<20 U	<17 U	<20 U	<17 U	<20 U	0.70	0.7
Total Mo	µg/L	<19 U	<20 U	<19 U	<20 U	<19 U	<20 U	0.65	0.6
Dissolved Na	mg/L	108 J	113	90.6 J	89.6	81.8 J	179	173	165
Total Na	mg/L	112 J	117	93.4 J	91.3	87.4 J	171	177	168
Dissolved Ni	µg/L	<84 U	<1.0 U	<84 U	<1.0 U	<84 U	0.27 J	<0.20 U	0.3 B
Total Ni	µg/L	<93 U	<1.0 U	<93 U	<1.0 U	<93 U	<1.0 U	1.0 *,B	0.2
Dissolved P	mg/L	<0.06 U	NR	<0.06 U	NR	<0.06 U	NR	<0.05 U	<0.05 U
Total P	mg/L	<0.07 U	NR	<0.07 U	NR	<0.07 U	NR	<0.03 U	<0.03 U
Dissolved Pb	µg/L	<17 U	0.22 J	<17 U	0.64 J	<17 U	<1.0 U	<0.20 U	<0.20 U
Total Pb	µg/L	<19 U	<1.0 U	<19 U	<1.0 U	<19 U	<1.0 U	<0.20 U	<0.20 U
Dissolved S	mg/L	9.36 J	9.97	13.8 J	13.9	10.8 J	23.5 *	NA	NA
Total S	mg/L	8.03 J	10.1	11.8 J	14.4	9.45 J	23.5 J-	NA	NA
Dissolved Sb	µg/L	R	<60 U	R	<60 U	R	<60 U	<0.20 U	<0.2 U
Total Sb	µg/L	R	<60 U	R	<60 U	R	<60 U	<0.20 U	<0.2 U
Dissolved Se	µg/L	<30 U	R	<30 U	R	<30 U	R	<2 U	<2 U
Total Se	µg/L	<33 U	R	<33 U	R	<33 U	R	<2 U	<2 U
Dissolved Si	mg/L	7.21 J	6.77	8.75 J	7.72	8.43 J	5.87	5.7	6.3
Total Si	mg/L	6.45 J	6.89	7.90 J	7.79	7.47 J	5.47	5.9	6.14
Dissolved Sr	µg/L	649	667	1820	2020	1340	248	242	316
Total Sr	µg/L	629 J	699	1840 J	2090	1360 J	256	250	328
Dissolved Th	µg/L	NA	NR	NA	NR	NA	NR	<0.20 U	<0.2 U
Total Th	µg/L	NA	NR	NA	NR	NA	NR	<0.20 U	<0.2 U
Dissolved Ti	µg/L	<7 U	<10 U	2 J	5 J	<7 U	<10 U	<5 U	<5 U
Total Ti	µg/L	<8 U	<10 U	<8 U	5 J	<8 U	<10 U	<3 U	<3 U
Dissolved Tl	µg/L	<17 U	<1.0 U	<17 U	<1.0 U	<17 U	<1.0 U	<0.20 U	<0.20 U
Total Tl	µg/L	<19 U	<1.0 U	<19 U	<1.0 U	<19 U	<1.0 U	<0.20 U	<0.20 U
Dissolved U	µg/L	<50 U	<1.0 U	<50 U	<1.0 U	<50 U	<1.0 U	<0.20 U	<0.20 U
Total U	µg/L	<56 U	<1.0 U	<56 U	<1.0 U	<56 U	<1.0 U	<0.20 U	<0.20 U

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

	Sample	GW14	GW14	GW14	GW15	GW15	GW15	GW16	GW16	GW16
	Sample Date	3/5/12	12/5/12	5/28/13	3/6/12	12/5/12	5/30/13	3/6/12	12/5/12	5/30/13
Parameter	Unit	Round 2	Round 4	Round 5	Round 2	Round 4	Round 5	Round 2	Round 4	Round 5
Total Mg	mg/L	<5.00 U	0.96	0.92	1.02 J	1.21	1.17	<5.00 U	1.06	1.05
Dissolved Mn	µg/L	<15 U	4.0 J	<5 U	5 J	4.0 J	<5 U	8 J	7.2	7
Total Mn	µg/L	<15 U	3.8	3.6	4 J	4.6	3.5	7 J	7.2	6.9
Dissolved Mo	µg/L	<20 U	0.60	0.8	<20 U	0.64	0.8	<20 U	<0.5 U	0.5
Total Mo	µg/L	<20 U	0.58	1.2	<20 U	0.58	0.6	<20 U	<0.5 U	0.7
Dissolved Na	mg/L	177	170	171	205	193	206	177	174	175
Total Na	mg/L	174	176	173	184	200	209	171	179	180
Dissolved Ni	µg/L	0.49 J	0.14 J	0.2 B	<1.0 U	0.19 J	<0.2 U	0.24 J	0.25	0.2
Total Ni	µg/L	<1.0 U	0.4 *,B	<0.2 U	<1.0 U	0.77 *,B	<0.2 U	<1.0 U	1.8 *,B	<0.2 U
Dissolved P	mg/L	NR	<0.05 U	0.05	NR	<0.05 U	0.06 B	NR	<0.05 U	<0.05 U
Total P	mg/L	NR	<0.03 U	<0.03 U	NR	<0.03 U	<0.03 U	NR	<0.03 U	<0.03 U
Dissolved Pb	µg/L	<1.0 U	0.07 J	0.37 B	<1.0 U	<0.20 U	0.10 J	<1.0 U	0.16 J	0.26
Total Pb	µg/L	<1.0 U	0.20 J	0.43	<1.0 U	<0.20 U	<0.20 U	<1.0 U	0.22	0.22
Dissolved S	mg/L	22.4 *	NA	NA	30.7 *	NA	NA	9.38 *	NA	NA
Total S	mg/L	24.0 J-	NA	NA	30.0	NA	NA	9.90	NA	NA
Dissolved Sb	µg/L	<60 U	<0.20 U	<0.2 U	<60 U	<0.20 U	<0.2 U	<60 U	<0.20 U	<0.2 U
Total Sb	µg/L	<60 U	<0.20 U	<0.2 U	<60 U	<0.20 U	<0.2 U	<60 U	<0.20 U	<0.2 U
Dissolved Se	µg/L	R	<2 U	<2 U	R	<2 U	<2 U	R	<2 U	<2 U
Total Se	µg/L	R	<2 U	<2 U	R	<2 U	<2 U	R	<2 U	<2 U
Dissolved Si	mg/L	5.90	5.8	5.8	6.58	6.0	5.9	6.59	6.5	6.6
Total Si	mg/L	5.67	6.0	5.67	5.90	6.5	5.67	6.32	6.8	6.42
Dissolved Sr	µg/L	306	296	283	320	317	309	259	267	272
Total Sr	µg/L	331	295	293	318	309	325	282	263	276
Dissolved Th	µg/L	NR	<0.20 U	<0.2 U	NR	<0.20 U	<0.2 U	NR	<0.20 U	<0.2 U
Total Th	µg/L	NR	<0.20 U	<0.2 U	NR	<0.20 U	<0.2 U	NR	<0.20 U	<0.2 U
Dissolved Ti	µg/L	<10 U	<5 U	<5 U	<10 U	<5 U	<5 U	<10 U	<5 U	<5 U
Total Ti	µg/L	<10 U	<3 U	<3 U	<10 U	<3 U	<3 U	<10 U	<3 U	<3 U
Dissolved Tl	µg/L	<1.0 U	<0.20 U	<0.20 U	<1.0 U	<0.20 U	<0.20 U	<1.0 U	<0.20 U	<0.20 U
Total Tl	µg/L	<1.0 U	<0.20 U	<0.20 U	<1.0 U	<0.20 U	<0.20 U	<1.0 U	<0.20 U	<0.20 U
Dissolved U	µg/L	<1.0 U	<0.20 U	<0.20 U	<1.0 U	<0.20 U	0.06 J	<1.0 U	<0.20 U	<0.20 U
Total U	µg/L	<1.0 U	<0.20 U	<0.20 U	<1.0 U	<0.20 U	0.06 J	<1.0 U	<0.20 U	<0.20 U

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

	Sample	PW01	PW02	PW03	SW01	SW01	SW02	SW02
	Sample Date	9/20/12	5/29/13	5/29/13	9/21/11	3/6/12	9/21/11	3/6/12
Parameter	Unit	Round 3	Round 5	Round 5	Round 1	Round 2	Round 1	Round 2
Total Mg	mg/L	2330	0.14	1860	3.59 J	2.72 J	3.56 J	2.94 J
Dissolved Mn	µg/L	3400	496	2560	6 J	8 J	5 J	8 J
Total Mn	µg/L	3430	713	2650	21 J	11 J	20 J	12 J
Dissolved Mo	µg/L	43 J	5	102	<17 U	<20 U	<17 U	<20 U
Total Mo	µg/L	<100 U	1.6	<50 U	<19 U	<20 U	<19 U	<20 U
Dissolved Na	mg/L	60100	1.15	96400	10.9 J	6.53	10.7 J	6.71
Total Na	mg/L	59900	1.05	48100	11.5 J	5.93	11.3 J	6.47
Dissolved Ni	µg/L	771	5.1	682	<84 U	0.86 J	<84 U	0.90 J
Total Ni	µg/L	716	15.4	73.5	<93 U	0.68 J	<93 U	0.74 J
Dissolved P	mg/L	87	<0.05 U	145	<0.06 U	NR	<0.06 U	NR
Total P	mg/L	3.77	<0.05 U	268	<0.07 U	NR	<0.07 U	NR
Dissolved Pb	µg/L	<40 U	353	<0.20 U	<17 U	<1.0 U	<17 U	<1.0 U
Total Pb	µg/L	<40 U	1960	<20 U	<19 U	<1.0 U	<19 U	<1.0 U
Dissolved S	mg/L	NA	NA	NA	4.15 J	5.31 *	4.20 J	5.54 *
Total S	mg/L	NA	NA	NA	3.57 J	5.06 *	3.57 J	5.50 *
Dissolved Sb	µg/L	<40 U	<0.4 U	<20 U	R	<60 U	R	<60 U
Total Sb	µg/L	<40 U	0.4 J	<20 U	R	<60 U	R	<60 U
Dissolved Se	µg/L	<400 U	<10 U	<100 U	<30 U	R	<30 U	R
Total Se	µg/L	<400 U	<4 U	<100 U	<33 U	R	<33 U	R
Dissolved Si	mg/L	15	0.34	38	4.40 J	0.15	4.41 J	0.17
Total Si	mg/L	14	0.47	19	3.97 J	0.23	3.97 J	0.22
Dissolved Sr	µg/L	752000	26	584000	435	314	427	327
Total Sr	µg/L	689000	30.1	60400	442 J	300	432 J	327
Dissolved Th	µg/L	<40 U	<0.4 U	<20 U	NA	NR	NA	NR
Total Th	µg/L	<40 U	0.3 J	<20 U	NA	NR	NA	NR
Dissolved Ti	µg/L	<25 U	<5 U	<50 U	<7 U	7 J	<7 U	7 J
Total Ti	µg/L	<500 U	<5 U	<50 U	<8 U	7 J	<8 U	8 J
Dissolved Tl	µg/L	<40 U	<0.40 U	<20 U	<17 U	<1.0 U	<17 U	<1.0 U
Total Tl	µg/L	17.0 J	0.97	<20 U	<19 U	<1.0 U	<19 U	<1.0 U
Dissolved U	µg/L	<40 U	<0.4 U	<20 U	<50 U	0.57 J	<50 U	0.57 J
Total U	µg/L	<40 U	<0.40 U	<20 U	<56 U	0.51 J	<56 U	0.59 J

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

Parameter	Sample Sample Date Unit	SW03 9/22/11 Round 1	SW03 3/7/12 Round 2	SW04 12/4/12 Round 4	SW04 5/29/13 Round 5
Total Mg	mg/L	3.58 J	3.06 J	5.39	4.73
Dissolved Mn	µg/L	7 J	4 J	227	433
Total Mn	µg/L	18 J	11 J	299	445
Dissolved Mo	µg/L	<17 U	<20 U	0.79	0.6
Total Mo	µg/L	<19 U	<20 U	0.81	0.8
Dissolved Na	mg/L	10.8 J	6.46	4.36	4.07
Total Na	mg/L	11.3 J	6.68	4.29	3.84
Dissolved Ni	µg/L	<84 U	<1.0 U	2.4	3.2
Total Ni	µg/L	<93 U	0.79 J	4.1 *,B	3.2
Dissolved P	mg/L	<0.06 U	NR	0.05 J	0.09
Total P	mg/L	<0.07 U	NR	0.22	0.2
Dissolved Pb	µg/L	<17 U	<1.0 U	0.60 *	1.1
Total Pb	µg/L	<19 U	<1.0 U	1.7	1.4
Dissolved S	mg/L	4.31 J	5.31 *	NA	NA
Total S	mg/L	3.61 J	5.63 *	NA	NA
Dissolved Sb	µg/L	R	<60 U	0.13 J	<0.2 U
Total Sb	µg/L	R	<60 U	0.14 J	<0.2 U
Dissolved Se	µg/L	<30 U	R	<2 U	0.4 J
Total Se	µg/L	<33 U	R	0.7 J	<2 U
Dissolved Si	mg/L	4.32 J	0.17	2.6	2.2 *
Total Si	mg/L	4.03 J	0.20	2.8	4.01
Dissolved Sr	µg/L	429	318	233	205
Total Sr	µg/L	429 J	338	243	205
Dissolved Th	µg/L	NA	NR	<0.20 U	<0.2 U
Total Th	µg/L	NA	NR	0.09 J	0.2 J
Dissolved Ti	µg/L	<7 U	7 J	11	<5 U
Total Ti	µg/L	<8 U	8 J	7	27 J,*
Dissolved Tl	µg/L	<17 U	<1.0 U	<0.20 U	<0.20 U
Total Tl	µg/L	<19 U	<1.0 U	<0.20 U	<0.20 U
Dissolved U	µg/L	<50 U	0.55 J	1.1	0.53
Total U	µg/L	<56 U	0.59 J	1.2	0.58

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

	Sample	GW01	GW01	GW01	GW01	GW01
	Sample Date	9/20/11	3/5/12	9/20/12	12/3/12	5/28/13
Parameter	Unit	Round 1	Round 2	Round 3	Round 4	Round 5
Dissolved V	µg/L	<10 U	<5.0 U	0.06 J	0.25	0.19 J
Total V	µg/L	<11 U	<5.0 U	<0.20 U	0.21	0.53 B
Dissolved Zn	µg/L	<50 U	NR	1 J	7.6	30
Total Zn	µg/L	<56 U	NR	2 J	7 B	33

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

	Sample	GW02	GW02	GW02	GW02	GW03	GW03	GW03
	Sample Date	9/20/11	3/5/12	12/3/12	5/28/13	9/20/11	3/5/12	12/3/12
Parameter	Unit	Round 1	Round 2	Round 4	Round 5	Round 1	Round 2	Round 4
Dissolved V	µg/L	<10 U	<5.0 U	0.05 J	0.02 J	<10 U	<5.0 U	0.05 J
Total V	µg/L	<11 U	<5.0 U	0.26	0.40 B	<11 U	<5.0 U	0.40
Dissolved Zn	µg/L	<50 U	NR	13.2	7	<50 U	NR	<5 U
Total Zn	µg/L	<56 U	NR	21 B	7	<56 U	NR	4 B

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW04 9/22/11 Round 1	GW04 3/6/12 Round 2	GW04 12/4/12 Round 4	GW04 5/29/13 Round 5	GW05 9/22/11 Round 1	GW05 3/6/12 Round 2	GW06 9/19/11 Round 1	GW06 3/7/12 Round 2
Dissolved V	µg/L	<10 U	<5.0 U	0.02 J	0.02 J	<10 U	1.40 J	<10 U	<5.0 U
Total V	µg/L	<11 U	<5.0 U	0.38 B	0.91 B	4 J	1.40 J	<11 U	<5.00 U
Dissolved Zn	µg/L	<50 U	NR	<5 U	<5 U	<50 U	NR	26 J	NR
Total Zn	µg/L	<56 U	NR	2 J	2 J	<56 U	NR	220 J	NR

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW07 9/19/11 Round 1	GW07 3/8/12 Round 2	GW08 9/20/11 Round 1	GW08 3/5/12 Round 2	GW08 9/20/12 Round 3	GW08 12/4/12 Round 4	GW08 5/29/13 Round 5	GW09 9/21/11 Round 1	GW09 3/7/12 Round 2
Dissolved V	µg/L	<10 U	<5.0 U	<10 U	<5.0 U	0.13 J	0.25	0.22	<10 U	<5.0 U
Total V	µg/L	<11 U	<5.0 U	<11 U	<5.0 U	0.26 J	0.33 B	0.58 B	<11 U	<5.0 U
Dissolved Zn	µg/L	341	NR	<50 U	NR	2 J	4 J	17 B	32 J	NR
Total Zn	µg/L	356 J	NR	<56 U	NR	9	9	9 B	41 J	NR

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

	Sample	GW10	GW10	GW11	GW11	GW12	GW13	GW13	GW13
	Sample Date	9/22/11	3/7/12	9/22/11	3/7/12	9/21/11	3/5/12	12/3/12	5/28/13
Parameter	Unit	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2	Round 4	Round 5
Dissolved V	µg/L	<10 U	<5.0 U	<10 U	<5.0 U	<10 U	<5.0 U	0.03 J	<0.2 U
Total V	µg/L	<11 U	<5.0 U	<11 U	<5.0 U	<11 U	<5.0 U	0.5	0.5 B
Dissolved Zn	µg/L	<50 U	NR	<50 U	NR	18 J	NR	<5 U	<5 U
Total Zn	µg/L	<56 U	NR	<56 U	NR	<56 U	NR	<3 U	1 J

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

	Sample	GW14	GW14	GW14	GW15	GW15	GW15	GW16	GW16	GW16
	Sample Date	3/5/12	12/5/12	5/28/13	3/6/12	12/5/12	5/30/13	3/6/12	12/5/12	5/30/13
Parameter	Unit	Round 2	Round 4	Round 5	Round 2	Round 4	Round 5	Round 2	Round 4	Round 5
Dissolved V	µg/L	<5.0 U	0.02 J	<0.2 U	<5.0 U	0.03 J	0.02 J	<5.0 U	0.04 J	0.02 J
Total V	µg/L	<5.0 U	0.36 B	0.51 B	<5.0 U	0.44 B	0.48 B	<5.0 U	0.43 B	0.56 B
Dissolved Zn	µg/L	NR	7	6	NR	<5 U	<5 U	NR	4 J	<5 U
Total Zn	µg/L	NR	7	5	NR	<3 U	2 J	NR	5	4

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

Parameter	Sample Sample Date Unit	PW01 9/20/12 Round 3	PW02 5/29/13 Round 5	PW03 5/29/13 Round 5	SW01 9/21/11 Round 1	SW01 3/6/12 Round 2	SW02 9/21/11 Round 1	SW02 3/6/12 Round 2
Dissolved V	µg/L	14.4 J	<0.2 U	2.3 J	<10 U	<5.0 U	<10 U	<5.0 U
Total V	µg/L	17.2 J	0.92 B	<10 U	<11 U	<5.0 U	<11 U	<5.0 U
Dissolved Zn	µg/L	291	119	<500 U	<50 U	NR	<50 U	NR
Total Zn	µg/L	312	191	<500 U	<56 U	NR	<56 U	NR

Table B-3 Sample Results - Dissolved and Total Metals (Wise County, Texas)

Parameter	Sample Sample Date Unit	SW03 9/22/11 Round 1	SW03 3/7/12 Round 2	SW04 12/4/12 Round 4	SW04 5/29/13 Round 5
Dissolved V	µg/L	<10 U	<5.0 U	1.3 *	1.5
Total V	µg/L	<11 U	<5.0 U	3 B	2.8
Dissolved Zn	µg/L	<50 U	NR	3 J	<5 U
Total Zn	µg/L	<56 U	NR	7	3

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

	Sample	GW01	GW01	GW01	GW01	GW01
	Sample Date	9/20/11	3/5/12	9/20/12	12/3/12	5/28/13
Parameter (CAS Number)	Unit	Round 1	Round 2	Round 3	Round 4	Round 5
ethanol (64-17-5)	µg/L	<100 U	<100 U	NA	<100 U	<100 U
isopropanol (67-63-0)	µg/L	<25.0 U	<25.0 U	NA	<10 U	<10 U
acrylonitrile (107-13-1)	µg/L	NA	<25.0 U,J-	NA	<1 U	<1 U
styrene (100-42-5)	µg/L	NA	<0.5 U	NA	NR	<0.5 U
acetone (67-64-1)	µg/L	<1.0 U	<1.0 U	NA	<1 U	2.6 B
tert-butyl alcohol (75-65-0)	µg/L	<5.0 U	<5.0 U	NA	<10 U	<10 U
methyl tert-butyl ether (1634-04-4)	µg/L	<1.0 U	<1.0 U	NA	<0.5 U	<0.5 U
diisopropyl ether (108-20-3)	µg/L	<1.0 U	<1.0 U	NA	<0.5 U	<0.5 U
ethyl tert-butyl ether (637-92-3)	µg/L	<1.0 U	<1.0 U	NA	<0.5 U	<0.5 U
tert-amyl methyl ether (994-05-8)	µg/L	<1.0 U	<1.0 U	NA	<0.5 U	<0.5 U
vinyl chloride (75-01-4)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U
1,1-dichloroethene (75-35-4)	µg/L	R	R	NA	<0.5 U	<0.5 U
carbon disulfide (75-15-0)	µg/L	<0.5 U,J-	<0.5 U,J-	NA	<0.5 U	<0.5 U
methylene chloride (75-09-2)	µg/L	<1.0 U	<1.0 U	NA	<0.5 U	<0.5 U
trans-1,2-dichloroethene (156-60-5)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U
1,1-dichloroethane (75-34-3)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U
cis-1,2-dichoroethene (156-59-2)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U
chloroform (67-66-3)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U
1,1,1-trichloroethane (71-55-6)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U
carbon tetrachloride (56-23-5)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U
benzene (71-43-2)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	0.12 J
1,2-dichloroethane (107-06-2)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U
trichloroethene (79-01-6)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U
toluene (108-88-3)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U
1,1,2-trichloroethane (79-00-5)	µg/L	R	R	NA	<0.5 U	<0.5 U
tetrachloroethene (127-18-4)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U
chlorobenzene (108-90-7)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U
ethylbenzene (100-41-4)	µg/L	<1.0 U	<1.0 U	NA	<0.5 U	<0.5 U
m+p xylene (108-38-3, 106-42-3)	µg/L	<2.0 U	<2.0 U	NA	<1 U	0.25 J
o-xylene (95-47-6)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	0.09 J
isopropylbenzene (98-82-8)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U
1,3,5-trimethylbenzene (108-67-8)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW02 9/20/11 Round 1	GW02 3/5/12 Round 2	GW02 12/3/12 Round 4	GW02 5/28/13 Round 5	GW03 9/20/11 Round 1	GW03 3/5/12 Round 2	GW03 12/3/12 Round 4
ethanol (64-17-5)	µg/L	<100 U	<100 U	<100 U	<100 U	<100 U	<100 U	<100 U
isopropanol (67-63-0)	µg/L	<25.0 U	<25.0 U	<10 U	<10 U	<25.0 U	<25.0 U	<10 U
acrylonitrile (107-13-1)	µg/L	NA	<25.0 U,J-	<1 U	<1 U	NA	<25.0 U,J-	<1 U
styrene (100-42-5)	µg/L	NA	<0.5 U	NR	<0.5 U	NA	<0.5 U	NR
acetone (67-64-1)	µg/L	<1.0 U	<1.0 U	<1 U	2.8 B	<1.0 U	<1.0 U	<1 U
tert-butyl alcohol (75-65-0)	µg/L	<5.0 U	<5.0 U	<10 U	<10 U	<5.0 U	<5.0 U	<10 U
methyl tert-butyl ether (1634-04-4)	µg/L	<1.0 U	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<1.0 U	<0.5 U
diisopropyl ether (108-20-3)	µg/L	<1.0 U	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<1.0 U	<0.5 U
ethyl tert-butyl ether (637-92-3)	µg/L	<1.0 U	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<1.0 U	<0.5 U
tert-amyl methyl ether (994-05-8)	µg/L	<1.0 U	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<1.0 U	<0.5 U
vinyl chloride (75-01-4)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1-dichloroethene (75-35-4)	µg/L	R	R	<0.5 U	<0.5 U	R	R	<0.5 U
carbon disulfide (75-15-0)	µg/L	<0.5 U,J-	<0.5 U,J-	<0.5 U	<0.5 U	<0.5 U,J-	<0.5 U,J-	<0.5 U
methylene chloride (75-09-2)	µg/L	<1.0 U	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<1.0 U	<0.5 U
trans-1,2-dichloroethene (156-60-5)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1-dichloroethane (75-34-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
cis-1,2-dichoroethene (156-59-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
chloroform (67-66-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1,1-trichloroethane (71-55-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
carbon tetrachloride (56-23-5)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
benzene (71-43-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2-dichloroethane (107-06-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
trichloroethene (79-01-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
toluene (108-88-3)	µg/L	<0.5 U	<0.5 U	0.80 B	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1,2-trichloroethane (79-00-5)	µg/L	R	R	<0.5 U	<0.5 U	R	R	<0.5 U
tetrachloroethene (127-18-4)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
chlorobenzene (108-90-7)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
ethylbenzene (100-41-4)	µg/L	<1.0 U	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<1.0 U	<0.5 U
m+p xylene (108-38-3, 106-42-3)	µg/L	<2.0 U	<2.0 U	<1 U	<1.0 U	<2.0 U	<2.0 U	<1 U
o-xylene (95-47-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
isopropylbenzene (98-82-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,3,5-trimethylbenzene (108-67-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW04 9/22/11 Round 1	GW04 3/6/12 Round 2	GW04 12/4/12 Round 4	GW04 5/29/13 Round 5	GW05 9/22/11 Round 1	GW05 3/6/12 Round 2
ethanol (64-17-5)	µg/L	<100 U	<100 U	<100 U	<100 U	<100 U	<100 U
isopropanol (67-63-0)	µg/L	<25.0 U	<25.0 U	<10 U	<10 U	<25.0 U	<25.0 U
acrylonitrile (107-13-1)	µg/L	NA	<25.0 U,J-	<1 U	<1 U	NA	<25.0 U,J-
styrene (100-42-5)	µg/L	NA	<0.5 U	NR	<0.5 U	NA	<0.5 U
acetone (67-64-1)	µg/L	<1.0 U	<1.0 U	<1 U	2.1 B	<1.0 U	<1.0 U
tert-butyl alcohol (75-65-0)	µg/L	<5.0 U	<5.0 U	<10 U	<10 U	<5.0 U	<5.0 U
methyl tert-butyl ether (1634-04-4)	µg/L	<1.0 U	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<1.0 U
diisopropyl ether (108-20-3)	µg/L	<1.0 U	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<1.0 U
ethyl tert-butyl ether (637-92-3)	µg/L	<1.0 U	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<1.0 U
tert-amyl methyl ether (994-05-8)	µg/L	<1.0 U	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<1.0 U
vinyl chloride (75-01-4)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1-dichloroethene (75-35-4)	µg/L	R	R	<0.5 U	<0.5 U	R	R
carbon disulfide (75-15-0)	µg/L	<0.5 U	<0.5 U,J-	<0.5 U	<0.5 U	<0.5 U	<0.5 U,J-
methylene chloride (75-09-2)	µg/L	<1.0 U	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<1.0 U
trans-1,2-dichloroethene (156-60-5)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1-dichloroethane (75-34-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
cis-1,2-dichoroethene (156-59-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
chloroform (67-66-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1,1-trichloroethane (71-55-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
carbon tetrachloride (56-23-5)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
benzene (71-43-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	0.62
1,2-dichloroethane (107-06-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
trichloroethene (79-01-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
toluene (108-88-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1,2-trichloroethane (79-00-5)	µg/L	R	R	<0.5 U	<0.5 U	R	R
tetrachloroethene (127-18-4)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
chlorobenzene (108-90-7)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
ethylbenzene (100-41-4)	µg/L	<1.0 U	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<1.0 U
m+p xylene (108-38-3, 106-42-3)	µg/L	<2.0 U	<2.0 U	<1 U	<1.0 U	<2.0 U	<2.0 U
o-xylene (95-47-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
isopropylbenzene (98-82-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,3,5-trimethylbenzene (108-67-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW06 9/19/11 Round 1	GW06 3/7/12 Round 2	GW07 9/19/11 Round 1	GW07 3/8/12 Round 2
ethanol (64-17-5)	µg/L	<100 U	<100 U	<100 U	<100 U
isopropanol (67-63-0)	µg/L	<25.0 U	<25.0 U	<25.0 U	<25.0 U
acrylonitrile (107-13-1)	µg/L	NA	<25.0 U,J-	NA	<25.0 U,J-
styrene (100-42-5)	µg/L	NA	<0.5 U	NA	<0.5 U
acetone (67-64-1)	µg/L	<1.0 U	<1.0 U,J-	<1.0 U	<1.0 U,J-
tert-butyl alcohol (75-65-0)	µg/L	<5.0 U	<5.0 U	<5.0 U	<5.0 U
methyl tert-butyl ether (1634-04-4)	µg/L	<1.0 U	<1.0 U	<1.0 U	<1.0 U
diisopropyl ether (108-20-3)	µg/L	<1.0 U	<1.0 U	<1.0 U	<1.0 U
ethyl tert-butyl ether (637-92-3)	µg/L	<1.0 U	<1.0 U	<1.0 U	<1.0 U
tert-amyl methyl ether (994-05-8)	µg/L	<1.0 U	<1.0 U	<1.0 U	<1.0 U
vinyl chloride (75-01-4)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1-dichloroethene (75-35-4)	µg/L	R	R	R	R
carbon disulfide (75-15-0)	µg/L	<0.5 U	<0.5 U,J-	<0.5 U	<0.5 U,J-
methylene chloride (75-09-2)	µg/L	<1.0 U	<1.0 U	<1.0 U	<1.0 U
trans-1,2-dichloroethene (156-60-5)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1-dichloroethane (75-34-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
cis-1,2-dichoroethene (156-59-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
chloroform (67-66-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1,1-trichloroethane (71-55-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
carbon tetrachloride (56-23-5)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
benzene (71-43-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2-dichloroethane (107-06-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
trichloroethene (79-01-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
toluene (108-88-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1,2-trichloroethane (79-00-5)	µg/L	R	R	R	R
tetrachloroethene (127-18-4)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
chlorobenzene (108-90-7)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
ethylbenzene (100-41-4)	µg/L	<1.0 U	<1.0 U	<1.0 U	<1.0 U
m+p xylene (108-38-3, 106-42-3)	µg/L	<2.0 U	<2.0 U	<2.0 U	<2.0 U
o-xylene (95-47-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
isopropylbenzene (98-82-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,3,5-trimethylbenzene (108-67-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW08 9/20/11 Round 1	GW08 3/5/12 Round 2	GW08 9/20/12 Round 3	GW08 12/4/12 Round 4	GW08 5/29/13 Round 5	GW09 9/21/11 Round 1	GW09 3/7/12 Round 2
ethanol (64-17-5)	µg/L	<100 U	<100 U	NA	<100 U	<100 U	<100 U	<100 U
isopropanol (67-63-0)	µg/L	<25.0 U	<25.0 U	NA	<10 U	<10 U	<25.0 U	<25.0 U
acrylonitrile (107-13-1)	µg/L	NA	<25.0 U,J-	NA	<1 U	<1 U	NA	<25.0 U,J-
styrene (100-42-5)	µg/L	NA	<0.5 U	NA	NR	<0.5 U	NA	<0.5 U
acetone (67-64-1)	µg/L	<1.0 U	<1.0 U	NA	23 B	2.8 B	<1.0 U	<1.0 U,J-
tert-butyl alcohol (75-65-0)	µg/L	<5.0 U	<5.0 U	NA	38	<10 U	<5.0 U	<5.0 U
methyl tert-butyl ether (1634-04-4)	µg/L	<1.0 U	<1.0 U	NA	0.56	<0.5 U	<1.0 U	<1.0 U
diisopropyl ether (108-20-3)	µg/L	<1.0 U	<1.0 U	NA	<0.5 U	<0.5 U	<1.0 U	<1.0 U
ethyl tert-butyl ether (637-92-3)	µg/L	<1.0 U	<1.0 U	NA	1.9	<0.5 U	<1.0 U	<1.0 U
tert-amyl methyl ether (994-05-8)	µg/L	<1.0 U	<1.0 U	NA	0.076 J	<0.5 U	<1.0 U	<1.0 U
vinyl chloride (75-01-4)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1-dichloroethene (75-35-4)	µg/L	R	R	NA	<0.5 U	<0.5 U	R	R
carbon disulfide (75-15-0)	µg/L	<0.5 U	<0.5 U,J-	NA	<0.5 U	<0.5 U	<0.5 U,J-	<0.5 U,J-
methylene chloride (75-09-2)	µg/L	<1.0 U	<1.0 U	NA	<0.5 U	<0.5 U	<1.0 U	<1.0 U
trans-1,2-dichloroethene (156-60-5)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1-dichloroethane (75-34-3)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U
cis-1,2-dichoroethene (156-59-2)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U
chloroform (67-66-3)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1,1-trichloroethane (71-55-6)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U
carbon tetrachloride (56-23-5)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U
benzene (71-43-2)	µg/L	<0.5 U	<0.5 U	NA	0.08 J	<0.5 U	<0.5 U	<0.5 U
1,2-dichloroethane (107-06-2)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U
trichloroethene (79-01-6)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U
toluene (108-88-3)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1,2-trichloroethane (79-00-5)	µg/L	R	R	NA	<0.5 U	<0.5 U	R	R
tetrachloroethene (127-18-4)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U
chlorobenzene (108-90-7)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U
ethylbenzene (100-41-4)	µg/L	<1.0 U	<1.0 U	NA	<0.5 U	<0.5 U	<1.0 U	<1.0 U
m+p xylene (108-38-3, 106-42-3)	µg/L	<2.0 U	<2.0 U	NA	<1 U	<1.0 U	<2.0 U	<2.0 U
o-xylene (95-47-6)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U
isopropylbenzene (98-82-8)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,3,5-trimethylbenzene (108-67-8)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW10 9/22/11 Round 1	GW10 3/7/12 Round 2	GW11 9/22/11 Round 1	GW11 3/7/12 Round 2	GW12 9/21/11 Round 1
ethanol (64-17-5)	µg/L	<100 U	<100 U	<100 U	<100 U	<100 U
isopropanol (67-63-0)	µg/L	<25.0 U	<25.0 U	<25.0 U	<25.0 U	<25.0 U
acrylonitrile (107-13-1)	µg/L	NA	<25.0 U,J-	NA	<25.0 U,J-	NA
styrene (100-42-5)	µg/L	NA	<0.5 U	NA	<0.5 U	NA
acetone (67-64-1)	µg/L	<1.0 U	<1.0 U,J-	<1.0 U	<1.0 U,J-	<1.0 U
tert-butyl alcohol (75-65-0)	µg/L	<5.0 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
methyl tert-butyl ether (1634-04-4)	µg/L	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
diisopropyl ether (108-20-3)	µg/L	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
ethyl tert-butyl ether (637-92-3)	µg/L	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
tert-amyl methyl ether (994-05-8)	µg/L	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
vinyl chloride (75-01-4)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1-dichloroethene (75-35-4)	µg/L	R	R	R	R	R
carbon disulfide (75-15-0)	µg/L	<0.5 U,J-	<0.5 U,J-	<0.5 U	<0.5 U,J-	<0.5 U,J-
methylene chloride (75-09-2)	µg/L	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
trans-1,2-dichloroethene (156-60-5)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1-dichloroethane (75-34-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
cis-1,2-dichoroethene (156-59-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
chloroform (67-66-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1,1-trichloroethane (71-55-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
carbon tetrachloride (56-23-5)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
benzene (71-43-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2-dichloroethane (107-06-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
trichloroethene (79-01-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
toluene (108-88-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1,2-trichloroethane (79-00-5)	µg/L	R	R	R	R	R
tetrachloroethene (127-18-4)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
chlorobenzene (108-90-7)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
ethylbenzene (100-41-4)	µg/L	<1.0 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
m+p xylene (108-38-3, 106-42-3)	µg/L	<2.0 U	<2.0 U	<2.0 U	<2.0 U	<2.0 U
o-xylene (95-47-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
isopropylbenzene (98-82-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,3,5-trimethylbenzene (108-67-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW13 3/5/12 Round 2	GW13 12/3/12 Round 4	GW13 5/28/13 Round 5	GW14 3/5/12 Round 2	GW14 12/5/12 Round 4	GW14 5/28/13 Round 5
ethanol (64-17-5)	µg/L	<100 U	<100 U	<100 U	<100 U	<100 U	<100 U
isopropanol (67-63-0)	µg/L	<25.0 U	<10 U	<10 U	<25.0 U	<10 U	<10 U
acrylonitrile (107-13-1)	µg/L	<25.0 U,J-	<1 U	<1 U	<25.0 U,J-	<1 U	<1 U
styrene (100-42-5)	µg/L	<0.5 U	NR	<0.5 U	<0.5 U	NR	<0.5 U
acetone (67-64-1)	µg/L	<1.0 U	<1 U	2.7 B	<1.0 U	13 B	2.2 B
tert-butyl alcohol (75-65-0)	µg/L	<5.0 U	<10 U	<10 U	<5.0 U	<10 U	<10 U
methyl tert-butyl ether (1634-04-4)	µg/L	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<0.5 U	<0.5 U
diisopropyl ether (108-20-3)	µg/L	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<0.5 U	<0.5 U
ethyl tert-butyl ether (637-92-3)	µg/L	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<0.5 U	<0.5 U
tert-amyl methyl ether (994-05-8)	µg/L	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<0.5 U	<0.5 U
vinyl chloride (75-01-4)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1-dichloroethene (75-35-4)	µg/L	R	<0.5 U	<0.5 U	R	<0.5 U	<0.5 U
carbon disulfide (75-15-0)	µg/L	<0.5 U,J-	<0.5 U	<0.5 U	<0.5 U,J-	<0.5 U	<0.5 U
methylene chloride (75-09-2)	µg/L	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<0.5 U	<0.5 U
trans-1,2-dichloroethene (156-60-5)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1-dichloroethane (75-34-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
cis-1,2-dichoroethene (156-59-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
chloroform (67-66-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1,1-trichloroethane (71-55-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
carbon tetrachloride (56-23-5)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
benzene (71-43-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2-dichloroethane (107-06-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
trichloroethene (79-01-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
toluene (108-88-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1,2-trichloroethane (79-00-5)	µg/L	R	<0.5 U	<0.5 U	R	<0.5 U	<0.5 U
tetrachloroethene (127-18-4)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
chlorobenzene (108-90-7)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
ethylbenzene (100-41-4)	µg/L	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<0.5 U	<0.5 U
m+p xylene (108-38-3, 106-42-3)	µg/L	<2.0 U	<1 U	<1.0 U	<2.0 U	<1 U	<1.0 U
o-xylene (95-47-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
isopropylbenzene (98-82-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,3,5-trimethylbenzene (108-67-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW15 3/6/12 Round 2	GW15 12/5/12 Round 4	GW15 5/30/13 Round 5	GW16 3/6/12 Round 2	GW16 12/5/12 Round 4	GW16 5/30/13 Round 5	PW01 9/20/12 Round 3
ethanol (64-17-5)	µg/L	<100 U	<100 U	<100 U	<100 U	<100 U	<100 U	NA
isopropanol (67-63-0)	µg/L	<25.0 U	<10 U	<10 U	<25.0 U	<10 U	<10 U	NA
acrylonitrile (107-13-1)	µg/L	<25.0 U,J-	<1 U	<1 U	<25.0 U,J-	<1 U	<1 U	NA
styrene (100-42-5)	µg/L	<0.5 U	NR	<0.5 U	<0.5 U	NR	<0.5 U	NA
acetone (67-64-1)	µg/L	<1.0 U	<1 U	2.3 B	<1.0 U	13 B	2.4 B	NA
tert-butyl alcohol (75-65-0)	µg/L	<5.0 U	<10 U	<10 U	<5.0 U	<10 U	<10 U	NA
methyl tert-butyl ether (1634-04-4)	µg/L	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<0.5 U	<0.5 U	NA
diisopropyl ether (108-20-3)	µg/L	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<0.5 U	<0.5 U	NA
ethyl tert-butyl ether (637-92-3)	µg/L	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<0.5 U	<0.5 U	NA
tert-amyl methyl ether (994-05-8)	µg/L	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<0.5 U	<0.5 U	NA
vinyl chloride (75-01-4)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,1-dichloroethene (75-35-4)	µg/L	R	<0.5 U	<0.5 U	R	<0.5 U	<0.5 U	NA
carbon disulfide (75-15-0)	µg/L	<0.5 U,J-	<0.5 U	<0.5 U	<0.5 U,J-	<0.5 U	<0.5 U	NA
methylene chloride (75-09-2)	µg/L	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<0.5 U	<0.5 U	NA
trans-1,2-dichloroethene (156-60-5)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,1-dichloroethane (75-34-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
cis-1,2-dichoroethene (156-59-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
chloroform (67-66-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,1,1-trichloroethane (71-55-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
carbon tetrachloride (56-23-5)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
benzene (71-43-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,2-dichloroethane (107-06-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
trichloroethene (79-01-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
toluene (108-88-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,1,2-trichloroethane (79-00-5)	µg/L	R	<0.5 U	<0.5 U	R	<0.5 U	<0.5 U	NA
tetrachloroethene (127-18-4)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
chlorobenzene (108-90-7)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
ethylbenzene (100-41-4)	µg/L	<1.0 U	<0.5 U	<0.5 U	<1.0 U	<0.5 U	<0.5 U	NA
m+p xylene (108-38-3, 106-42-3)	µg/L	<2.0 U	<1 U	<1.0 U	<2.0 U	<1 U	<1.0 U	NA
o-xylene (95-47-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
isopropylbenzene (98-82-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,3,5-trimethylbenzene (108-67-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	PW02 5/29/13 Round 5	PW03 5/29/13 Round 5	SW01 9/21/11 Round 1	SW01 3/6/12 Round 2	SW02 9/21/11 Round 1	SW02 3/6/12 Round 2
ethanol (64-17-5)	µg/L	<2000 U	2200	<100 U	<100 U	<100 U	<100 U
isopropanol (67-63-0)	µg/L	360	170	<25.0 U	<25.0 U	<25.0 U	<25.0 U
acrylonitrile (107-13-1)	µg/L	<200 U	<100 U	NA	<25.0 U,J-	NA	<25.0 U,J-
styrene (100-42-5)	µg/L	<100 U	<50 U	NA	<0.5 U	NA	<0.5 U
acetone (67-64-1)	µg/L	880	770	<1.0 U	<1.0 U	<1.0 U	<1.0 U
tert-butyl alcohol (75-65-0)	µg/L	<200 U	<200 U	<5.0 U	<5.0 U	<5.0 U	<5.0 U
methyl tert-butyl ether (1634-04-4)	µg/L	<100 U	<50 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
diisopropyl ether (108-20-3)	µg/L	<100 U	<50 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
ethyl tert-butyl ether (637-92-3)	µg/L	<100 U	<50 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
tert-amyl methyl ether (994-05-8)	µg/L	<100 U	<50 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
vinyl chloride (75-01-4)	µg/L	<100 U	<50 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1-dichloroethene (75-35-4)	µg/L	<100 U	<50 U	R	R	R	R
carbon disulfide (75-15-0)	µg/L	<100 U	<50 U	<0.5 U,J-	<0.5 U,J-	<0.5 U,J-	<0.5 U,J-
methylene chloride (75-09-2)	µg/L	<100 U	<50 U	<1.0 U	<1.0 U	<1.0 U	<1.0 U
trans-1,2-dichloroethene (156-60-5)	µg/L	<100 U	<50 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1-dichloroethane (75-34-3)	µg/L	<100 U	<50 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
cis-1,2-dichoroethene (156-59-2)	µg/L	<100 U	<50 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
chloroform (67-66-3)	µg/L	<100 U	<50 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1,1-trichloroethane (71-55-6)	µg/L	<100 U	<50 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
carbon tetrachloride (56-23-5)	µg/L	<100 U	<50 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
benzene (71-43-2)	µg/L	3100	4300	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2-dichloroethane (107-06-2)	µg/L	<100 U	<50 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
trichloroethene (79-01-6)	µg/L	<100 U	<50 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
toluene (108-88-3)	µg/L	<100 U	<50 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1,2-trichloroethane (79-00-5)	µg/L	<0.5 U	<0.5 U	R	R	R	R
tetrachloroethene (127-18-4)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
chlorobenzene (108-90-7)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
ethylbenzene (100-41-4)	µg/L	720	350	<1.0 U	<1.0 U	<1.0 U	<1.0 U
m+p xylene (108-38-3, 106-42-3)	µg/L	4800	5600	<2.0 U	<2.0 U	<2.0 U	<2.0 U
o-xylene (95-47-6)	µg/L	1500	1400	<0.5 U	<0.5 U	<0.5 U	<0.5 U
isopropylbenzene (98-82-8)	µg/L	55 J	46 J	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,3,5-trimethylbenzene (108-67-8)	µg/L	230	810	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	SW03 9/22/11 Round 1	SW03 3/7/12 Round 2	SW04 12/4/12 Round 4	SW04 5/29/13 Round 5
ethanol (64-17-5)	µg/L	<100 U	<100 U	<100 U	<100 U
isopropanol (67-63-0)	µg/L	<25.0 U	<25.0 U	<10 U	<10 U
acrylonitrile (107-13-1)	µg/L	NA	<25.0 U,J-	<1 U	<1 U
styrene (100-42-5)	µg/L	NA	<0.5 U	NR	<0.5 U
acetone (67-64-1)	µg/L	<1.0 U	<1.0 U,J-	9.8 B	3.1 B
tert-butyl alcohol (75-65-0)	µg/L	<5.0 U	<5.0 U	<10 U	<10 U
methyl tert-butyl ether (1634-04-4)	µg/L	<1.0 U	<1.0 U	<0.5 U	<0.5 U
diisopropyl ether (108-20-3)	µg/L	<1.0 U	<1.0 U	<0.5 U	<0.5 U
ethyl tert-butyl ether (637-92-3)	µg/L	<1.0 U	<1.0 U	<0.5 U	<0.5 U
tert-amyl methyl ether (994-05-8)	µg/L	<1.0 U	<1.0 U	<0.5 U	<0.5 U
vinyl chloride (75-01-4)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1-dichloroethene (75-35-4)	µg/L	R	R	<0.5 U	<0.5 U
carbon disulfide (75-15-0)	µg/L	<0.5 U,J-	<0.5 U,J-	<0.5 U	<0.5 U
methylene chloride (75-09-2)	µg/L	<1.0 U	<1.0 U	<0.5 U	<0.5 U
trans-1,2-dichloroethene (156-60-5)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1-dichloroethane (75-34-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
cis-1,2-dichoroethene (156-59-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
chloroform (67-66-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1,1-trichloroethane (71-55-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
carbon tetrachloride (56-23-5)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
benzene (71-43-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2-dichloroethane (107-06-2)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
trichloroethene (79-01-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
toluene (108-88-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1,2-trichloroethane (79-00-5)	µg/L	R	R	<0.5 U	<0.5 U
tetrachloroethene (127-18-4)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
chlorobenzene (108-90-7)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
ethylbenzene (100-41-4)	µg/L	<1.0 U	<1.0 U	<0.5 U	<0.5 U
m+p xylene (108-38-3, 106-42-3)	µg/L	<2.0 U	<2.0 U	<1 U	<1.0 U
o-xylene (95-47-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
isopropylbenzene (98-82-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,3,5-trimethylbenzene (108-67-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW01 9/20/11 Round 1	GW01 3/5/12 Round 2	GW01 9/20/12 Round 3	GW01 12/3/12 Round 4	GW01 5/28/13 Round 5
1,2,4-trimethylbenzene (95-63-6)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U
1,3-dichlorobenzene (541-73-1)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U
1,4-dichlorobenzene (106-46-7)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U
1,2,3-trimethylbenzene (526-73-8)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U
1,2-dichlorobenzene (95-50-1)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U
naphthalene (91-20-3)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW02 9/20/11 Round 1	GW02 3/5/12 Round 2	GW02 12/3/12 Round 4	GW02 5/28/13 Round 5	GW03 9/20/11 Round 1	GW03 3/5/12 Round 2	GW03 12/3/12 Round 4
1,2,4-trimethylbenzene (95-63-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,3-dichlorobenzene (541-73-1)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,4-dichlorobenzene (106-46-7)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2,3-trimethylbenzene (526-73-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2-dichlorobenzene (95-50-1)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
naphthalene (91-20-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

	Sample	GW04	GW04	GW04	GW04	GW05	GW05
	Sample Date	9/22/11	3/6/12	12/4/12	5/29/13	9/22/11	3/6/12
Parameter (CAS Number)	Unit	Round 1	Round 2	Round 4	Round 5	Round 1	Round 2
1,2,4-trimethylbenzene (95-63-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,3-dichlorobenzene (541-73-1)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,4-dichlorobenzene (106-46-7)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2,3-trimethylbenzene (526-73-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2-dichlorobenzene (95-50-1)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
naphthalene (91-20-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

	Sample	GW06	GW06	GW07	GW07
	Sample Date	9/19/11	3/7/12	9/19/11	3/8/12
Parameter (CAS Number)	Unit	Round 1	Round 2	Round 1	Round 2
1,2,4-trimethylbenzene (95-63-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,3-dichlorobenzene (541-73-1)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,4-dichlorobenzene (106-46-7)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2,3-trimethylbenzene (526-73-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2-dichlorobenzene (95-50-1)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
naphthalene (91-20-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

	Sample	GW08	GW08	GW08	GW08	GW08	GW09	GW09
	Sample Date	9/20/11	3/5/12	9/20/12	12/4/12	5/29/13	9/21/11	3/7/12
Parameter (CAS Number)	Unit	Round 1	Round 2	Round 3	Round 4	Round 5	Round 1	Round 2
1,2,4-trimethylbenzene (95-63-6)	µg/L	<0.5 U	<0.5 U	NA	0.074 J	<0.5 U	<0.5 U	<0.5 U
1,3-dichlorobenzene (541-73-1)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,4-dichlorobenzene (106-46-7)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2,3-trimethylbenzene (526-73-8)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2-dichlorobenzene (95-50-1)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U
naphthalene (91-20-3)	µg/L	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW10 9/22/11 Round 1	GW10 3/7/12 Round 2	GW11 9/22/11 Round 1	GW11 3/7/12 Round 2	GW12 9/21/11 Round 1
1,2,4-trimethylbenzene (95-63-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,3-dichlorobenzene (541-73-1)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,4-dichlorobenzene (106-46-7)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2,3-trimethylbenzene (526-73-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2-dichlorobenzene (95-50-1)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
naphthalene (91-20-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW13 3/5/12 Round 2	GW13 12/3/12 Round 4	GW13 5/28/13 Round 5	GW14 3/5/12 Round 2	GW14 12/5/12 Round 4	GW14 5/28/13 Round 5
1,2,4-trimethylbenzene (95-63-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,3-dichlorobenzene (541-73-1)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,4-dichlorobenzene (106-46-7)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2,3-trimethylbenzene (526-73-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2-dichlorobenzene (95-50-1)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
naphthalene (91-20-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

	Sample	GW15	GW15	GW15	GW16	GW16	GW16	PW01
	Sample Date	3/6/12	12/5/12	5/30/13	3/6/12	12/5/12	5/30/13	9/20/12
Parameter (CAS Number)	Unit	Round 2	Round 4	Round 5	Round 2	Round 4	Round 5	Round 3
1,2,4-trimethylbenzene (95-63-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,3-dichlorobenzene (541-73-1)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,4-dichlorobenzene (106-46-7)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,2,3-trimethylbenzene (526-73-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,2-dichlorobenzene (95-50-1)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
naphthalene (91-20-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

	Sample	PW02	PW03	SW01	SW01	SW02	SW02
	Sample Date	5/29/13	5/29/13	9/21/11	3/6/12	9/21/11	3/6/12
Parameter (CAS Number)	Unit	Round 5	Round 5	Round 1	Round 2	Round 1	Round 2
1,2,4-trimethylbenzene (95-63-6)	µg/L	360	1200	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,3-dichlorobenzene (541-73-1)	µg/L	<100 U	<50 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,4-dichlorobenzene (106-46-7)	µg/L	<100 U	<50 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2,3-trimethylbenzene (526-73-8)	µg/L	99 J	200	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2-dichlorobenzene (95-50-1)	µg/L	<100 U	<50 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
naphthalene (91-20-3)	µg/L	150	25	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Table B-4 Sample Results - Volatile Organic Compounds (Wise County, Texas)

	Sample	SW03	SW03	SW04	SW04
	Sample Date	9/22/11	3/7/12	12/4/12	5/29/13
Parameter (CAS Number)	Unit	Round 1	Round 2	Round 4	Round 5
1,2,4-trimethylbenzene (95-63-6)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,3-dichlorobenzene (541-73-1)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,4-dichlorobenzene (106-46-7)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2,3-trimethylbenzene (526-73-8)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2-dichlorobenzene (95-50-1)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U
naphthalene (91-20-3)	µg/L	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Table B-5 Sample Results - Dissolved Gases, Diesel and Gasoline Range Organics, Glycols, and Low Molecular Weight Acids (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW01 9/20/11 Round 1	GW01 3/5/12 Round 2	GW01 9/20/12 Round 3	GW01 12/3/12 Round 4	GW01 5/28/13 Round 5
Dissolved Gases						
Methane (74-82-8)	mg/L	0.0093	0.0195	NA	0.0224	NA
Ethane (74-84-0)	mg/L	<0.0029 U	<0.0027 U	NA	<0.0028 U	NA
Propane (74-98-6)	mg/L	<0.0040 U	<0.0038 U	NA	<0.0038 U	NA
Butane (106-97-8)	mg/L	<0.0050 U	<0.0048 U	NA	<0.0048 U	NA
Diesel and Gas Range Organics						
GRO/TPH	µg/L	<20.0 U	<20.0 U	NA	<20.0 U	NA
DRO	µg/L	<20.0 U	<20.0 U	NA	<20.0 U	NA
Glycols						
2-butoxyethanol (111-76-2)	µg/L	<10 U,H	<10 U,J-	NA	<25 U	NA
Diethylene glycol (111-46-6)	µg/L	<50 U,H	<50 U	NA	<25 U	NA
Triethylene glycol (112-27-6)	µg/L	<50 U,H	<50 U,J-	NA	<25 U	NA
Tetraethylene glycol (112-60-7)	µg/L	<25 U,H	<25 U	NA	<25 U	NA
Low Molecular Weight Acids						
Lactate (50-21-5)	mg/L	<0.10 U	<0.10 U	NA	<0.10 U	NA
Formate (64-18-6)	mg/L	<0.10 U	0.85 B	NA	R	NA
Acetate (64-19-7)	mg/L	<0.10 U	<0.10 U	NA	<0.10 U	NA
Propionate (79-09-4)	mg/L	<0.10 U	<0.10 U	NA	<0.10 U	NA
Butyrate (107-92-6)	mg/L	<0.10 U	<0.10 U	NA	<0.10 U	NA

Table B-5 Sample Results - Dissolved Gases, Diesel and Gasoline Range Organics, Glycols, and Low Molecular Weight Acids (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW02 9/20/11 Round 1	GW02 3/5/12 Round 2	GW02 12/3/12 Round 4	GW02 5/28/13 Round 5	GW03 9/20/11 Round 1	GW03 3/5/12 Round 2	GW03 12/3/12 Round 4
Dissolved Gases								
Methane (74-82-8)	mg/L	<0.0014 U	0.0016	0.0013 J	NA	0.0023	0.0018	0.0014
Ethane (74-84-0)	mg/L	<0.0029 U	<0.0027 U	<0.0028 U	NA	<0.0029 U	<0.0027 U	<0.0028 U
Propane (74-98-6)	mg/L	<0.0040 U	<0.0038 U	<0.0038 U	NA	<0.0040 U	<0.0038 U	<0.0038 U
Butane (106-97-8)	mg/L	<0.0050 U	<0.0048 U	<0.0048 U	NA	<0.0050 U	<0.0048 U	<0.0048 U
Diesel and Gas Range Organics								
GRO/TPH	µg/L	<20.0 U	<20.0 U	<20.0 U	NA	<20.0 U	<20.0 U	<20.0 U
DRO	µg/L	<20.0 U	<20.0 U	<20.0 U	NA	<20.0 U	<20.0 U	<20.0 U
Glycols								
2-butoxyethanol (111-76-2)	µg/L	<10 U,H	<10 U,J-	<25 U	NA	<10 U,H	<10 U,J-	<25 U
Diethylene glycol (111-46-6)	µg/L	<50 U,H	<50 U	<25 U	NA	<50 U,H	<50 U	<25 U
Triethylene glycol (112-27-6)	µg/L	<50 U,H	<50 U,J-	<25 U	NA	<50 U,H	<50 U,J-	<25 U
Tetraethylene glycol (112-60-7)	µg/L	<25 U,H	<25 U	<25 U	NA	<25 U,H	<25 U	<25 U
Low Molecular Weight Acids								
Lactate (50-21-5)	mg/L	<0.10 U	<0.10 U	<0.10 U	NA	<0.10 U	<0.10 U	<0.10 U
Formate (64-18-6)	mg/L	<0.10 U	0.41 B	R	NA	<0.10 U	0.43 B	R
Acetate (64-19-7)	mg/L	<0.10 U	<0.10 U	<0.10 U	NA	0.17 B	0.07 J	<0.10 U
Propionate (79-09-4)	mg/L	<0.10 U	<0.10 U	<0.10 U	NA	<0.10 U	<0.10 U	<0.10 U
Butyrate (107-92-6)	mg/L	<0.10 U	<0.10 U	<0.10 U	NA	<0.10 U	<0.10 U	<0.10 U

Table B-5 Sample Results - Dissolved Gases, Diesel and Gasoline Range Organics, Glycols, and Low Molecular Weight Acids (Wise County, Texas)

	Sample	GW04	GW04	GW04	GW04	GW05	GW05	GW06	GW06
	Sample Date	9/22/11	3/6/12	12/4/12	5/29/13	9/22/11	3/6/12	9/19/11	3/7/12
Parameter (CAS Number)	Unit	Round 1	Round 2	Round 4	Round 5	Round 1	Round 2	Round 1	Round 2
Dissolved Gases									
Methane (74-82-8)	mg/L	<0.0014 U	0.0015	<0.0014 U	NA	<0.0014 U	0.0019	<0.0014 U	<0.0014 U
Ethane (74-84-0)	mg/L	0.0017 J	<0.0027 U	<0.0028 U	NA	<0.0029 U	<0.0027 U	<0.0029 U	<0.0027 U
Propane (74-98-6)	mg/L	0.0034 J	<0.0038 U	<0.0038 U	NA	<0.0040 U	<0.0038 U	<0.0040 U	<0.0038 U
Butane (106-97-8)	mg/L	0.0015 J	<0.0048 U	<0.0048 U	NA	<0.0050 U	<0.0048 U	<0.0050 U	<0.0048 U
Diesel and Gas Range Organics									
GRO/TPH	µg/L	<20.0 U	<20.0 U	<20.0 U	NA	<20.0 U	<20.0 U	<20.0 U	<20.0 U
DRO	µg/L	<20.0 U	<20.0 U	<20.0 U	NA	<20.0 U	<20.0 U	<20.0 U	<20.0 U
Glycols									
2-butoxyethanol (111-76-2)	µg/L	<10 U,H	<10 U,J-	<25 U	NA	<10 U,H	<10 U,J-	<10 U,H	<10 U,J-
Diethylene glycol (111-46-6)	µg/L	<50 U	<50 U	<25 U	NA	<50 U	<50 U	<50 U	<50 U
Triethylene glycol (112-27-6)	µg/L	<50 U	<50 U,J-	<25 U	NA	<50 U	<50 U,J-	<50 U	<50 U,J-
Tetraethylene glycol (112-60-7)	µg/L	<25 U	<25 U	<25 U	NA	<25 U	<25 U	<25 U	<25 U
Low Molecular Weight Acids									
Lactate (50-21-5)	mg/L	<0.10 U	<0.10 U	<0.10 U	NA	<0.10 U	0.08 J	<0.10 U	<0.10 U
Formate (64-18-6)	mg/L	<0.10 U	0.44	R	NA	<0.10 U	0.52	<0.10 U	0.16 B
Acetate (64-19-7)	mg/L	0.16 B	<0.10 U	<0.10 U	NA	0.19 B	0.07 J	0.14 B	<0.10 U
Propionate (79-09-4)	mg/L	<0.10 U	<0.10 U	<0.10 U	NA	<0.10 U	<0.10 U	<0.10 U	<0.10 U
Butyrate (107-92-6)	mg/L	<0.10 U	<0.10 U	<0.10 U	NA	<0.10 U	<0.10 U	<0.10 U	<0.10 U

Table B-5 Sample Results - Dissolved Gases, Diesel and Gasoline Range Organics, Glycols, and Low Molecular Weight Acids (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW07 9/19/11 Round 1	GW07 3/8/12 Round 2	GW08 9/20/11 Round 1	GW08 3/5/12 Round 2	GW08 9/20/12 Round 3	GW08 12/4/12 Round 4	GW08 5/29/13 Round 5
Dissolved Gases								
Methane (74-82-8)	mg/L	0.0188	0.0242	0.0121	0.0147	NA	<0.0014 U	NA
Ethane (74-84-0)	mg/L	<0.0029 U	<0.0027 U	<0.0029 U	<0.0027 U	NA	<0.0028 U	NA
Propane (74-98-6)	mg/L	<0.0040 U	<0.0038 U	<0.0040 U	<0.0038 U	NA	<0.0038 U	NA
Butane (106-97-8)	mg/L	<0.0050 U	<0.0048 U	<0.0050 U	<0.0048 U	NA	<0.0048 U	NA
Diesel and Gas Range Organics								
GRO/TPH	µg/L	<20.0 U	<20.0 U	<20.0 U	<20.0 U	NA	20.4	NA
DRO	µg/L	<20.0 U	<20.0 U	<20.0 U	<20.0 U	NA	<20.0 U	NA
Glycols								
2-butoxyethanol (111-76-2)	µg/L	<10 U,H	<10 U,J-	<10 U,H	<10 U,J-	NA	<25 U	NA
Diethylene glycol (111-46-6)	µg/L	<50 U	<50 U	<50 U,H	<50 U	NA	<25 U	NA
Triethylene glycol (112-27-6)	µg/L	<50 U	<50 U,J-	<50 U,H	<50 U,J-	NA	<25 U	NA
Tetraethylene glycol (112-60-7)	µg/L	<25 U	<25 U	<25 U,H	<25 U	NA	<25 U	NA
Low Molecular Weight Acids								
Lactate (50-21-5)	mg/L	<0.10 U	<0.10 U	<0.10 U	<0.10 U	NA	<0.10 U	NA
Formate (64-18-6)	mg/L	<0.10 U	0.22 B	0.29	0.20	NA	R	NA
Acetate (64-19-7)	mg/L	0.16 B	<0.10 U	0.23 B	<0.10 U	NA	<0.10 U	NA
Propionate (79-09-4)	mg/L	<0.10 U	<0.10 U	<0.10 U	<0.10 U	NA	<0.10 U	NA
Butyrate (107-92-6)	mg/L	<0.10 U	<0.10 U	<0.10 U	<0.10 U	NA	<0.10 U	NA

Table B-5 Sample Results - Dissolved Gases, Diesel and Gasoline Range Organics, Glycols, and Low Molecular Weight Acids (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW09 9/21/11 Round 1	GW09 3/7/12 Round 2	GW10 9/22/11 Round 1	GW10 3/7/12 Round 2	GW11 9/22/11 Round 1	GW11 3/7/12 Round 2	GW12 9/21/11 Round 1
Dissolved Gases								
Methane (74-82-8)	mg/L	<0.0014 U	0.0009 J	<0.0014 U	<0.0014 U	<0.0014 U	0.0007 J	<0.0014 U
Ethane (74-84-0)	mg/L	<0.0029 U	<0.0027 U	<0.0029 U	<0.0027 U	<0.0029 U	<0.0027 U	<0.0029 U
Propane (74-98-6)	mg/L	<0.0040 U	<0.0038 U	<0.0040 U	<0.0038 U	<0.0040 U	<0.0038 U	<0.0040 U
Butane (106-97-8)	mg/L	<0.0050 U	<0.0048 U	<0.0050 U	<0.0048 U	<0.0050 U	<0.0048 U	<0.0050 U
Diesel and Gas Range Organics								
GRO/TPH	µg/L	<20.0 U	<20.0 U	<20.0 U	<20.0 U	<20.0 U	<20.0 U	<20.0 U
DRO	µg/L	<20.0 U	<20.0 U	<20.0 U	<20.0 U	<20.0 U	<20.0 U	<20.0 U
Glycols								
2-butoxyethanol (111-76-2)	µg/L	<10 U,H	<10 U,J-	<10 U,H	<10 U,J-	<10 U,H	<10 U,J-	<10 U,H
Diethylene glycol (111-46-6)	µg/L	<50 U,H	<50 U	<50 U	<50 U	<50 U	<50 U	<50 U,H
Triethylene glycol (112-27-6)	µg/L	<50 U,H	<50 U,J-	<50 U	<50 U,J-	<50 U	<50 U,J-	<50 U,H
Tetraethylene glycol (112-60-7)	µg/L	<25 U,H	<25 U	<25 U	<25 U	<25 U	<25 U	<25 U,H
Low Molecular Weight Acids								
Lactate (50-21-5)	mg/L	<0.10 U	<0.10 U	<0.10 U	<0.10 U	<0.10 U	<0.10 U	<0.10 U
Formate (64-18-6)	mg/L	0.11	0.29 B	<0.10 U	0.28 B	<0.10 U	0.22 B	<0.10 U
Acetate (64-19-7)	mg/L	0.23 B	<0.10 U	0.22 B	<0.10 U	<0.10 U	<0.10 U	<0.10 U
Propionate (79-09-4)	mg/L	<0.10 U	<0.10 U	<0.10 U	<0.10 U	<0.10 U	<0.10 U	<0.10 U
Butyrate (107-92-6)	mg/L	<0.10 U	<0.10 U	<0.10 U	<0.10 U	<0.10 U	<0.10 U	<0.10 U

Table B-5 Sample Results - Dissolved Gases, Diesel and Gasoline Range Organics, Glycols, and Low Molecular Weight Acids (Wise County, Texas)

Parameter (CAS Number)	Sample / Sample Date / Unit	GW13 3/5/12 Round 2	GW13 12/3/12 Round 4	GW13 5/28/13 Round 5	GW14 3/5/12 Round 2	GW14 12/5/12 Round 4	GW14 5/28/13 Round 5
Dissolved Gases							
Methane (74-82-8)	mg/L	0.0018	0.00143	NA	0.0016	<0.0014 U	NA
Ethane (74-84-0)	mg/L	<0.0027 U	<0.0028 U	NA	<0.0027 U	<0.0028 U	NA
Propane (74-98-6)	mg/L	<0.0038 U	<0.0038 U	NA	<0.0038 U	<0.0038 U	NA
Butane (106-97-8)	mg/L	<0.0048 U	<0.0048 U	NA	<0.0048 U	<0.0048 U	NA
Diesel and Gas Range Organics							
GRO/TPH	µg/L	<20.0 U	<20.0 U	NA	<20.0 U	<20.0 U	NA
DRO	µg/L	<20.0 U	<20.0 U	NA	<20.0 U	<20.0 U	NA
Glycols							
2-butoxyethanol (111-76-2)	µg/L	<10 U,J-	<25 U	NA	<10 U,J-	<25 U	NA
Diethylene glycol (111-46-6)	µg/L	<50 U	<25 U	NA	<50 U	<25 U	NA
Triethylene glycol (112-27-6)	µg/L	<50 U,J-	<25 U	NA	<50 U,J-	<25 U	NA
Tetraethylene glycol (112-60-7)	µg/L	<25 U	<25 U	NA	<25 U	<25 U	NA
Low Molecular Weight Acids							
Lactate (50-21-5)	mg/L	<0.10 U	<0.10 U	NA	<0.10 U	<0.10 U	NA
Formate (64-18-6)	mg/L	0.46 B	R	NA	0.40 B	R	NA
Acetate (64-19-7)	mg/L	<0.10 U	<0.10 U	NA	<0.10 U	<0.10 U	NA
Propionate (79-09-4)	mg/L	<0.10 U	<0.10 U	NA	<0.10 U	<0.10 U	NA
Butyrate (107-92-6)	mg/L	<0.10 U	<0.10 U	NA	<0.10 U	<0.10 U	NA

Table B-5 Sample Results - Dissolved Gases, Diesel and Gasoline Range Organics, Glycols, and Low Molecular Weight Acids (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW15 3/6/12 Round 2	GW15 12/5/12 Round 4	GW15 5/30/13 Round 5	GW16 3/6/12 Round 2	GW16 12/5/12 Round 4	GW16 5/30/13 Round 5
Dissolved Gases							
Methane (74-82-8)	mg/L	0.0014	0.0012 J	NA	0.0013 J	0.0021	NA
Ethane (74-84-0)	mg/L	<0.0027 U		NA	<0.0027 U	<0.0028 U	NA
Propane (74-98-6)	mg/L	<0.0038 U	<0.0038 U	NA	<0.0038 U	<0.0038 U	NA
Butane (106-97-8)	mg/L	<0.0048 U	<0.0048 U	NA	<0.0048 U	<0.0048 U	NA
Diesel and Gas Range Organics							
GRO/TPH	µg/L	<20.0 U	<20.0 U	NA	<20.0 U	<20.0 U	NA
DRO	µg/L	<20.0 U	<20.0 U	29.0 B	<20.0 U	<20.0 U	NA
Glycols							
2-butoxyethanol (111-76-2)	µg/L	<10 U,J-	<25 U	NA	<10 U,J-	<25 U	NA
Diethylene glycol (111-46-6)	µg/L	<50 U	<25 U	NA	<50 U	<25 U	NA
Triethylene glycol (112-27-6)	µg/L	<50 U,J-	<25 U	NA	<50 U,J-	<25 U	NA
Tetraethylene glycol (112-60-7)	µg/L	<25 U	<25 U	NA	<25 U	<25 U	NA
Low Molecular Weight Acids							
Lactate (50-21-5)	mg/L	<0.10 U	<0.10 U	NA	<0.10 U	<0.10 U	NA
Formate (64-18-6)	mg/L	0.41	R	NA	0.39	R	NA
Acetate (64-19-7)	mg/L	<0.10 U	<0.10 U	NA	<0.10 U	<0.10 U	NA
Propionate (79-09-4)	mg/L	<0.10 U	<0.10 U	NA	<0.10 U	<0.10 U	NA
Butyrate (107-92-6)	mg/L	<0.10 U	<0.10 U	NA	<0.10 U	<0.10 U	NA

Table B-5 Sample Results - Dissolved Gases, Diesel and Gasoline Range Organics, Glycols, and Low Molecular Weight Acids (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	PW01 9/20/12 Round 3	PW02 5/29/13 Round 5	PW03 5/29/13 Round 5	SW01 9/21/11 Round 1	SW01 3/6/12 Round 2	SW02 9/21/11 Round 1	SW02 3/6/12 Round 2
Dissolved Gases								
Methane (74-82-8)	mg/L	NA	NA	NA	0.0131	0.0022	0.0096	0.0082
Ethane (74-84-0)	mg/L	NA	NA	NA	<0.0029 U	<0.0027 U	<0.0029 U	<0.0027 U
Propane (74-98-6)	mg/L	NA	NA	NA	<0.0040 U	<0.0038 U	<0.0040 U	<0.0038 U
Butane (106-97-8)	mg/L	NA	NA	NA	<0.0050 U	<0.0048 U	<0.0050 U	<0.0048 U
Diesel and Gas Range Organics								
GRO/TPH	µg/L	NA	NA	NA	<20.0 U	<20.0 U	<20.0 U	<20.0 U
DRO	µg/L	NA	NA	NA	218 J-	106 J+	243 J-	105 J+
Glycols								
2-butoxyethanol (111-76-2)	µg/L	NA	NA	NA	<10 U,H	<10 U,J-	<10 U,H	<10 U,J-
Diethylene glycol (111-46-6)	µg/L	NA	NA	NA	<50 U,H	<50 U	<50 U,H	<50 U
Triethylene glycol (112-27-6)	µg/L	NA	NA	NA	<50 U,H	<50 U,J-	<50 U,H	<50 U,J-
Tetraethylene glycol (112-60-7)	µg/L	NA	NA	NA	<25 U,H	<25 U	<25 U,H	<25 U
Low Molecular Weight Acids								
Lactate (50-21-5)	mg/L	NA	NA	NA	<0.10 U	<0.10 U	<0.10 U	<0.10 U
Formate (64-18-6)	mg/L	NA	NA	NA	<0.10 U	0.14	<0.10 U	0.12
Acetate (64-19-7)	mg/L	NA	NA	NA	0.35 B	0.06 J	0.24 B	0.07 J
Propionate (79-09-4)	mg/L	NA	NA	NA	<0.10 U	<0.10 U	<0.10 U	<0.10 U
Butyrate (107-92-6)	mg/L	NA	NA	NA	<0.10 U	<0.10 U	<0.10 U	<0.10 U

Table B-5 Sample Results - Dissolved Gases, Diesel and Gasoline Range Organics, Glycols, and Low Molecular Weight Acids (Wise County, Texas)

	Sample	SW03	SW03	SW04	SW04
	Sample Date	9/22/11	3/7/12	12/4/12	5/29/13
Parameter (CAS Number)	Unit	Round 1	Round 2	Round 4	Round 5
Dissolved Gases					
Methane (74-82-8)	mg/L	0.0124	0.0063	0.132	NA
Ethane (74-84-0)	mg/L	<0.0029 U	<0.0027 U	<0.0028 U	NA
Propane (74-98-6)	mg/L	<0.0040 U	<0.0038 U	<0.0038 U	NA
Butane (106-97-8)	mg/L	<0.0050 U	<0.0048 U	<0.0048 U	NA
Diesel and Gas Range Organics					
GRO/TPH	µg/L	<20.0 U	<20.0 U	<20.0 U	NA
DRO	µg/L	212 J-	150 J+	770	NA
Glycols					
2-butoxyethanol (111-76-2)	µg/L	<10 U,H	<10 U,J-	<25 U	NA
Diethylene glycol (111-46-6)	µg/L	<50 U	<50 U	<25 U	NA
Triethylene glycol (112-27-6)	µg/L	<50 U	<50 U,J-	<25 U	NA
Tetraethylene glycol (112-60-7)	µg/L	<25 U	<25 U	<25 U	NA
Low Molecular Weight Acids					
Lactate (50-21-5)	mg/L	<0.10 U	<0.10 U	<0.10 U	NA
Formate (64-18-6)	mg/L	<0.10 U	0.12 B	R	NA
Acetate (64-19-7)	mg/L	0.30 B	0.06 J	0.33	NA
Propionate (79-09-4)	mg/L	<0.10 U	<0.10 U	<0.10 U	NA
Butyrate (107-92-6)	mg/L	<0.10 U	<0.10 U	<0.10 U	NA

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW01 9/20/11 Round 1	GW01 3/5/12 Round 2	GW01 9/20/12 Round 3	GW01 12/3/12 Round 4	GW01 5/28/13 Round 5
R-(+)-limonene (5989-27-5)	µg/L	<0.50 U,J-	<1.00 U	NA	<1.00 U,J-	NA
1,2,4-trichlorobenzene (120-82-1)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
1,2-dichlorobenzene (95-50-1)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
1,2-dinitrobenzene (528-29-0)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
1,3-dichlorobenzene (541-73-1)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
1,3-dimethyladamantane (702-79-4)	µg/L	<0.50 U,J-	<1.00 U	NA	<1.00 U,J-	NA
1,3 -dinitrobenzene (99-65-0)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
1,4-dichlorobenzene (106-46-7)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
1,4-dinitrobenzene (100-25-4)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
1-methylnaphthalene (90-12-0)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
2,3,4,6-tetrachlorophenol (58-90-2)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA
2,3,5,6-tetrachlorophenol (935-95-5)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA
2,4,5-trichlorophenol (95-95-4)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA
2,4,6-trichlorophenol (88-06-2)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA
2,4-dichlorophenol (120-83-2)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA
2,4-dimethylphenol (105-67-9)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA
2,4-dinitrophenol (51-28-5)	µg/L	<5.00 U	<3.00 U	NA	<3.00 U	NA
2,4-dinitrotoluene (121-14-2)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
2,6-dinitrotoluene (606-20-2)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
2-butoxyethanol (111-76-2)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
2-chloronaphthalene (91-58-7)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
2-chlorophenol (95-57-8)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA
2-methylnaphthalene (91-57-6)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
2-methylphenol (95-48-7)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA
2-nitroaniline (88-74-4)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
2-nitrophenol (88-75-5)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA
3&4-methylphenol (108-39-4 & 106-44-5)	µg/L	<0.50 U	<5.00 U	NA	<5.00 U	NA
3,3'-dichlorobenzidine (91-94-1)	µg/L	NR	<1.00 U	NA	<1.00 U	NA
3-nitroaniline (99-09-2)	µg/L	NR	<3.00 U	NA	<3.00 U	NA
4,6-dinitro-2-methylphenol (534-52-1)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA
4-bromophenyl phenyl ether (101-55-3)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
4-chloro-3-methylphenol (59-50-7)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW02 9/20/11 Round 1	GW02 3/5/12 Round 2	GW02 12/3/12 Round 4	GW02 5/28/13 Round 5	GW03 9/20/11 Round 1	GW03 3/5/12 Round 2	GW03 12/3/12 Round 4
R-(+)-limonene (5989-27-5)	µg/L	<0.50 U,J-	<1.00 U	<1.00 U,J-	NA	<0.50 U,J-	<1.00 U	<1.00 U,J-
1,2,4-trichlorobenzene (120-82-1)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
1,2-dichlorobenzene (95-50-1)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
1,2-dinitrobenzene (528-29-0)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
1,3-dichlorobenzene (541-73-1)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
1,3-dimethyladamantane (702-79-4)	µg/L	<0.50 U,J-	<1.00 U	<1.00 U,J-	NA	<0.50 U,J-	<1.00 U	<1.00 U,J-
1,3 -dinitrobenzene (99-65-0)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
1,4-dichlorobenzene (106-46-7)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
1,4-dinitrobenzene (100-25-4)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
1-methylnaphthalene (90-12-0)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
2,3,4,6-tetrachlorophenol (58-90-2)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U	<2.00 U
2,3,5,6-tetrachlorophenol (935-95-5)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U	<2.00 U
2,4,5-trichlorophenol (95-95-4)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U	<2.00 U
2,4,6-trichlorophenol (88-06-2)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U	<2.00 U
2,4-dichlorophenol (120-83-2)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U	<2.00 U
2,4-dimethylphenol (105-67-9)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U	<2.00 U
2,4-dinitrophenol (51-28-5)	µg/L	<5.00 U	<3.00 U	<3.00 U	NA	<5.00 U	<3.00 U	<3.00 U
2,4-dinitrotoluene (121-14-2)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
2,6-dinitrotoluene (606-20-2)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
2-butoxyethanol (111-76-2)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
2-chloronaphthalene (91-58-7)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
2-chlorophenol (95-57-8)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U	<2.00 U
2-methylnaphthalene (91-57-6)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
2-methylphenol (95-48-7)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U	<2.00 U
2-nitroaniline (88-74-4)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
2-nitrophenol (88-75-5)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U	<2.00 U
3&4-methylphenol (108-39-4 & 106-44-5)	µg/L	<0.50 U	<5.00 U	<5.00 U	NA	<0.50 U	<5.00 U	<5.00 U
3,3'-dichlorobenzidine (91-94-1)	µg/L	NR	<1.00 U	<1.00 U	NA	NR	<1.00 U	<1.00 U
3-nitroaniline (99-09-2)	µg/L	NR	<3.00 U	<3.00 U	NA	NR	<3.00 U	<3.00 U
4,6-dinitro-2-methylphenol (534-52-1)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U	<2.00 U
4-bromophenyl phenyl ether (101-55-3)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
4-chloro-3-methylphenol (59-50-7)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U	<2.00 U

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW04 9/22/11 Round 1	GW04 3/6/12 Round 2	GW04 12/4/12 Round 4	GW04 5/29/13 Round 5	GW05 9/22/11 Round 1	GW05 3/6/12 Round 2
R-(+)-limonene (5989-27-5)	µg/L	<0.50 U	<1.00 U	<1.00 U,J-	NA	<0.50 U	<1.00 U
1,2,4-trichlorobenzene (120-82-1)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
1,2-dichlorobenzene (95-50-1)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
1,2-dinitrobenzene (528-29-0)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
1,3-dichlorobenzene (541-73-1)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
1,3-dimethyladamantane (702-79-4)	µg/L	<0.50 U	<1.00 U	<1.00 U,J-	NA	<0.50 U	<1.00 U
1,3 -dinitrobenzene (99-65-0)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
1,4-dichlorobenzene (106-46-7)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
1,4-dinitrobenzene (100-25-4)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
1-methylnaphthalene (90-12-0)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
2,3,4,6-tetrachlorophenol (58-90-2)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U
2,3,5,6-tetrachlorophenol (935-95-5)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U
2,4,5-trichlorophenol (95-95-4)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U
2,4,6-trichlorophenol (88-06-2)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U
2,4-dichlorophenol (120-83-2)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U
2,4-dimethylphenol (105-67-9)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U
2,4-dinitrophenol (51-28-5)	µg/L	<5.00 U	<3.00 U	<3.00 U	NA	<5.00 U	<3.00 U
2,4-dinitrotoluene (121-14-2)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
2,6-dinitrotoluene (606-20-2)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
2-butoxyethanol (111-76-2)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
2-chloronaphthalene (91-58-7)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
2-chlorophenol (95-57-8)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U
2-methylnaphthalene (91-57-6)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
2-methylphenol (95-48-7)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U
2-nitroaniline (88-74-4)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
2-nitrophenol (88-75-5)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U
3&4-methylphenol (108-39-4 & 106-44-5)	µg/L	<0.50 U	<5.00 U	<5.00 U	NA	<0.50 U	<5.00 U
3,3'-dichlorobenzidine (91-94-1)	µg/L	NR	<1.00 U	<1.00 U	NA	NR	<1.00 U
3-nitroaniline (99-09-2)	µg/L	NR	<3.00 U	<3.00 U	NA	NR	<3.00 U
4,6-dinitro-2-methylphenol (534-52-1)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U
4-bromophenyl phenyl ether (101-55-3)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
4-chloro-3-methylphenol (59-50-7)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW06 9/19/11 Round 1	GW06 3/7/12 Round 2	GW07 9/19/11 Round 1	GW07 3/8/12 Round 2
R-(+)-limonene (5989-27-5)	µg/L	<0.50 U,J-	<1.00 U	<0.50 U,J-	<1.00 U
1,2,4-trichlorobenzene (120-82-1)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
1,2-dichlorobenzene (95-50-1)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
1,2-dinitrobenzene (528-29-0)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
1,3-dichlorobenzene (541-73-1)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
1,3-dimethyladamantane (702-79-4)	µg/L	<0.50 U,J-	<1.00 U	<0.50 U,J-	<1.00 U
1,3 -dinitrobenzene (99-65-0)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
1,4-dichlorobenzene (106-46-7)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
1,4-dinitrobenzene (100-25-4)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
1-methylnaphthalene (90-12-0)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
2,3,4,6-tetrachlorophenol (58-90-2)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U
2,3,5,6-tetrachlorophenol (935-95-5)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U
2,4,5-trichlorophenol (95-95-4)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U
2,4,6-trichlorophenol (88-06-2)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U
2,4-dichlorophenol (120-83-2)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U
2,4-dimethylphenol (105-67-9)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U
2,4-dinitrophenol (51-28-5)	µg/L	<5.00 U	<3.00 U	<5.00 U	<3.00 U
2,4-dinitrotoluene (121-14-2)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
2,6-dinitrotoluene (606-20-2)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
2-butoxyethanol (111-76-2)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
2-chloronaphthalene (91-58-7)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
2-chlorophenol (95-57-8)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U
2-methylnaphthalene (91-57-6)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
2-methylphenol (95-48-7)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U
2-nitroaniline (88-74-4)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
2-nitrophenol (88-75-5)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U
3&4-methylphenol (108-39-4 & 106-44-5)	µg/L	<0.50 U	<5.00 U	<0.50 U	<5.00 U
3,3'-dichlorobenzidine (91-94-1)	µg/L	NR	<1.00 U	NR	<1.00 U
3-nitroaniline (99-09-2)	µg/L	NR	<3.00 U	NR	<3.00 U
4,6-dinitro-2-methylphenol (534-52-1)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U
4-bromophenyl phenyl ether (101-55-3)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
4-chloro-3-methylphenol (59-50-7)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW08 9/20/11 Round 1	GW08 3/5/12 Round 2	GW08 9/20/12 Round 3	GW08 12/4/12 Round 4	GW08 5/29/13 Round 5	GW09 9/21/11 Round 1	GW09 3/7/12 Round 2
R-(+)-limonene (5989-27-5)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U,J-	NA	<0.50 U	<1.00 U
1,2,4-trichlorobenzene (120-82-1)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
1,2-dichlorobenzene (95-50-1)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
1,2-dinitrobenzene (528-29-0)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
1,3-dichlorobenzene (541-73-1)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
1,3-dimethyladamantane (702-79-4)	µg/L	<0.50 U,J-	<1.00 U	NA	<1.00 U,J-	NA	<0.50 U	<1.00 U
1,3 -dinitrobenzene (99-65-0)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
1,4-dichlorobenzene (106-46-7)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
1,4-dinitrobenzene (100-25-4)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
1-methylnaphthalene (90-12-0)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
2,3,4,6-tetrachlorophenol (58-90-2)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA	<0.50 U	<2.00 U
2,3,5,6-tetrachlorophenol (935-95-5)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA	<0.50 U	<2.00 U
2,4,5-trichlorophenol (95-95-4)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA	<0.50 U	<2.00 U
2,4,6-trichlorophenol (88-06-2)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA	<0.50 U	<2.00 U
2,4-dichlorophenol (120-83-2)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA	<0.50 U	<2.00 U
2,4-dimethylphenol (105-67-9)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA	<0.50 U	<2.00 U
2,4-dinitrophenol (51-28-5)	µg/L	<5.00 U	<3.00 U	NA	<3.00 U	NA	<5.00 U	<3.00 U
2,4-dinitrotoluene (121-14-2)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
2,6-dinitrotoluene (606-20-2)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
2-butoxyethanol (111-76-2)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
2-chloronaphthalene (91-58-7)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
2-chlorophenol (95-57-8)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA	<0.50 U	<2.00 U
2-methylnaphthalene (91-57-6)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
2-methylphenol (95-48-7)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA	<0.50 U	<2.00 U
2-nitroaniline (88-74-4)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
2-nitrophenol (88-75-5)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA	<0.50 U	<2.00 U
3&4-methylphenol (108-39-4 & 106-44-5)	µg/L	<0.50 U	<5.00 U	NA	<5.00 U	NA	<0.50 U	<5.00 U
3,3'-dichlorobenzidine (91-94-1)	µg/L	NR	<1.00 U	NA	<1.00 U	NA	NR	<1.00 U
3-nitroaniline (99-09-2)	µg/L	NR	<3.00 U	NA	<3.00 U	NA	NR	<3.00 U
4,6-dinitro-2-methylphenol (534-52-1)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA	<0.50 U	<2.00 U
4-bromophenyl phenyl ether (101-55-3)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
4-chloro-3-methylphenol (59-50-7)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA	<0.50 U	<2.00 U

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample / Sample Date / Unit	GW10 9/22/11 Round 1	GW10 3/7/12 Round 2	GW11 9/22/11 Round 1	GW11 3/7/12 Round 2	GW12 9/21/11 Round 1
R-(+)-limonene (5989-27-5)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U,J-
1,2,4-trichlorobenzene (120-82-1)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
1,2-dichlorobenzene (95-50-1)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
1,2-dinitrobenzene (528-29-0)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
1,3-dichlorobenzene (541-73-1)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
1,3-dimethyladamantane (702-79-4)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U,J-
1,3 -dinitrobenzene (99-65-0)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
1,4-dichlorobenzene (106-46-7)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
1,4-dinitrobenzene (100-25-4)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
1-methylnaphthalene (90-12-0)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
2,3,4,6-tetrachlorophenol (58-90-2)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U	<0.50 U
2,3,5,6-tetrachlorophenol (935-95-5)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U	<0.50 U
2,4,5-trichlorophenol (95-95-4)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U	<0.50 U
2,4,6-trichlorophenol (88-06-2)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U	<0.50 U
2,4-dichlorophenol (120-83-2)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U	<0.50 U
2,4-dimethylphenol (105-67-9)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U	<0.50 U
2,4-dinitrophenol (51-28-5)	µg/L	<5.00 U	<3.00 U	<5.00 U	<3.00 U	<5.00 U
2,4-dinitrotoluene (121-14-2)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
2,6-dinitrotoluene (606-20-2)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
2-butoxyethanol (111-76-2)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
2-chloronaphthalene (91-58-7)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
2-chlorophenol (95-57-8)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U	<0.50 U
2-methylnaphthalene (91-57-6)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
2-methylphenol (95-48-7)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U	<0.50 U
2-nitroaniline (88-74-4)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
2-nitrophenol (88-75-5)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U	<0.50 U
3&4-methylphenol (108-39-4 & 106-44-5)	µg/L	<0.50 U	<5.00 U	<0.50 U	<5.00 U	<0.50 U
3,3'-dichlorobenzidine (91-94-1)	µg/L	NR	<1.00 U	NR	<1.00 U	NR
3-nitroaniline (99-09-2)	µg/L	NR	<3.00 U	NR	<3.00 U	NR
4,6-dinitro-2-methylphenol (534-52-1)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U	<0.50 U
4-bromophenyl phenyl ether (101-55-3)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
4-chloro-3-methylphenol (59-50-7)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U	<0.50 U

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW13 3/5/12 Round 2	GW13 12/3/12 Round 4	GW13 5/28/13 Round 5	GW14 3/5/12 Round 2	GW14 12/5/12 Round 4	GW14 5/28/13 Round 5
R-(+)-limonene (5989-27-5)	µg/L	<1.00 U	<1.00 U,J-	NA	<1.00 U	<1.00 U,J-	NA
1,2,4-trichlorobenzene (120-82-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
1,2-dichlorobenzene (95-50-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
1,2-dinitrobenzene (528-29-0)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
1,3-dichlorobenzene (541-73-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
1,3-dimethyladamantane (702-79-4)	µg/L	<1.00 U	<1.00 U,J-	NA	<1.00 U	<1.00 U,J-	NA
1,3 -dinitrobenzene (99-65-0)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
1,4-dichlorobenzene (106-46-7)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
1,4-dinitrobenzene (100-25-4)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
1-methylnaphthalene (90-12-0)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
2,3,4,6-tetrachlorophenol (58-90-2)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
2,3,5,6-tetrachlorophenol (935-95-5)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
2,4,5-trichlorophenol (95-95-4)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
2,4,6-trichlorophenol (88-06-2)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
2,4-dichlorophenol (120-83-2)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
2,4-dimethylphenol (105-67-9)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
2,4-dinitrophenol (51-28-5)	µg/L	<3.00 U	<3.00 U	NA	<3.00 U	<3.00 U	NA
2,4-dinitrotoluene (121-14-2)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
2,6-dinitrotoluene (606-20-2)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
2-butoxyethanol (111-76-2)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
2-chloronaphthalene (91-58-7)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
2-chlorophenol (95-57-8)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
2-methylnaphthalene (91-57-6)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
2-methylphenol (95-48-7)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
2-nitroaniline (88-74-4)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
2-nitrophenol (88-75-5)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
3&4-methylphenol (108-39-4 & 106-44-5)	µg/L	<5.00 U	<5.00 U	NA	<5.00 U	<5.00 U	NA
3,3'-dichlorobenzidine (91-94-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
3-nitroaniline (99-09-2)	µg/L	<3.00 U	<3.00 U	NA	<3.00 U	<3.00 U	NA
4,6-dinitro-2-methylphenol (534-52-1)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
4-bromophenyl phenyl ether (101-55-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
4-chloro-3-methylphenol (59-50-7)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

	Sample	GW15	GW15	GW15	GW16	GW16	GW16
	Sample Date	3/6/12	12/5/12	5/30/13	3/6/12	12/5/12	5/30/13
Parameter (CAS Number)	Unit	Round 2	Round 4	Round 5	Round 2	Round 4	Round 5
R-(+)-limonene (5989-27-5)	µg/L	<1.00 U	<1.00 U,J-	NA	<1.00 U	<1.00 U,J-	NA
1,2,4-trichlorobenzene (120-82-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
1,2-dichlorobenzene (95-50-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
1,2-dinitrobenzene (528-29-0)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
1,3-dichlorobenzene (541-73-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
1,3-dimethyladamantane (702-79-4)	µg/L	<1.00 U	<1.00 U,J-	NA	<1.00 U	<1.00 U,J-	NA
1,3 -dinitrobenzene (99-65-0)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
1,4-dichlorobenzene (106-46-7)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
1,4-dinitrobenzene (100-25-4)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
1-methylnaphthalene (90-12-0)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
2,3,4,6-tetrachlorophenol (58-90-2)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
2,3,5,6-tetrachlorophenol (935-95-5)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
2,4,5-trichlorophenol (95-95-4)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
2,4,6-trichlorophenol (88-06-2)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
2,4-dichlorophenol (120-83-2)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
2,4-dimethylphenol (105-67-9)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
2,4-dinitrophenol (51-28-5)	µg/L	<3.00 U	<3.00 U	NA	<3.00 U	<3.00 U	NA
2,4-dinitrotoluene (121-14-2)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
2,6-dinitrotoluene (606-20-2)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
2-butoxyethanol (111-76-2)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
2-chloronaphthalene (91-58-7)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
2-chlorophenol (95-57-8)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
2-methylnaphthalene (91-57-6)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
2-methylphenol (95-48-7)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
2-nitroaniline (88-74-4)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
2-nitrophenol (88-75-5)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
3&4-methylphenol (108-39-4 & 106-44-5)	µg/L	<5.00 U	<5.00 U	NA	<5.00 U	<5.00 U	NA
3,3'-dichlorobenzidine (91-94-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
3-nitroaniline (99-09-2)	µg/L	<3.00 U	<3.00 U	NA	<3.00 U	<3.00 U	NA
4,6-dinitro-2-methylphenol (534-52-1)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
4-bromophenyl phenyl ether (101-55-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
4-chloro-3-methylphenol (59-50-7)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

	Sample	PW01	PW02	PW03	SW01	SW01	SW02	SW02
	Sample Date	9/20/12	5/29/13	5/29/13	9/21/11	3/6/12	9/21/11	3/6/12
Parameter (CAS Number)	Unit	Round 3	Round 5	Round 5	Round 1	Round 2	Round 1	Round 2
R-(+)-limonene (5989-27-5)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
1,2,4-trichlorobenzene (120-82-1)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
1,2-dichlorobenzene (95-50-1)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
1,2-dinitrobenzene (528-29-0)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
1,3-dichlorobenzene (541-73-1)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
1,3-dimethyladamantane (702-79-4)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
1,3 -dinitrobenzene (99-65-0)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
1,4-dichlorobenzene (106-46-7)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
1,4-dinitrobenzene (100-25-4)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
1-methylnaphthalene (90-12-0)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
2,3,4,6-tetrachlorophenol (58-90-2)	µg/L	NA	NA	NA	<0.50 U	<2.00 U	<0.50 U	<2.00 U
2,3,5,6-tetrachlorophenol (935-95-5)	µg/L	NA	NA	NA	<0.50 U	<2.00 U	<0.50 U	<2.00 U
2,4,5-trichlorophenol (95-95-4)	µg/L	NA	NA	NA	<0.50 U	<2.00 U	<0.50 U	<2.00 U
2,4,6-trichlorophenol (88-06-2)	µg/L	NA	NA	NA	<0.50 U	<2.00 U	<0.50 U	<2.00 U
2,4-dichlorophenol (120-83-2)	µg/L	NA	NA	NA	<0.50 U	<2.00 U	<0.50 U	<2.00 U
2,4-dimethylphenol (105-67-9)	µg/L	NA	NA	NA	<0.50 U	<2.00 U	<0.50 U	<2.00 U
2,4-dinitrophenol (51-28-5)	µg/L	NA	NA	NA	<5.00 U	<3.00 U	<5.00 U	<3.00 U
2,4-dinitrotoluene (121-14-2)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
2,6-dinitrotoluene (606-20-2)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
2-butoxyethanol (111-76-2)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
2-chloronaphthalene (91-58-7)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
2-chlorophenol (95-57-8)	µg/L	NA	NA	NA	<0.50 U	<2.00 U	<0.50 U	<2.00 U
2-methylnaphthalene (91-57-6)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
2-methylphenol (95-48-7)	µg/L	NA	NA	NA	<0.50 U	<2.00 U	<0.50 U	<2.00 U
2-nitroaniline (88-74-4)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
2-nitrophenol (88-75-5)	µg/L	NA	NA	NA	<0.50 U	<2.00 U	<0.50 U	<2.00 U
3&4-methylphenol (108-39-4 & 106-44-5)	µg/L	NA	NA	NA	<0.50 U	<5.00 U	<0.50 U	<5.00 U
3,3'-dichlorobenzidine (91-94-1)	µg/L	NA	NA	NA	NR	<1.00 U	NR	<1.00 U
3-nitroaniline (99-09-2)	µg/L	NA	NA	NA	NR	<3.00 U	NR	<3.00 U
4,6-dinitro-2-methylphenol (534-52-1)	µg/L	NA	NA	NA	<0.50 U	<2.00 U	<0.50 U	<2.00 U
4-bromophenyl phenyl ether (101-55-3)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
4-chloro-3-methylphenol (59-50-7)	µg/L	NA	NA	NA	<0.50 U	<2.00 U	<0.50 U	<2.00 U

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

	Sample	SW03	SW03	SW04	SW04
	Sample Date	9/22/11	3/7/12	12/4/12	5/29/13
Parameter (CAS Number)	Unit	Round 1	Round 2	Round 4	Round 5
R-(+)-limonene (5989-27-5)	µg/L	<0.50 U	<1.00 U	<4.00 U,J-	NA
1,2,4-trichlorobenzene (120-82-1)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
1,2-dichlorobenzene (95-50-1)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
1,2-dinitrobenzene (528-29-0)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
1,3-dichlorobenzene (541-73-1)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
1,3-dimethyladamantane (702-79-4)	µg/L	<0.50 U	<1.00 U	<4.00 U,J-	NA
1,3 -dinitrobenzene (99-65-0)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
1,4-dichlorobenzene (106-46-7)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
1,4-dinitrobenzene (100-25-4)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
1-methylnaphthalene (90-12-0)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
2,3,4,6-tetrachlorophenol (58-90-2)	µg/L	<0.50 U	<2.00 U	<8.00 U	NA
2,3,5,6-tetrachlorophenol (935-95-5)	µg/L	<0.50 U	<2.00 U	<8.00 U	NA
2,4,5-trichlorophenol (95-95-4)	µg/L	<0.50 U	<2.00 U	<8.00 U	NA
2,4,6-trichlorophenol (88-06-2)	µg/L	<0.50 U	<2.00 U	<8.00 U	NA
2,4-dichlorophenol (120-83-2)	µg/L	<0.50 U	<2.00 U	<8.00 U	NA
2,4-dimethylphenol (105-67-9)	µg/L	<0.50 U	<2.00 U	<8.00 U	NA
2,4-dinitrophenol (51-28-5)	µg/L	<5.00 U	<3.00 U	<12.0 U	NA
2,4-dinitrotoluene (121-14-2)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
2,6-dinitrotoluene (606-20-2)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
2-butoxyethanol (111-76-2)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
2-chloronaphthalene (91-58-7)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
2-chlorophenol (95-57-8)	µg/L	<0.50 U	<2.00 U	<8.00 U	NA
2-methylnaphthalene (91-57-6)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
2-methylphenol (95-48-7)	µg/L	<0.50 U	<2.00 U	<8.00 U	NA
2-nitroaniline (88-74-4)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
2-nitrophenol (88-75-5)	µg/L	<0.50 U	<2.00 U	<8.00 U	NA
3&4-methylphenol (108-39-4 & 106-44-5)	µg/L	<0.50 U	<5.00 U	<20.0 U	NA
3,3'-dichlorobenzidine (91-94-1)	µg/L	NR	<1.00 U	<4.00 U,J-	NA
3-nitroaniline (99-09-2)	µg/L	NR	<3.00 U	<12.0 U,J-	NA
4,6-dinitro-2-methylphenol (534-52-1)	µg/L	<0.50 U	<2.00 U	<8.00 U	NA
4-bromophenyl phenyl ether (101-55-3)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
4-chloro-3-methylphenol (59-50-7)	µg/L	<0.50 U	<2.00 U	<8.00 U	NA

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW01 9/20/11 Round 1	GW01 3/5/12 Round 2	GW01 9/20/12 Round 3	GW01 12/3/12 Round 4	GW01 5/28/13 Round 5
4-chloroaniline (106-47-8)	µg/L	NR	<3.00 U	NA	<3.00 U	NA
4-chlorophenyl phenyl ether (7005-72-3)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
4-nitroaniline (100-01-6)	µg/L	NR	<3.00 U	NA	<3.00 U	NA
4-nitrophenol (100-02-7)	µg/L	<2.50 U	<3.00 U	NA	<3.00 U	NA
Acenaphthene (83-32-9)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Acenaphthylene (208-96-8)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Adamantane (281-23-2)	µg/L	<0.50 U,J-	<1.00 U	NA	<1.00 U,J-	NA
Aniline (62-53-3)	µg/L	NR	<1.00 U	NA	<1.00 U	NA
Anthracene (120-12-7)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Azobenzene (103-33-3)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Benzo(a)anthracene (56-55-3)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Benzo(a)pyrene (50-32-8)	µg/L	<0.50 U	<1.00 U,J-	NA	<1.00 U	NA
Benzo(b)fluoranthene (205-99-2)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Benzo(g,h,i)perylene (191-24-2)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Benzo(k)fluoranthene (207-08-9)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Benzoic Acid (65-85-0)	µg/L	<5.00 U	<3.00 U	NA	<3.00 U	NA
Benzyl alcohol (100-51-6)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Bis-(2-chloroethoxy)methane (111-91-1)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Bis-(2-chloroethyl)ether (111-44-4)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Bis-(2-chloroisopropyl)ether (108-60-1)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Bis-(2-ethylhexyl) adipate (103-23-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	NA
Bis-(2-ethylhexyl) phthalate (117-81-7)	µg/L	<1.00 U	<2.00 U	NA	<2.00 U	NA
Butyl benzyl phthalate (85-68-7)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Carbazole (86-74-8)	µg/L	NR	<3.00 U	NA	<3.00 U	NA
Chrysene (218-01-9)	µg/L	<0.50 U	<1.00 U,J-	NA	<1.00 U	NA
Dibenz(a,h)anthracene (53-70-3)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Dibenzofuran (132-64-9)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Diethyl phthalate (84-66-2)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Dimethyl phthalate (131-11-3)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Di-n-butyl phthalate (84-74-2)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Di-n-octyl phthalate (117-84-0)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Diphenylamine (122-39-4)	µg/L	<0.50 U,J-	<1.00 U	NA	<1.00 U	NA

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

	Sample	GW02	GW02	GW02	GW02	GW03	GW03	GW03
	Sample Date	9/20/11	3/5/12	12/3/12	5/28/13	9/20/11	3/5/12	12/3/12
Parameter (CAS Number)	Unit	Round 1	Round 2	Round 4	Round 5	Round 1	Round 2	Round 4
4-chloroaniline (106-47-8)	µg/L	NR	<3.00 U	<3.00 U	NA	NR	<3.00 U	<3.00 U
4-chlorophenyl phenyl ether (7005-72-3)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
4-nitroaniline (100-01-6)	µg/L	NR	<3.00 U	<3.00 U	NA	NR	<3.00 U	<3.00 U
4-nitrophenol (100-02-7)	µg/L	<2.50 U	<3.00 U	<3.00 U	NA	<2.50 U	<3.00 U	<3.00 U
Acenaphthene (83-32-9)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Acenaphthylene (208-96-8)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Adamantane (281-23-2)	µg/L	<0.50 U,J-	<1.00 U	<1.00 U,J-	NA	<0.50 U,J-	<1.00 U	<1.00 U,J-
Aniline (62-53-3)	µg/L	NR	<1.00 U	<1.00 U	NA	NR	<1.00 U	<1.00 U
Anthracene (120-12-7)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Azobenzene (103-33-3)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Benzo(a)anthracene (56-55-3)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Benzo(a)pyrene (50-32-8)	µg/L	<0.50 U	<1.00 U,J-	<1.00 U	NA	<0.50 U	<1.00 U,J-	<1.00 U
Benzo(b)fluoranthene (205-99-2)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Benzo(g,h,i)perylene (191-24-2)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Benzo(k)fluoranthene (207-08-9)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Benzoic Acid (65-85-0)	µg/L	<5.00 U	<3.00 U	<3.00 U	NA	<5.00 U	<3.00 U	<3.00 U
Benzyl alcohol (100-51-6)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Bis-(2-chloroethoxy)methane (111-91-1)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Bis-(2-chloroethyl)ether (111-44-4)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Bis-(2-chloroisopropyl)ether (108-60-1)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Bis-(2-ethylhexyl) adipate (103-23-1)	µg/L	<1.00 U	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	<1.00 U
Bis-(2-ethylhexyl) phthalate (117-81-7)	µg/L	<1.00 U	<2.00 U	<2.00 U	NA	<1.00 U	<2.00 U	<2.00 U
Butyl benzyl phthalate (85-68-7)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Carbazole (86-74-8)	µg/L	NR	<3.00 U	<3.00 U	NA	NR	<3.00 U	<3.00 U
Chrysene (218-01-9)	µg/L	<0.50 U	<1.00 U,J-	<1.00 U	NA	<0.50 U	<1.00 U,J-	<1.00 U
Dibenz(a,h)anthracene (53-70-3)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Dibenzofuran (132-64-9)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Diethyl phthalate (84-66-2)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Dimethyl phthalate (131-11-3)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Di-n-butyl phthalate (84-74-2)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Di-n-octyl phthalate (117-84-0)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Diphenylamine (122-39-4)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW04 9/22/11 Round 1	GW04 3/6/12 Round 2	GW04 12/4/12 Round 4	GW04 5/29/13 Round 5	GW05 9/22/11 Round 1	GW05 3/6/12 Round 2
4-chloroaniline (106-47-8)	µg/L	NR	<3.00 U	<3.00 U	NA	NR	<3.00 U
4-chlorophenyl phenyl ether (7005-72-3)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
4-nitroaniline (100-01-6)	µg/L	NR	<3.00 U	<3.00 U	NA	NR	<3.00 U
4-nitrophenol (100-02-7)	µg/L	<2.50 U	<3.00 U	<3.00 U	NA	<2.50 U	<3.00 U
Acenaphthene (83-32-9)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Acenaphthylene (208-96-8)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Adamantane (281-23-2)	µg/L	<0.50 U	<1.00 U	<1.00 U,J-	NA	<0.50 U	<1.00 U
Aniline (62-53-3)	µg/L	NR	<1.00 U	<1.00 U	NA	NR	<1.00 U
Anthracene (120-12-7)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Azobenzene (103-33-3)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Benzo(a)anthracene (56-55-3)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Benzo(a)pyrene (50-32-8)	µg/L	<0.50 U	<1.00 U,J-	<1.00 U	NA	<0.50 U	<1.00 U,J-
Benzo(b)fluoranthene (205-99-2)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Benzo(g,h,i)perylene (191-24-2)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Benzo(k)fluoranthene (207-08-9)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Benzoic Acid (65-85-0)	µg/L	<5.00 U	<3.00 U	<3.00 U	NA	<5.00 U	<3.00 U
Benzyl alcohol (100-51-6)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Bis-(2-chloroethoxy)methane (111-91-1)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Bis-(2-chloroethyl)ether (111-44-4)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Bis-(2-chloroisopropyl)ether (108-60-1)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Bis-(2-ethylhexyl) adipate (103-23-1)	µg/L	<1.00 U	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U
Bis-(2-ethylhexyl) phthalate (117-81-7)	µg/L	<1.00 U	<2.00 U	<2.00 U	NA	<1.00 U	<2.00 U
Butyl benzyl phthalate (85-68-7)	µg/L	<0.50 U	1.40	<1.00 U	NA	<0.50 U	<1.00 U
Carbazole (86-74-8)	µg/L	NR	<3.00 U	<3.00 U	NA	NR	<3.00 U
Chrysene (218-01-9)	µg/L	<0.50 U	<1.00 U,J-	<1.00 U	NA	<0.50 U	<1.00 U,J-
Dibenz(a,h)anthracene (53-70-3)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Dibenzofuran (132-64-9)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Diethyl phthalate (84-66-2)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Dimethyl phthalate (131-11-3)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Di-n-butyl phthalate (84-74-2)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Di-n-octyl phthalate (117-84-0)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Diphenylamine (122-39-4)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample / Sample Date / Unit	GW06 9/19/11 Round 1	GW06 3/7/12 Round 2	GW07 9/19/11 Round 1	GW07 3/8/12 Round 2
4-chloroaniline (106-47-8)	µg/L	NR	<3.00 U	NR	<3.00 U
4-chlorophenyl phenyl ether (7005-72-3)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
4-nitroaniline (100-01-6)	µg/L	NR	<3.00 U	NR	<3.00 U
4-nitrophenol (100-02-7)	µg/L	<2.50 U	<3.00 U	<2.50 U	<3.00 U
Acenaphthene (83-32-9)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Acenaphthylene (208-96-8)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Adamantane (281-23-2)	µg/L	<0.50 U,J-	<1.00 U	<0.50 U,J-	<1.00 U
Aniline (62-53-3)	µg/L	NR	<1.00 U	NR	<1.00 U
Anthracene (120-12-7)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Azobenzene (103-33-3)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Benzo(a)anthracene (56-55-3)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Benzo(a)pyrene (50-32-8)	µg/L	<0.50 U	<1.00 U,J-	<0.50 U	<1.00 U,J-
Benzo(b)fluoranthene (205-99-2)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Benzo(g,h,i)perylene (191-24-2)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Benzo(k)fluoranthene (207-08-9)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Benzoic Acid (65-85-0)	µg/L	<5.00 U	<3.00 U	<5.00 U	<3.00 U
Benzyl alcohol (100-51-6)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Bis-(2-chloroethoxy)methane (111-91-1)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Bis-(2-chloroethyl)ether (111-44-4)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Bis-(2-chloroisopropyl)ether (108-60-1)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Bis-(2-ethylhexyl) adipate (103-23-1)	µg/L	<1.00 U	<1.00 U	<1.00 U	<1.00 U
Bis-(2-ethylhexyl) phthalate (117-81-7)	µg/L	2.51 B	<2.00 U	<1.00 U	<2.00 U
Butyl benzyl phthalate (85-68-7)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Carbazole (86-74-8)	µg/L	NR	<3.00 U	NR	<3.00 U
Chrysene (218-01-9)	µg/L	<0.50 U	<1.00 U,J-	<0.50 U	<1.00 U,J-
Dibenz(a,h)anthracene (53-70-3)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Dibenzofuran (132-64-9)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Diethyl phthalate (84-66-2)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Dimethyl phthalate (131-11-3)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Di-n-butyl phthalate (84-74-2)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Di-n-octyl phthalate (117-84-0)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Diphenylamine (122-39-4)	µg/L	<0.50 U,J-	<1.00 U	<0.50 U,J-	<1.00 U

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW08 9/20/11 Round 1	GW08 3/5/12 Round 2	GW08 9/20/12 Round 3	GW08 12/4/12 Round 4	GW08 5/29/13 Round 5	GW09 9/21/11 Round 1	GW09 3/7/12 Round 2
4-chloroaniline (106-47-8)	µg/L	NR	<3.00 U	NA	<3.00 U	NA	NR	<3.00 U
4-chlorophenyl phenyl ether (7005-72-3)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
4-nitroaniline (100-01-6)	µg/L	NR	<3.00 U	NA	<3.00 U	NA	NR	<3.00 U
4-nitrophenol (100-02-7)	µg/L	<2.50 U	<3.00 U	NA	<3.00 U	NA	<2.50 U	<3.00 U
Acenaphthene (83-32-9)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Acenaphthylene (208-96-8)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Adamantane (281-23-2)	µg/L	<0.50 U,J-	<1.00 U	NA	<1.00 U,J-	NA	<0.50 U	<1.00 U
Aniline (62-53-3)	µg/L	NR	<1.00 U	NA	<1.00 U	NA	NR	<1.00 U
Anthracene (120-12-7)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Azobenzene (103-33-3)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Benzo(a)anthracene (56-55-3)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Benzo(a)pyrene (50-32-8)	µg/L	<0.50 U	<1.00 U,J-	NA	<1.00 U	NA	<0.50 U	<1.00 U,J-
Benzo(b)fluoranthene (205-99-2)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Benzo(g,h,i)perylene (191-24-2)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Benzo(k)fluoranthene (207-08-9)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Benzoic Acid (65-85-0)	µg/L	<5.00 U	<3.00 U	NA	<3.00 U	NA	<5.00 U	<3.00 U
Benzyl alcohol (100-51-6)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Bis-(2-chloroethoxy)methane (111-91-1)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Bis-(2-chloroethyl)ether (111-44-4)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Bis-(2-chloroisopropyl)ether (108-60-1)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Bis-(2-ethylhexyl) adipate (103-23-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	NA	<1.00 U	<1.00 U
Bis-(2-ethylhexyl) phthalate (117-81-7)	µg/L	<1.00 U	<2.00 U	NA	<2.00 U	NA	<1.00 U	<2.00 U
Butyl benzyl phthalate (85-68-7)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Carbazole (86-74-8)	µg/L	NR	<3.00 U	NA	<3.00 U	NA	NR	<3.00 U
Chrysene (218-01-9)	µg/L	<0.50 U	<1.00 U,J-	NA	<1.00 U	NA	<0.50 U	<1.00 U,J-
Dibenz(a,h)anthracene (53-70-3)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Dibenzofuran (132-64-9)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Diethyl phthalate (84-66-2)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Dimethyl phthalate (131-11-3)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Di-n-butyl phthalate (84-74-2)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Di-n-octyl phthalate (117-84-0)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Diphenylamine (122-39-4)	µg/L	<0.50 U,J-	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

	Sample	GW10	GW10	GW11	GW11	GW12
	Sample Date	9/22/11	3/7/12	9/22/11	3/7/12	9/21/11
Parameter (CAS Number)	Unit	Round 1	Round 2	Round 1	Round 2	Round 1
4-chloroaniline (106-47-8)	µg/L	NR	<3.00 U	NR	<3.00 U	NR
4-chlorophenyl phenyl ether (7005-72-3)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
4-nitroaniline (100-01-6)	µg/L	NR	<3.00 U	NR	<3.00 U	NR
4-nitrophenol (100-02-7)	µg/L	<2.50 U	<3.00 U	<2.50 U	<3.00 U	<2.50 U
Acenaphthene (83-32-9)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Acenaphthylene (208-96-8)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Adamantane (281-23-2)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U,J-
Aniline (62-53-3)	µg/L	NR	<1.00 U	NR	<1.00 U	NR
Anthracene (120-12-7)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Azobenzene (103-33-3)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Benzo(a)anthracene (56-55-3)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Benzo(a)pyrene (50-32-8)	µg/L	<0.50 U	<1.00 U,J-	<0.50 U	<1.00 U,J-	<0.50 U
Benzo(b)fluoranthene (205-99-2)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Benzo(g,h,i)perylene (191-24-2)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Benzo(k)fluoranthene (207-08-9)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Benzoic Acid (65-85-0)	µg/L	<5.00 U	<3.00 U	<5.00 U	<3.00 U	<5.00 U
Benzyl alcohol (100-51-6)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Bis-(2-chloroethoxy)methane (111-91-1)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Bis-(2-chloroethyl)ether (111-44-4)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Bis-(2-chloroisopropyl)ether (108-60-1)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Bis-(2-ethylhexyl) adipate (103-23-1)	µg/L	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 U
Bis-(2-ethylhexyl) phthalate (117-81-7)	µg/L	<1.00 U	<2.00 U	2.02 J+	<2.00 U	<1.00 U
Butyl benzyl phthalate (85-68-7)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Carbazole (86-74-8)	µg/L	NR	<3.00 U	NR	<3.00 U	NR
Chrysene (218-01-9)	µg/L	<0.50 U	<1.00 U,J-	<0.50 U	<1.00 U,J-	<0.50 U
Dibenz(a,h)anthracene (53-70-3)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Dibenzofuran (132-64-9)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Diethyl phthalate (84-66-2)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Dimethyl phthalate (131-11-3)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Di-n-butyl phthalate (84-74-2)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Di-n-octyl phthalate (117-84-0)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Diphenylamine (122-39-4)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

	Sample	GW13	GW13	GW13	GW14	GW14	GW14
	Sample Date	3/5/12	12/3/12	5/28/13	3/5/12	12/5/12	5/28/13
Parameter (CAS Number)	Unit	Round 2	Round 4	Round 5	Round 2	Round 4	Round 5
4-chloroaniline (106-47-8)	µg/L	<3.00 U	<3.00 U	NA	<3.00 U	<3.00 U	NA
4-chlorophenyl phenyl ether (7005-72-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
4-nitroaniline (100-01-6)	µg/L	<3.00 U	<3.00 U	NA	<3.00 U	<3.00 U	NA
4-nitrophenol (100-02-7)	µg/L	<3.00 U	<3.00 U	NA	<3.00 U	<3.00 U	NA
Acenaphthene (83-32-9)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Acenaphthylene (208-96-8)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Adamantane (281-23-2)	µg/L	<1.00 U	<1.00 U,J-	NA	<1.00 U	<1.00 U,J-	NA
Aniline (62-53-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Anthracene (120-12-7)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Azobenzene (103-33-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Benzo(a)anthracene (56-55-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Benzo(a)pyrene (50-32-8)	µg/L	<1.00 U,J-	<1.00 U	NA	<1.00 U,J-	<1.00 U	NA
Benzo(b)fluoranthene (205-99-2)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Benzo(g,h,i)perylene (191-24-2)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Benzo(k)fluoranthene (207-08-9)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Benzoic Acid (65-85-0)	µg/L	<3.00 U	<3.00 U	NA	<3.00 U	<3.00 U	NA
Benzyl alcohol (100-51-6)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Bis-(2-chloroethoxy)methane (111-91-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Bis-(2-chloroethyl)ether (111-44-4)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Bis-(2-chloroisopropyl)ether (108-60-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Bis-(2-ethylhexyl) adipate (103-23-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Bis-(2-ethylhexyl) phthalate (117-81-7)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
Butyl benzyl phthalate (85-68-7)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Carbazole (86-74-8)	µg/L	<3.00 U	<3.00 U	NA	<3.00 U	<3.00 U	NA
Chrysene (218-01-9)	µg/L	<1.00 U,J-	<1.00 U	NA	<1.00 U,J-	<1.00 U	NA
Dibenz(a,h)anthracene (53-70-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Dibenzofuran (132-64-9)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Diethyl phthalate (84-66-2)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Dimethyl phthalate (131-11-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Di-n-butyl phthalate (84-74-2)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Di-n-octyl phthalate (117-84-0)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Diphenylamine (122-39-4)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW15 3/6/12 Round 2	GW15 12/5/12 Round 4	GW15 5/30/13 Round 5	GW16 3/6/12 Round 2	GW16 12/5/12 Round 4	GW16 5/30/13 Round 5
4-chloroaniline (106-47-8)	µg/L	<3.00 U	<3.00 U	NA	<3.00 U	<3.00 U	NA
4-chlorophenyl phenyl ether (7005-72-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
4-nitroaniline (100-01-6)	µg/L	<3.00 U	<3.00 U	NA	<3.00 U	<3.00 U	NA
4-nitrophenol (100-02-7)	µg/L	<3.00 U	<3.00 U	NA	<3.00 U	<3.00 U	NA
Acenaphthene (83-32-9)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Acenaphthylene (208-96-8)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Adamantane (281-23-2)	µg/L	<1.00 U	<1.00 U,J-	NA	<1.00 U	<1.00 U,J-	NA
Aniline (62-53-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Anthracene (120-12-7)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Azobenzene (103-33-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Benzo(a)anthracene (56-55-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Benzo(a)pyrene (50-32-8)	µg/L	<1.00 U,J-	<1.00 U	NA	<1.00 U,J-	<1.00 U	NA
Benzo(b)fluoranthene (205-99-2)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Benzo(g,h,i)perylene (191-24-2)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Benzo(k)fluoranthene (207-08-9)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Benzoic Acid (65-85-0)	µg/L	<3.00 U	<3.00 U	NA	<3.00 U	<3.00 U	NA
Benzyl alcohol (100-51-6)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Bis-(2-chloroethoxy)methane (111-91-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Bis-(2-chloroethyl)ether (111-44-4)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Bis-(2-chloroisopropyl)ether (108-60-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Bis-(2-ethylhexyl) adipate (103-23-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Bis-(2-ethylhexyl) phthalate (117-81-7)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
Butyl benzyl phthalate (85-68-7)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Carbazole (86-74-8)	µg/L	<3.00 U	<3.00 U	NA	<3.00 U	<3.00 U	NA
Chrysene (218-01-9)	µg/L	<1.00 U,J-	<1.00 U	NA	<1.00 U,J-	<1.00 U	NA
Dibenz(a,h)anthracene (53-70-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Dibenzofuran (132-64-9)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Diethyl phthalate (84-66-2)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Dimethyl phthalate (131-11-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Di-n-butyl phthalate (84-74-2)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Di-n-octyl phthalate (117-84-0)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Diphenylamine (122-39-4)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	PW01 9/20/12 Round 3	PW02 5/29/13 Round 5	PW03 5/29/13 Round 5	SW01 9/21/11 Round 1	SW01 3/6/12 Round 2	SW02 9/21/11 Round 1	SW02 3/6/12 Round 2
4-chloroaniline (106-47-8)	µg/L	NA	NA	NA	NR	<3.00 U	NR	<3.00 U
4-chlorophenyl phenyl ether (7005-72-3)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
4-nitroaniline (100-01-6)	µg/L	NA	NA	NA	NR	<3.00 U	NR	<3.00 U
4-nitrophenol (100-02-7)	µg/L	NA	NA	NA	<2.50 U	<3.00 U	<2.50 U	<3.00 U
Acenaphthene (83-32-9)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Acenaphthylene (208-96-8)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Adamantane (281-23-2)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Aniline (62-53-3)	µg/L	NA	NA	NA	NR	<1.00 U	NR	<1.00 U
Anthracene (120-12-7)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Azobenzene (103-33-3)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Benzo(a)anthracene (56-55-3)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Benzo(a)pyrene (50-32-8)	µg/L	NA	NA	NA	<0.50 U	<1.00 U,J-	<0.50 U	<1.00 U,J-
Benzo(b)fluoranthene (205-99-2)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Benzo(g,h,i)perylene (191-24-2)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Benzo(k)fluoranthene (207-08-9)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Benzoic Acid (65-85-0)	µg/L	NA	NA	NA	<5.00 U	<3.00 U	<5.00 U	<3.00 U
Benzyl alcohol (100-51-6)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Bis-(2-chloroethoxy)methane (111-91-1)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Bis-(2-chloroethyl)ether (111-44-4)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Bis-(2-chloroisopropyl)ether (108-60-1)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Bis-(2-ethylhexyl) adipate (103-23-1)	µg/L	NA	NA	NA	<1.00 U	<1.00 U	<1.00 U	<1.00 U
Bis-(2-ethylhexyl) phthalate (117-81-7)	µg/L	NA	NA	NA	<1.00 U	<2.00 U	<1.00 U	<2.00 U
Butyl benzyl phthalate (85-68-7)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Carbazole (86-74-8)	µg/L	NA	NA	NA	NR	<3.00 U	NR	<3.00 U
Chrysene (218-01-9)	µg/L	NA	NA	NA	<0.50 U	<1.00 U,J-	<0.50 U	<1.00 U,J-
Dibenz(a,h)anthracene (53-70-3)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Dibenzofuran (132-64-9)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Diethyl phthalate (84-66-2)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Dimethyl phthalate (131-11-3)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Di-n-butyl phthalate (84-74-2)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Di-n-octyl phthalate (117-84-0)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Diphenylamine (122-39-4)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

	Sample	SW03	SW03	SW04	SW04
	Sample Date	9/22/11	3/7/12	12/4/12	5/29/13
Parameter (CAS Number)	Unit	Round 1	Round 2	Round 4	Round 5
4-chloroaniline (106-47-8)	µg/L	NR	<3.00 U	<12.0 U,J-	NA
4-chlorophenyl phenyl ether (7005-72-3)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
4-nitroaniline (100-01-6)	µg/L	NR	<3.00 U	<12.0 U	NA
4-nitrophenol (100-02-7)	µg/L	<2.50 U	<3.00 U	<12.0 U	NA
Acenaphthene (83-32-9)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Acenaphthylene (208-96-8)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Adamantane (281-23-2)	µg/L	<0.50 U	<1.00 U	<4.00 U,J-	NA
Aniline (62-53-3)	µg/L	NR	<1.00 U	<4.00 U	NA
Anthracene (120-12-7)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Azobenzene (103-33-3)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Benzo(a)anthracene (56-55-3)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Benzo(a)pyrene (50-32-8)	µg/L	<0.50 U	<1.00 U,J-	<4.00 U	NA
Benzo(b)fluoranthene (205-99-2)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Benzo(g,h,i)perylene (191-24-2)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Benzo(k)fluoranthene (207-08-9)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Benzoic Acid (65-85-0)	µg/L	<5.00 U	<3.00 U	<12.0 U	NA
Benzyl alcohol (100-51-6)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Bis-(2-chloroethoxy)methane (111-91-1)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Bis-(2-chloroethyl)ether (111-44-4)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Bis-(2-chloroisopropyl)ether (108-60-1)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Bis-(2-ethylhexyl) adipate (103-23-1)	µg/L	<1.00 U	<1.00 U	<4.00 U	NA
Bis-(2-ethylhexyl) phthalate (117-81-7)	µg/L	<1.00 U	<2.00 U	<8.00 U	NA
Butyl benzyl phthalate (85-68-7)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Carbazole (86-74-8)	µg/L	NR	<3.00 U	<12.0 U	NA
Chrysene (218-01-9)	µg/L	<0.50 U	<1.00 U,J-	<4.00 U	NA
Dibenz(a,h)anthracene (53-70-3)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Dibenzofuran (132-64-9)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Diethyl phthalate (84-66-2)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Dimethyl phthalate (131-11-3)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Di-n-butyl phthalate (84-74-2)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Di-n-octyl phthalate (117-84-0)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Diphenylamine (122-39-4)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW01 9/20/11 Round 1	GW01 3/5/12 Round 2	GW01 9/20/12 Round 3	GW01 12/3/12 Round 4	GW01 5/28/13 Round 5
Fluoranthene (206-44-0)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Fluorene (86-73-7)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Hexachlorobenzene (118-74-1)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Hexachlorobutadiene (87-68-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	NA
Hexachlorocyclopentadiene (77-47-4)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Hexachloroethane (67-72-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	NA
Indeno(1,2,3-cd)pyrene (193-39-5)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Isophorone (78-59-1)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Naphthalene (91-20-3)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Nitrobenzene (98-95-3)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
N-nitrosodimethylamine (62-75-9)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
N-nitrosodi-n-propylamine (621-64-7)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Pentachlorophenol (87-86-5)	µg/L	<1.00 U	<2.00 U	NA	<2.00 U	NA
Phenanthrene (85-01-8)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Phenol (108-95-2)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA
Pyrene (129-00-0)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Pyridine (110-86-1)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
Squalene (111-02-4)	µg/L	<1.00 U,J-	<2.00 U,J-	NA	<2.00 U	NA
Terpiniol (98-55-5)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA
tri-(2-butoxyethyl) phosphate (78-51-3)	µg/L	<1.00 U	NR	NA	<1.00 U	NA

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW02 9/20/11 Round 1	GW02 3/5/12 Round 2	GW02 12/3/12 Round 4	GW02 5/28/13 Round 5	GW03 9/20/11 Round 1	GW03 3/5/12 Round 2	GW03 12/3/12 Round 4
Fluoranthene (206-44-0)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Fluorene (86-73-7)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Hexachlorobenzene (118-74-1)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Hexachlorobutadiene (87-68-3)	µg/L	<1.00 U	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	<1.00 U
Hexachlorocyclopentadiene (77-47-4)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Hexachloroethane (67-72-1)	µg/L	<1.00 U	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	<1.00 U
Indeno(1,2,3-cd)pyrene (193-39-5)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Isophorone (78-59-1)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Naphthalene (91-20-3)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Nitrobenzene (98-95-3)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
N-nitrosodimethylamine (62-75-9)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
N-nitrosodi-n-propylamine (621-64-7)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Pentachlorophenol (87-86-5)	µg/L	<1.00 U	<2.00 U	<2.00 U	NA	<1.00 U	<2.00 U	<2.00 U
Phenanthrene (85-01-8)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Phenol (108-95-2)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U	<2.00 U
Pyrene (129-00-0)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Pyridine (110-86-1)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
Squalene (111-02-4)	µg/L	<1.00 U	<2.00 U,J-	<2.00 U	NA	<1.00 U	<2.00 U,J-	<2.00 U
Terpiniol (98-55-5)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U	<1.00 U
tri-(2-butoxyethyl) phosphate (78-51-3)	µg/L	<1.00 U	NR	<1.00 U	NA	<1.00 U	NR	<1.00 U

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW04 9/22/11 Round 1	GW04 3/6/12 Round 2	GW04 12/4/12 Round 4	GW04 5/29/13 Round 5	GW05 9/22/11 Round 1	GW05 3/6/12 Round 2
Fluoranthene (206-44-0)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Fluorene (86-73-7)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Hexachlorobenzene (118-74-1)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Hexachlorobutadiene (87-68-3)	µg/L	<1.00 U	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U
Hexachlorocyclopentadiene (77-47-4)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Hexachloroethane (67-72-1)	µg/L	<1.00 U	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U
Indeno(1,2,3-cd)pyrene (193-39-5)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Isophorone (78-59-1)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Naphthalene (91-20-3)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Nitrobenzene (98-95-3)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
N-nitrosodimethylamine (62-75-9)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
N-nitrosodi-n-propylamine (621-64-7)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Pentachlorophenol (87-86-5)	µg/L	<1.00 U	<2.00 U	<2.00 U	NA	<1.00 U	<2.00 U
Phenanthrene (85-01-8)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Phenol (108-95-2)	µg/L	<0.50 U	<2.00 U	<2.00 U	NA	<0.50 U	<2.00 U
Pyrene (129-00-0)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Pyridine (110-86-1)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
Squalene (111-02-4)	µg/L	<1.00 U	<2.00 U,J-	<2.00 U	NA	<1.00 U	<2.00 U,J-
Terpiniol (98-55-5)	µg/L	<0.50 U	<1.00 U	<1.00 U	NA	<0.50 U	<1.00 U
tri-(2-butoxyethyl) phosphate (78-51-3)	µg/L	<1.00 U	NR	<1.00 U	NA	<1.00 U	NR

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

	Sample	GW06	GW06	GW07	GW07
	Sample Date	9/19/11	3/7/12	9/19/11	3/8/12
Parameter (CAS Number)	Unit	Round 1	Round 2	Round 1	Round 2
Fluoranthene (206-44-0)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Fluorene (86-73-7)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Hexachlorobenzene (118-74-1)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Hexachlorobutadiene (87-68-3)	µg/L	<1.00 U	<1.00 U	<1.00 U	<1.00 U
Hexachlorocyclopentadiene (77-47-4)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Hexachloroethane (67-72-1)	µg/L	<1.00 U	<1.00 U	<1.00 U	<1.00 U
Indeno(1,2,3-cd)pyrene (193-39-5)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Isophorone (78-59-1)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Naphthalene (91-20-3)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Nitrobenzene (98-95-3)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
N-nitrosodimethylamine (62-75-9)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
N-nitrosodi-n-propylamine (621-64-7)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Pentachlorophenol (87-86-5)	µg/L	<1.00 U	<2.00 U	<1.00 U	<2.00 U
Phenanthrene (85-01-8)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Phenol (108-95-2)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U
Pyrene (129-00-0)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Pyridine (110-86-1)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Squalene (111-02-4)	µg/L	<1.00 U,J-	<2.00 U,J-	<1.00 U,J-	<2.00 U,J-
Terpiniol (98-55-5)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U
tri-(2-butoxyethyl) phosphate (78-51-3)	µg/L	<1.00 U	NR	<1.00 U	NR

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW08 9/20/11 Round 1	GW08 3/5/12 Round 2	GW08 9/20/12 Round 3	GW08 12/4/12 Round 4	GW08 5/29/13 Round 5	GW09 9/21/11 Round 1	GW09 3/7/12 Round 2
Fluoranthene (206-44-0)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Fluorene (86-73-7)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Hexachlorobenzene (118-74-1)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Hexachlorobutadiene (87-68-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	NA	<1.00 U	<1.00 U
Hexachlorocyclopentadiene (77-47-4)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Hexachloroethane (67-72-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	NA	<1.00 U	<1.00 U
Indeno(1,2,3-cd)pyrene (193-39-5)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Isophorone (78-59-1)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Naphthalene (91-20-3)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Nitrobenzene (98-95-3)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
N-nitrosodimethylamine (62-75-9)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
N-nitrosodi-n-propylamine (621-64-7)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Pentachlorophenol (87-86-5)	µg/L	<1.00 U	<2.00 U	NA	<2.00 U	NA	<1.00 U	<2.00 U
Phenanthrene (85-01-8)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Phenol (108-95-2)	µg/L	<0.50 U	<2.00 U	NA	<2.00 U	NA	<0.50 U	<2.00 U
Pyrene (129-00-0)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Pyridine (110-86-1)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
Squalene (111-02-4)	µg/L	<1.00 U,J-	<2.00 U,J-	NA	<2.00 U	NA	<1.00 U	<2.00 U,J-
Terpiniol (98-55-5)	µg/L	<0.50 U	<1.00 U	NA	<1.00 U	NA	<0.50 U	<1.00 U
tri-(2-butoxyethyl) phosphate (78-51-3)	µg/L	<1.00 U	NR	NA	<1.00 U	NA	<1.00 U	NR

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW10 9/22/11 Round 1	GW10 3/7/12 Round 2	GW11 9/22/11 Round 1	GW11 3/7/12 Round 2	GW12 9/21/11 Round 1
Fluoranthene (206-44-0)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Fluorene (86-73-7)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Hexachlorobenzene (118-74-1)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Hexachlorobutadiene (87-68-3)	µg/L	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 U
Hexachlorocyclopentadiene (77-47-4)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Hexachloroethane (67-72-1)	µg/L	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 U
Indeno(1,2,3-cd)pyrene (193-39-5)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Isophorone (78-59-1)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Naphthalene (91-20-3)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Nitrobenzene (98-95-3)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
N-nitrosodimethylamine (62-75-9)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
N-nitrosodi-n-propylamine (621-64-7)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Pentachlorophenol (87-86-5)	µg/L	<1.00 U	<2.00 U	<1.00 U	<2.00 U	<1.00 U
Phenanthrene (85-01-8)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Phenol (108-95-2)	µg/L	<0.50 U	<2.00 U	<0.50 U	<2.00 U	<0.50 U
Pyrene (129-00-0)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Pyridine (110-86-1)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
Squalene (111-02-4)	µg/L	<1.00 U	<2.00 U,J-	<1.00 U	<2.00 U,J-	<1.00 U
Terpiniol (98-55-5)	µg/L	<0.50 U	<1.00 U	<0.50 U	<1.00 U	<0.50 U
tri-(2-butoxyethyl) phosphate (78-51-3)	µg/L	<1.00 U	NR	<1.00 U	NR	<1.00 U

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW13 3/5/12 Round 2	GW13 12/3/12 Round 4	GW13 5/28/13 Round 5	GW14 3/5/12 Round 2	GW14 12/5/12 Round 4	GW14 5/28/13 Round 5
Fluoranthene (206-44-0)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Fluorene (86-73-7)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Hexachlorobenzene (118-74-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Hexachlorobutadiene (87-68-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Hexachlorocyclopentadiene (77-47-4)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Hexachloroethane (67-72-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Indeno(1,2,3-cd)pyrene (193-39-5)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Isophorone (78-59-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Naphthalene (91-20-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Nitrobenzene (98-95-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
N-nitrosodimethylamine (62-75-9)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
N-nitrosodi-n-propylamine (621-64-7)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Pentachlorophenol (87-86-5)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
Phenanthrene (85-01-8)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Phenol (108-95-2)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
Pyrene (129-00-0)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Pyridine (110-86-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Squalene (111-02-4)	µg/L	<2.00 U,J-	<2.00 U	NA	<2.00 U,J-	<2.00 U	NA
Terpiniol (98-55-5)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
tri-(2-butoxyethyl) phosphate (78-51-3)	µg/L	NR	<1.00 U	NA	NR	<1.00 U	NA

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	GW15 3/6/12 Round 2	GW15 12/5/12 Round 4	GW15 5/30/13 Round 5	GW16 3/6/12 Round 2	GW16 12/5/12 Round 4	GW16 5/30/13 Round 5
Fluoranthene (206-44-0)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Fluorene (86-73-7)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Hexachlorobenzene (118-74-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Hexachlorobutadiene (87-68-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Hexachlorocyclopentadiene (77-47-4)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Hexachloroethane (67-72-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Indeno(1,2,3-cd)pyrene (193-39-5)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Isophorone (78-59-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Naphthalene (91-20-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Nitrobenzene (98-95-3)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
N-nitrosodimethylamine (62-75-9)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
N-nitrosodi-n-propylamine (621-64-7)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Pentachlorophenol (87-86-5)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
Phenanthrene (85-01-8)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Phenol (108-95-2)	µg/L	<2.00 U	<2.00 U	NA	<2.00 U	<2.00 U	NA
Pyrene (129-00-0)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Pyridine (110-86-1)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
Squalene (111-02-4)	µg/L	<2.00 U,J-	<2.00 U	NA	<2.00 U,J-	<2.00 U	NA
Terpiniol (98-55-5)	µg/L	<1.00 U	<1.00 U	NA	<1.00 U	<1.00 U	NA
tri-(2-butoxyethyl) phosphate (78-51-3)	µg/L	NR	<1.00 U	NA	NR	<1.00 U	NA

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	PW01 9/20/12 Round 3	PW02 5/29/13 Round 5	PW03 5/29/13 Round 5	SW01 9/21/11 Round 1	SW01 3/6/12 Round 2	SW02 9/21/11 Round 1	SW02 3/6/12 Round 2
Fluoranthene (206-44-0)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Fluorene (86-73-7)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Hexachlorobenzene (118-74-1)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Hexachlorobutadiene (87-68-3)	µg/L	NA	NA	NA	<1.00 U	<1.00 U	<1.00 U	<1.00 U
Hexachlorocyclopentadiene (77-47-4)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Hexachloroethane (67-72-1)	µg/L	NA	NA	NA	<1.00 U	<1.00 U	<1.00 U	<1.00 U
Indeno(1,2,3-cd)pyrene (193-39-5)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Isophorone (78-59-1)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Naphthalene (91-20-3)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Nitrobenzene (98-95-3)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
N-nitrosodimethylamine (62-75-9)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
N-nitrosodi-n-propylamine (621-64-7)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Pentachlorophenol (87-86-5)	µg/L	NA	NA	NA	<1.00 U	<2.00 U	<1.00 U	<2.00 U
Phenanthrene (85-01-8)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Phenol (108-95-2)	µg/L	NA	NA	NA	<0.50 U	<2.00 U	<0.50 U	<2.00 U
Pyrene (129-00-0)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Pyridine (110-86-1)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
Squalene (111-02-4)	µg/L	NA	NA	NA	<1.00 U	<2.00 U,J-	<1.00 U	<2.00 U,J-
Terpiniol (98-55-5)	µg/L	NA	NA	NA	<0.50 U	<1.00 U	<0.50 U	<1.00 U
tri-(2-butoxyethyl) phosphate (78-51-3)	µg/L	NA	NA	NA	<1.00 U	NR	<1.00 U	NR

Table B-6 Sample Results - Semivolatile Organic Compounds (Wise County, Texas)

Parameter (CAS Number)	Sample Sample Date Unit	SW03 9/22/11 Round 1	SW03 3/7/12 Round 2	SW04 12/4/12 Round 4	SW04 5/29/13 Round 5
Fluoranthene (206-44-0)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Fluorene (86-73-7)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Hexachlorobenzene (118-74-1)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Hexachlorobutadiene (87-68-3)	µg/L	<1.00 U	<1.00 U	<4.00 U	NA
Hexachlorocyclopentadiene (77-47-4)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Hexachloroethane (67-72-1)	µg/L	<1.00 U	<1.00 U	<4.00 U	NA
Indeno(1,2,3-cd)pyrene (193-39-5)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Isophorone (78-59-1)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Naphthalene (91-20-3)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Nitrobenzene (98-95-3)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
N-nitrosodimethylamine (62-75-9)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
N-nitrosodi-n-propylamine (621-64-7)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Pentachlorophenol (87-86-5)	µg/L	<1.00 U	<2.00 U	<8.00 U	NA
Phenanthrene (85-01-8)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Phenol (108-95-2)	µg/L	<0.50 U	<2.00 U	<8.00 U	NA
Pyrene (129-00-0)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Pyridine (110-86-1)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
Squalene (111-02-4)	µg/L	<1.00 U	<2.00 U,J-	<8.00 U,J-	NA
Terpiniol (98-55-5)	µg/L	<0.50 U	<1.00 U	<4.00 U	NA
tri-(2-butoxyethyl) phosphate (78-51-3)	µg/L	<1.00 U	NR	<4.00 U	NA

Table B-7 Sample Results - Water Isotopes and Strontium Isotopes (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW01 9/20/11 Round 1	GW01 3/5/12 Round 2	GW01 9/20/12 Round 3	GW01 12/3/12 Round 4	GW01 5/28/13 Round 5
Water Isotopes						
$\delta^{2}H$	‰	NA	-34.70	-34.31	-35.39	-35.89
$\delta^{18}O$		NA	-5.69	-5.53	-5.86	-6.00
Strontium Isotopes						
Sr	µg/L	NA	12000	3750	13500	13650
Rb	µg/L	NA	4.7	1.9	5.0	4.9
$^{87}Sr/^{86}Sr$	Atom Ratio	NA	0.708825	0.70880	0.70880	0.708795
1/Sr	L/µg	NA	0.0000833	0.0002667	0.000074074	0.000073260
Rb/Sr	Weight Ratio	NA	0.000392	0.0005067	0.000370370	0.000358974

Table B-7 Sample Results - Water Isotopes and Strontium Isotopes (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW02 9/20/11 Round 1	GW02 3/5/12 Round 2	GW02 12/3/12 Round 4	GW02 5/28/13 Round 5	GW03 9/20/11 Round 1	GW03 3/5/12 Round 2	GW03 12/3/12 Round 4
Water Isotopes								
δ^2H	‰	NA	-33.09	-33.19	-33.82	NA	-34.68	-35.34
$\delta^{18}O$		NA	-5.59	-5.69	-5.65	NA	-5.79	-5.95
Strontium Isotopes								
Sr	µg/L	NA	566	562	486	NA	421	473
Rb	µg/L	NA	0.8	0.8	0.8	NA	1.1	1.1
$^{87}Sr/^{86}Sr$	Atom Ratio	NA	0.708491	0.70842	0.708458	NA	0.708434	0.70851
1/Sr	L/µg	NA	0.0017668	0.001779359	0.002057613	NA	0.0023753	0.002114165
Rb/Sr	Weight Ratio	NA	0.001413	0.001423488	0.001646091	NA	0.002613	0.002325581

Table B-7 Sample Results - Water Isotopes and Strontium Isotopes (Wise County, Texas)

	Sample	GW04	GW04	GW04	GW04	GW05	GW05	GW06	GW06
	Sample Date	9/22/11	3/6/12	12/4/12	5/29/13	9/22/11	3/6/12	9/19/11	3/7/12
Parameter	Unit	Round 1	Round 2	Round 4	Round 5	Round 1	Round 2	Round 1	Round 2
Water Isotopes									
δ^2H	‰	NA	-34.71	-35.29	-35.23	NA	-33.74	NA	NR
$\delta^{18}O$		NA	-5.70	-5.89	-5.79	NA	-5.57	NA	NR
Strontium Isotopes									
Sr	µg/L	NA	230	233	221	NA	1800	NA	NR
Rb	µg/L	NA	0.6	0.5	0.7	NA	1.3	NA	NR
$^{87}Sr/^{86}Sr$	Atom Ratio	NA	0.708392	0.70837	0.708407	NA	0.708439	NA	NR
1/Sr	L/µg	NA	0.0043478	0.004291845	0.004524887	NA	0.0005556	NA	NR
Rb/Sr	Weight Ratio	NA	0.002609	0.002145923	0.003167421	NA	0.000722	NA	NR

Table B-7 Sample Results - Water Isotopes and Strontium Isotopes (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW07 9/19/11 Round 1	GW07 3/8/12 Round 2	GW08 9/20/11 Round 1	GW08 3/5/12 Round 2	GW08 9/20/12 Round 3	GW08 12/4/12 Round 4	GW08 5/29/13 Round 5
Water Isotopes								
$\delta^{2}H$	‰	NA	NR	NA	-31.75	-31.98	-32.24	-33.16
$\delta^{18}O$		NA	NR	NA	-5.36	-5.28	-5.53	-5.58
Strontium Isotopes								
Sr	µg/L	NA	NR	NA	6540	3450	2750	4020
Rb	µg/L	NA	NR	NA	2.4	1.2	1.2	1.5
$^{87}Sr/^{86}Sr$	Atom Ratio	NA	NR	NA	0.709063	0.70903	0.70901	0.709019
1/Sr	L/µg	NA	NR	NA	0.0001529	0.0002899	0.000363636	0.000248756
Rb/Sr	Weight Ratio	NA	NR	NA	0.000367	0.0003478	0.000436364	0.000373134

Table B-7 Sample Results - Water Isotopes and Strontium Isotopes (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW09 9/21/11 Round 1	GW09 3/7/12 Round 2	GW10 9/22/11 Round 1	GW10 3/7/12 Round 2	GW11 9/22/11 Round 1	GW11 3/7/12 Round 2	GW12 9/21/11 Round 1
Water Isotopes								
δ^2H	‰	NA	-31.15	NA	NR	NA	NR	NA
$\delta^{18}O$		NA	-5.11	NA	NR	NA	NR	NA
Strontium Isotopes								
Sr	µg/L	NA	NR	NA	NR	NA	247	NA
Rb	µg/L	NA	NR	NA	NR	NA	0.8	NA
$^{87}Sr/^{86}Sr$	Atom Ratio	NA	NR	NA	NR	NA	0.708658	NA
1/Sr	L/µg	NA	NR	NA	NR	NA	0.0040486	NA
Rb/Sr	Weight Ratio	NA	NR	NA	NR	NA	0.003239	NA

Table B-7 Sample Results - Water Isotopes and Strontium Isotopes (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW13 3/5/12 Round 2	GW13 12/3/12 Round 4	GW13 5/28/13 Round 5	GW14 3/5/12 Round 2	GW14 12/5/12 Round 4	GW14 5/28/13 Round 5
Water Isotopes							
$\delta^{2}H$	‰	-34.01	-34.66	-35.21	-34.08	-34.53	-35.11
$\delta^{18}O$		-5.57	-5.92	-6.03	-5.70	-5.80	-6.02
Strontium Isotopes							
Sr	µg/L	229	237	310	288	294	270
Rb	µg/L	0.6	0.6	0.7	0.6	0.6	0.6
$^{87}Sr/^{86}Sr$	Atom Ratio	0.708502	0.70848	0.708706	0.708528	0.70849	0.708493
1/Sr	L/µg	0.0043668	0.004219409	0.003225806	0.0034722	0.003401361	0.003703704
Rb/Sr	Weight Ratio	0.002620	0.002531646	0.002258065	0.002083	0.002040816	0.002222222

Table B-7 Sample Results - Water Isotopes and Strontium Isotopes (Wise County, Texas)

Parameter	Sample Sample Date Unit	GW15 3/6/12 Round 2	GW15 12/5/12 Round 4	GW15 5/30/13 Round 5	GW16 3/6/12 Round 2	GW16 12/5/12 Round 4	GW16 5/30/13 Round 5
Water Isotopes							
δ^2H	‰	-33.58	-33.93	-34.02	-34.97	-35.22	-35.97
$\delta^{18}O$		-5.58	-5.89	-5.65	-5.77	-5.92	-5.92
Strontium Isotopes							
Sr	µg/L	290	309	301	NR	267	259
Rb	µg/L	0.7	0.6	0.6	NR	0.8	0.8
$^{87}Sr/^{86}Sr$	Atom Ratio	0.708417	0.70839	0.708390	NR	0.70868	0.708693
1/Sr	L/µg	0.0034483	0.003236246	0.003322259	NR	0.003745318	0.003861004
Rb/Sr	Weight Ratio	0.002414	0.001941748	0.001993355	NR	0.002996255	0.003088803

Table B-7 Sample Results - Water Isotopes and Strontium Isotopes (Wise County, Texas)

Parameter	Sample Sample Date Unit	PW01 9/20/12 Round 3	PW02 5/29/13 Round 5	PW03 5/29/13 Round 5	SW01 9/21/11 Round 1	SW01 3/6/12 Round 2	SW02 9/21/11 Round 1	SW02 3/6/12 Round 2
Water Isotopes								
δ^2H	‰	-10.41	-28.63	-11.86	NA	NR	NA	NR
$\delta^{18}O$		2.14	-1.18	1.90	NA	NR	NA	NR
Strontium Isotopes								
Sr	µg/L	668000*	48	532000	NA	NR	NA	NR
Rb	µg/L	3470*	<4	2120	NA	NR	NA	NR
$^{87}Sr/^{86}Sr$	Atom Ratio	0.71303	0.711061	0.712297	NA	NR	NA	NR
1/Sr	L/µg	0.0000015	0.020833333	0.000001880	NA	NR	NA	NR
Rb/Sr	Weight Ratio	0.0051946	NR	0.003984962	NA	NR	NA	NR

Table B-7 Sample Results - Water Isotopes and Strontium Isotopes (Wise County, Texas)

	Sample	SW03	SW03	SW04	SW04
	Sample Date	9/22/11	3/7/12	12/4/12	5/29/13
Parameter	Unit	Round 1	Round 2	Round 4	Round 5
Water Isotopes					
δ^2H	‰	NA	NR	9.53	1.99
$\delta^{18}O$		NA	NR	3.39	1.37
Strontium Isotopes					
Sr	µg/L	NA	NR	233	198
Rb	µg/L	NA	NR	2.8	6.2
$^{87}Sr/^{86}Sr$	Atom Ratio	NA	NR	0.709692	0.709651
1/Sr	L/µg	NA	NR	0.004291845	0.005050505
Rb/Sr	Weight Ratio	NA	NR	0.012017167	0.031313131

Appendix C
Background Data
Retrospective Case Study in Wise County, Texas

U.S. Environmental Protection Agency
Office of Research and Development
Washington, DC

May 2015
EPA/600/R-14/090

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C.1. Land Use

This appendix contains descriptions of land uses in Wise County as a whole, followed by descriptions of land uses in and around the sampling points of this study. The Cropland Data Layer produced by the National Agricultural Statistics Service (NASS), a part of the U.S. Department of Agriculture,[1] provides data on agricultural uses of land. Figure C1 shows land uses, including the agricultural uses of land, in Wise County in 2012. Table C1 shows the percentages of county land devoted to the largest agricultural uses. Grassland herbaceous was the largest use of agricultural land in the county.

The National Land Cover Database was used here to examine changes in land use. The earliest available imagery dates to 1992, there is imagery available from 2001, and the latest available imagery dates to 2006. The data from the National Land Cover Database for 1992 and 2006 were not directly comparable due to changes in input data and mapping methodologies. However, it was possible to compare data from 1992 to that from 2001 and to compare data from 2001 to that from 2006 to identify changes in land use (Multi-Resolution Land Characteristics Consortium 2013.) Figure C2 shows land use changes in Wise County between 1992 and 2001 and between 2001 and 2006, respectively. Table C2 contains data on the changes in land use in the county in the two sub-periods. It can be seen from the table that only a tiny proportion of the land in the county changed use in either sub-period.

The population totals for Wise County (i.e., an indicator of the intensity of land use) at each census year from 1950 to 2010 are shown in Figure C3 (U.S. Census Bureau 2013a, b,c). The population of Wise County has grown throughout the period, and the population of the county tripled between 1970 and 2010. In 2011 the population density in Wise County was approximately 66 persons per square mile; the entire state had approximately 98 persons per square mile (U.S. Census Bureau 2012a). In 2010 the percentage of the land taken up by urban areas (another indicator of the intensity of land use) in Wise County was 1.6%; in the entire state, urban areas comprise 3.4% (U.S. Census Bureau 2012b).

Employment is another broad indicator of land use in the county. Table C3 shows the largest industries by employment in Wise County. The production industries (i.e., manufacturing, mining, and utilities) accounted for 29% of employment in Wise County.

C.2. Search Areas

C.2.1. Land Use

Figures C4 through C6, which were created using data from the National Land Cover Database, show land use maps for Search Areas A, B, and C, respectively, in 1992 and 2006. The search areas encompass a 3-mile search radius around the sampling points in the county and were used to focus the analysis of land use patterns and the environmental records searches. Tables C4 through C6 contain data on land use in Search Areas A, B and C, respectively, in 1992 and 2006. Bearing in mind that the data for land use in the two years were not comparable due to methodological differences, they indicate that

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[1] The Cropland Data Layer is “created annually for the continental United States using moderate resolution satellite imagery and extensive agricultural ground truth.” (U.S .Department of Agriculture 2012)

grassland/herbaceous and pasture/hay (i.e., land suitable for grazing or animal forage production), forest, and row/cultivated crop land were the largest land use categories in the search areas.

C.2.2. Crop Land

Figures C7 through C9 show land uses, including the agricultural uses of land, in Search Areas A, B, and C, respectively, in 2012. Tables C7 through C9 show the percentages of land devoted to the largest agricultural uses in Search Areas A, B, and C, respectively. Grassland herbaceous was the largest use of agricultural land in all three search areas.

C.2.3. Land Use Changes

Figures C10 through C12 show land use changes in Search Areas A, B and C, respectively, between 1992 and 2001 and between 2001 and 2006. Tables C10 through C12 contain data on the changes in land use in the two sub-periods. It can be seen from the tables that only a tiny proportion of the land in each search area changed use in either sub-period.

C.3. Environmental Records Search

Environmental record searches of the three study areas (Locations A, B, and C) were obtained by Environmental Data Resources, Inc. (EDR). EDR provides a service for searching publically available databases as well as providing data from their own proprietary databases. The database searches included records reviews of several different federal, state, tribal, and EDR proprietary environmental databases for the three study areas with documented use, storage, or release of hazardous materials or petroleum products (see Attachment 1).[2]

The record searches were based on 3-mile-radius search areas centered around a single sampling point or a cluster of EPA sampling points. These search areas were chosen based on professional judgment considering the large size of the study area as described below:

1. In general, a 3-mile search radius was centered around a cluster of EPA sample points in each location.
2. If sample points were less than 1 mile from the edge of the 3-mile search radius, they were considered extraneous points and 1-mile radii were used.

The identified records included historically contaminated properties; businesses that use, generate, transport, or dispose of hazardous materials or petroleum products in their operations; active contaminated sites that are currently being assessed and/or remediated; sites with National Pollutant Discharge Elimination System (NPDES) and State Pollutant Discharge Elimination system (SPDES) permits; and active and abandoned mines and landfills. All these properties, listed on the

2 Note: Environmental Data Resources Inc. (EDR) does not search the EnviroFacts and its associated EnviroMapper databases but does search 19 of the 20 environmental databases covered by EnviroFacts, either as standalone databases (such as CERCLIS, RCRA, TSCA, etc.) or as databases searched as part of the Facility Index System/Facility Registry System (FINDS) database. The only EnviroFacts database that is not reviewed as part of an EDR search is the Cleanups in My Community (Cleanup) database, which maps and lists areas where hazardous waste is being or has been cleaned up throughout the United States. However, it is likely the information in the Cleanup database is also found in other databases that are part of EDR searches.

Environmental Records Search Report, were reviewed and screened to determine whether they are potential candidate causes. The criteria used for the screening included relevant environmental information (including, but not limited to, notices of violations, current and historical use of the site, materials and wastes at the site, releases and/or spills) and distance from the sampling points.

Sites that could not be mapped due to poor or inadequate address information were not included on the EDR Radius Map. However, EDR determined that, based on the limited address information available, it was possible that these sites could be located within the stated search radius (e.g., zip code listed within searched radius) and were listed on the Environmental Records Search Report as orphan sites[3]. Even though they are not mappable, the orphan sites were screened to the extent possible based on limited information on those sites available through additional searches of the databases listed above and information obtained through Internet searches (e.g., EPA and Texas Railroad Commission [TRRC] websites).

C.3.1. Oil and Gas Well Inventory

Well inventories of the same search areas described above for the EDR reports were prepared using the TRRC oil and gas well database. All oil and gas wells within these search area radii were selected for review. Specific focus was placed on wells within 1 mile of EPA sampling locations.

C.3.2. State Record Summary

The TRRC database was used to find up-to-date records for wells within the search radii. The database provides information on inspection and pollution prevention visits, including a listing of all inspections that have occurred at each well on record, if violations were noted, and any enforcement that may have resulted. The system provides multiple options to search for records. Because of the large number of wells in each study area, this record search was only for oil and gas wells within a 1-mile radius of each EPA sampling point.

C.4. Evaluation of Data for Location A

C.4.1. Environmental Records Search Report Summary

One 3-mile search radius was established to perform database searches that would capture all seven EPA sample points (see Figure C13). The database search located five mapped records within this search area. An additional 43 records for orphan sites were identified during the searches. Some of the same records were identified in different databases. Therefore the actual number of sites was less than the 48 records identified. An attempt to locate these sites with the information available in the reports and through internet searches was made to aid in determining the potential of these sites as candidate causes. The evaluation of sites is summarized in Table C13.

A total of one incident, record, and site were retained as potential candidate causes and were identified within the databases as described below:

[3] Orphan sites are those sites with poor locational information in the databases that may or may not exist outside the actual search radius.

- **Emergency Response Notification System (ERNS) –** This database records and stores information on reported releases of oil and hazardous substances. This site was a drilling pad location. On October 29, 2009, a release of a black "smokey" [sic] fluid from a drilling rig was reported. The site is located at 415 Star Shell Road, in Decatur, Texas, approximately 0.17 miles northwest of EPA sample WISETXGW12. Because of the proximity of this release to the sampling point and unknown materials and quantity, this site is a potential candidate cause.

C.4.2. Oil and Gas Well Inventory Summary

As described above, the EPA sampling locations were compared with the distance to the inventory of wells identified in the in EPA geographic information system (GIS) database files and the TRRC oil and gas well database files (see Table C14).

There are 304 oil and gas wells in Location A's 3-mile search area. Of the 304 wells, 62 are within 1 mile of EPA sample points (see Table C15).

In addition to obtaining well inventory data, Google Earth Aerial Imagery between 1995 and 2013 were reviewed to identify the presence or absence of impoundments or reserve pits associated with oil and gas wells in the study area.

Impoundments/reserve pits were observed in the aerial images that were reviewed. However, since these features are relatively short-term and the time frame between the images can span multiple years, additional impoundments/reserve pits could have been present in the study area but not captured by the available Google Earth Imagery. Most of the impoundments observed were post-2004. In Location A, between 35 and 41 well pads were observed within a 1-mile radius of a given EPA sample point. Many of the well pads contain or previously contained reserve pits, which are generally used for drill cuttings. The nearest distances of the impoundments and well pads relative to the EPA sample locations are summarized in Table C16 and the locations of impoundments relative to the search areas are shown on Figure C14. Specific use of each impoundment is unknown; however, impoundments are generally used to store fresh water for hydraulic fracturing, but treated flowback fluids (brines and spent hydraulic fracturing fluid) from the hydraulic fracturing process are also placed in these impoundments. Available aerial imagery did not show any impoundments in Location A within 1 mile of an EPA sampling point.

In summary, numerous oil and gas production wells are in the study area, most well pads contain/contained a reserve pit, and some of the well pads were associated with an impoundment. The presence of numerous oil and gas wells, reserve pits, and impoundments increase the probability of one or more of these features to be a potential candidate cause.

C.4.3. State Record Summary

Notice of Violations (NOVs). A list of oil and gas wells within Location A's 1-mile search area was submitted to the TRRC for NOV review since NOVs are not available online from the state of Texas. Only major violations associated with the individual wells (e.g., spills, releases, and well-integrity issues) were requested (i.e., administrative violations were not deemed necessary for this study). No major violations were reported by TRRC for this area.

C.5. Evaluation of Data for Location B

C.5.1. Environmental Records Search Report Summary

A 3-mile search radius that would capture all 10 EPA sample points was established for database searches (see Figure C13). The database search located 31 records within this search area. An additional 41 records for orphan sites were identified during the searches. Some of the same records were identified in different databases. Therefore the actual number of sites is less than the 72 records identified. An attempt to locate these sites with the information available in the reports and through Internet searches was made to aid in determining the potential of these sites as candidate causes Site evaluations are summarized in Table C17.

Of the 72 records, a total of four incidents, records, and sites were retained as potential candidate causes and were identified within the databases as described below:

- **Old Decatur Site** – This site is an historic landfill, closed in 1972, located 0.45 miles northeast of sample WISETXGW15 and approximately 1 mile southwest of the junction of Highway 28 and Highway 380. Landfills can impact water quality over large areas and release a variety of contaminants. No additional information was found through desktop and Internet searches.
- **Timeout Chevron** – Records for this site indicate use of an underground storage tank (UST) containing petroleum fluids. Old USTs were typically built using a single wall design that was prone to leak. The site is located approximately 1.23 miles northeast of sample location WISETXGW15.
- **JE Haynes Construction** – Records for this site indicate use of a UST containing petroleum fluids. Old USTs were typically built using a single wall design that was prone to leak. The site is located approximately 1.52 miles northeast of sample location WISETXGW05.
- **Historical Automotive Site** –Historically, automotive shops have contributed to groundwater contamination as the result of poor disposal practices of waste automotive fluids. This site is located 1.7 miles northeast of sample WISETXGW15.

C.5.2. Oil and Gas Well Inventory Summary

As noted above, the EPA sampling locations were compared with the inventory of wells identified in the EPA's GIS database files and TRRC database files (see Table C18).

There are 369 oil and gas wells in the 3-mile search area. Of the 369 wells, 76 are within 1 mile of EPA sample points (see Table C19).

Impoundments/reserve pits were observed in Google Earth aerial images that were reviewed. However, since these features are relatively short-term and the time frame between the images can span multiple years, additional impoundments/reserve pits could have been present but were not captured by the available Google Earth imagery. Most of the impoundments observed were post-2008 and in some cases have since been reclaimed. In Location B, between 28 and 41 well pads were observed within a 1-

mile radius of a given EPA sample point. Many of the well pads contain or previously contained reserve pits, which are generally used for drill cuttings. The nearest distances of the impoundments and well pads relative to the EPA sample locations are summarized in Table C20 and the locations relative to the search areas are shown on Figure C15. Specific use of each impoundment is unknown; however, although impoundments are generally used to store fresh water for hydraulic fracturing, treated flowback fluids (brines and spent hydraulic fracturing fluid) from the hydraulic fracturing process are also placed in these impoundments. Two impoundments are within a 1-mile radius of any given sample point. The distance between a given EPA sample point to the nearest impoundment ranged from between less than 0.1 miles to 0.6 miles.

In summary, numerous production wells are in the study area, most well pads contain a reserve pit, and some of the well pads are associated with an impoundment. The presence of numerous oil and gas wells, reserve pits, and impoundments increases the probability of one or more of these features to be a potential candidate cause.

C.5.3. State Record Summary

Notice of Violations. A list of oil and gas wells within the Location B 1-mile search area was submitted to the TRRC for NOV review since NOVs are not available online from the state of Texas. Only major violations associated with the individual wells (e.g., spill, releases, and well integrity issues) were requested (i.e., administrative violations were not deemed necessary for this study). No major violations were reported by TRRC for this area. However, since brine migration is the issue of concern in this area, there may be violations associated with brine releases from reserve pits or impoundments. Additional information was requested; however, no additional information was provided by the TRRC regarding impoundment releases.

C.6. Evaluation of Data for Location C

C.6.1. Environmental Records Search Report Summary

A 3-mile search radius that would capture the two EPA sample points was established for database searches (see Figure C13). The database search located one mapped record within this search area. An additional 118 records for orphan sites were identified during the searches. Some of the same records were identified in different databases. Therefore the actual number of sites is less than the 119 records identified. An attempt was made to locate these sites using information available in the reports and through the Internet to help determine the potential of these sites as candidate causes. The evaluation of sites is summarized in Table C21.

No incidents, records, or releases were identified at Location C in the databases and none were retained as potential candidate causes.

C.6.2. Oil and Gas Well Inventory Summary

As described above, the EPA sampling locations were compared with the distance to the inventory of wells identified in the in EPA's GIS database files and the TRRC oil and gas well database files (see Table C22).

There are 161 oil and gas wells in the 3-mile search area. Of the 161 wells, 30 are within 1 mile of EPA sample points (see Table C23).

Impoundments/reserve pits were observed in Google Earth aerial images that were reviewed. However, since these features are relatively short-term and the time frame between the images can span multiple years, additional impoundments/reserve pits could have been present but were not captured by the available Google Earth Imagery. Most of the impoundments observed were post-2008. In Location C, between 17 and 18 well pads were observed within a 1-mile radius of a given EPA sample point. Many of the well pads contain or previously contained reserve pits, which are generally used for drill cuttings. The nearest distances of the impoundments and well pads relative to the EPA sample locations are summarized in Table C24 and the locations relative to the search areas are shown on Figure C16. Specific use of each impoundment is unknown; however, although impoundments are generally used to store fresh water for hydraulic fracturing, treated flowback fluids (brines and spent hydraulic fracturing fluid) from the hydraulic fracturing process are also placed in these impoundments. Two impoundments are within a 1-mile radius of any given sample point. The distance from a given EPA sample point to the nearest impoundment ranged from between 0.2 miles to 0.7 miles.

In summary, numerous production wells are in the study area, most well pads contain a reserve pit, and some of the well pads are associated with an impoundment. The presence of numerous oil and gas wells, reserve pits, and impoundments increases the probability of one or more of these features to be a potential candidate cause.

C.6.3. State Record Summary

Notice of Violations. A list of oil and gas wells within the Location C 1-mile search area was submitted to the TRRC for NOV review since NOVs are not available online from the state of Texas. Only major violations associated with the individual wells (e.g., spills, releases, and well integrity issues) were requested (i.e., administrative violations were not deemed necessary for this study). Three violations were noted (see Table C25). These violations included an alleged casing leak in April 2013, an oil and brine spill in September 2011, and a production fluid spill in February 2013. The casing leak could not be confirmed by TRRC, the oil and brine spill was contained and cleaned up, and the status of the production fluid spill is unknown. The operator was directed to conduct remedial cleanup of affected areas. As of March 1, 2013, a site inspection reported that cleanup had not been conducted. Because of its proximity to an EPA sampling location, this incident could be considered a potential candidate cause.

C.7. References

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Appendix C Tables

Table C1 Major Agricultural Land Uses in Wise County

Agricultural Land Use	% of County Land Area
Grassland herbaceous	63.9
Pasture/hay	4.7
Winter wheat	2.9
Fallow/idle cropland	0.8
Sorghum	0.7
Corn	0.2

Source: U.S. Department of Agriculture, 2012.

Table C2 Changes in Land Use, 1992 to 2001 and 2001 to 2006, in Wise County

Change in Land Use	% of County Land Area	
	1992 to 2001	2001 to 2006
No change	97.0	99.2
Change in land use	3.0	0.8
- to grassland/shrub	1.3	0.0
- to agriculture	0.7	0.0
- to urban	0.4	0.0
- to barren	0.3	0.1
- to open water	0.2	0.0
- to developed	0.0	0.1
- to herbaceous	0.0	0.4

Source: U.S. Geological Survey, 2012.
Note: Percentages may not sum to 100% due to rounding

Table C3 Largest Industries by Employment in Wise County in 2011

Industry Title	Number of Paid Employees	% of Total Paid Employees
Mining, quarrying, and oil and gas extraction	3,337	20.4
Health care and social assistance	2,433	14.9
Retail trade	2,217	13.6
Accommodation and food services	1,474	9.0
Manufacturing	1,396	8.5
Other services (except public administration)	1,277	7.8
Transportation and warehousing	1,077	6.6
Construction	774	4.7
Wholesale trade	598	3.7
Administrative and support and waste management and remediation services	488	3.0
Finance and insurance	368	2.3
Professional, scientific, and technical services	263	1.6
Real estate and rental and leasing	244	1.5
Arts, entertainment, and recreation	39	0.2

Source: U.S. Census Bureau, 2011.

Table C4 Land Use in Search Area A in 1992 and 2006

Land Use	1992		2006	
	Square Miles	% of Total	Square Miles	% of Total
Grassland/herbaceous	10.2	36.0	20.4	72.0
Pasture/hay	9.4	33.4	2.6	9.1
Deciduous forest	3.1	11.1	2.8	9.9
Row/cultivated crops	1.8	6.3	0.7	2.6
Shrub/scrub	1.5	5.5	0.0	0.1
Evergreen forest	1.2	4.3	0.0	0.0
Mixed forest	0.6	2.2	0.0	0.0
Open water	0.3	1.2	0.3	0.9
Developed	0.0	0.0	1.4	5.1
Total	**28.3**	**100.0**	**28.3**	**100.0**

Note: Totals may not sum exactly due to rounding.
Source: U.S. Geological Survey, 2012

Table C5 Land Use in Search Area B in 1992 and 2006

Land Use	1992		2006	
	Square Miles	% of Total	Square Miles	% of Total
Pasture/hay	10.1	35.8	6.0	21.3
Grassland/herbaceous	8.4	29.6	13.9	49.0
Deciduous forest	3.3	11.7	3.8	13.3
Row/cultivated crops	2.8	10.1	2.0	7.0
Shrub/scrub	1.6	5.5	0.0	0.1
Evergreen forest	1.0	3.4	0.0	0.0
Mixed forest	0.4	1.5	0.0	0.0
Open water	0.3	1.2	0.1	0.3
Developed	0.3	1.1	2.4	8.6
Barren	0.0	0.1	0.1	0.2
Emergent herbaceous wetlands	0.0	0.0	0.1	0.2
Total	**28.3**	**100.0**	**28.3**	**100.0**

Source: U.S. Geological Survey, 2012
Note: Totals may not sum exactly due to rounding.

Table C6 Land Use in Search Area C in 1992 and 2006

Land Use	1992		2006	
	Square Miles	% of Total	Square Miles	% of Total
Grassland/herbaceous	13.4	47.3	15.0	53.1
Deciduous forest	6.0	21.4	8.1	28.8
Pasture/hay	2.5	9.0	3.0	10.6
Shrub/scrub	2.5	8.9	0.0	0.0
Row/cultivated crops	1.7	5.9	0.3	0.9
Evergreen forest	1.4	4.9	0.2	0.7
Open water	0.4	1.4	0.2	0.7
Mixed forest	0.3	0.9	0.0	0.0
Developed	0.0	0.0	1.5	5.2
Total	**28.3**	**100.0**	**28.3**	**100.0**

Source: U.S. Geological Survey, 2012.
Note: Totals may not sum exactly due to rounding.

Table C7 Major Agricultural Land Uses in Search Area A

Use	% of County Land Area
Grassland herbaceous	71.8
Pasture/hay	4.2
Sorghum	3.9
Winter wheat	3.6
Fallow/idle cropland	0.2
Corn	0.1

Source: U.S. Department of Agriculture, 2012.

Table C8 Major Agricultural Land Uses in Search Area B

Use	% of County Land Area
Grassland herbaceous	63.1
Pasture/hay	9.9
Winter wheat	3.1
Sorghum	0.7
Fallow/idle cropland	0.3
Corn	0.1

Source: U.S. Department of Agriculture, 2012.

Table C9 Major Agricultural Land Uses in Search Area C

Use	% of County Land Area
Grassland herbaceous	57.7
Pasture/hay	4.1
Winter wheat	0.9
Fallow/idle cropland	0.2

Source: U.S .Department of Agriculture, 2012.

Table C10 Changes in Land Use, 1992 to 2001 and 2001 to 2006, in Search Area A

	% of County Land Area	
	1992 to 2001	2001 to 2006
No change	97.1	99.9
Change in land use	2.9	0.1
- to grassland/shrub	1.7	0.00
- to agriculture	0.6	0.00
- to urban	0.5	0.00
- to open water	0.1	0.02
- to barren	0.0	0.07

Source: U.S .Geological Survey, 2012.
Note: Totals may not sum exactly due to rounding.

Table C11 Changes in Land Use, 1992 to 2001 and 2001 to 2006, in Search Area B

	% of County Land Area	
	1992 to 2001	2001 to 2006
No change	96.2	99.5
Change in land use	3.8	0.5
- to grassland/shrub	1.6	0.00
- to agriculture	1.2	0.00
- to urban	0.7	0.00
- to open water	0.2	0.00
- to barren	0.1	0.06
- to developed	0.0	0.21
- to emergent herbaceous wetlands	0.0	0.21

Source: U.S. Geological Survey, 2012.
Note: Totals may not sum exactly due to rounding.

Table C12 Changes in Land Use, 1992 to 2001 and 2001 to 2006, in Search Area C

	% of County Land Area	
	1992 to 2001	2001 to 2006
No change	98.4	99.7
Change in land use	1.6	0.3
- to grassland/shrub	1.0	0.0
- to agriculture	0.5	0.0
- to urban	0.1	0.0
- to herbaceous	0.0	0.3

Source: U.S. Geological Survey, 2012.
Note: Totals may not sum exactly due to rounding.

Table C13 Environmental Database Review Summary, Wise County, Texas - Location A

Database	Name of Facility	Site Location	Distance from Nearest Sampling Point	Potential Candidate Cause Yes/No	Potential Candidate Cause Justification	Ground Water Wells
ERNS	NOT REPORTED	415 STAR SHELL RD. DECATUR, TX 76234	0.17 mi NW of WISETXGW12	Yes	On 10/29/09 a release of a substance to soils was reported for emergency response. The released material was not identified but was described as a black, smokey fluid shooting out of a drilling rig. Based on the proximity of this site to an EPA sampling location and the presence and quantity of unknown materials, this site is a potential candidate cause.	
1 ENF site, NW 0.814 mi.	WRIGHT 15H AND 16H	1247 COUNTY RD 2513 DECATUR, TX 76234	0.66 mi NW of WISETXGW11	No	This enforcement action was for not properly permitting a compressor at a nearby drill site. No record of a release.	
TIER 2	TARGA MIDSTREAM SERVICES LP	COUNTY ROAD 2610 DECATUR, TX 76234	1.50 NW of WISETXGW11	No	Natural condensate/liquids stored on site, but no releases are recorded.	
AIRS orphan site	POOR FARM COMPRESSOR SITE	ON THE EAST SIDE OF S.H. 51, 2.2 MI. S. OF HWY. 287 DECATUR, TX 76234	1.8 mi NE of WISETXGW15	No	This record is for air emissions inventory. Not a potential candidate.	
LPST, AST, UST orphan site	WISE COUNTY PRECINCT 1	N HWY 51 DECATUR, TX 76234	>9.4 mi W of WISETXGW10	No	Leaking petroleum storage tank that involved minor soil contamination that did not require remedial action. Currently, a diesel storage tank is on site. Based on distance, this site is not likely to impact water quality in Location A.	
LPST orphan site	TXDOT MAINTENANCE FACILITY	HWY 281 DECATUR, TX 76234	NI	No	Petroleum product affected the groundwater but has been remediated. Due to the lack of a contaminants after a completed remediation, this site is not considered a potential candidate cause.	
LPST orphan	FORMER HAPPY K	8175 N HWY 51 DECATUR, TX 76234	NI	No	Petroleum product affected the groundwater but has been remediated. Due to the lack of a contaminants after a completed remediation, this site is not considered a potential candidate cause.	
GCC orphan	S & J OIL COMPANY INC	1000 S HWY 287 DECATUR, TX 76234	~9.8 mi SW of WISETXGW10	No	Record is for a site with groundwater contamination but contaminant not specified. Contaminant not likely to migrate this distance and be detected in EPA samples.	
Ind. Haz Waste orphan	DEROCHE TRUCKING	HIGHWAY 1 14 EAST DECATUR, TX 76234	>14.5 mi SE of WISETXGW10	No	Record is for a conditionally exempt small quantity generator (CESQG). No reports of a release. Distance too great to impact water quality.	
Ind. Haz Waste orphan	DUSTYS TRUCK SERVICE	HIGHWAY 287 NORTH DECATUR, TX 76234	>9.6 mi W of WISETXGW10	No	Record is for a CESQG that is no longer active. No records of release and distance too great to impact water quality.	
SPILLS orphan	HWY 287, 7 MI SOUTH OF DECATUR, TX	HWY 287, 7 MI SOUTH OF DECATUR, TX 76234	9.4 mi SW of WISETXGW10	No	53,000 gallons of gasoline were spilled and affected ground water. Contaminant not likely to migrate this distance and be detected in EPA samples.	
TIER 2 orphan	MCLEODUSA - DECATUR.TX	2425 US HWY 287 DECATUR, TX 76234	9.8 mi SW of WISETXGW10	No	Record is for storage or generation of chemicals between 2005 and 2007. No indication of a release and too distant to impact ground water quality in Location A.	
5 TIER 2 orphan records	"TARGA MIDSTREAM SERVICES L.P. ""DECATUR STATION"	HIGHWAY 287 DECATUR, TX 76234	>9.6 mi W of WISETXGW10	No	Two records indicate storage of natural gas condensate/liquids. No indication of a release and too distant to impact ground water quality in Location A.	
2 TIER 2 orphan reports	"RYDER SCOTT MANAGEMENT, LLC - WAGGONER-WALKER # 2"	OLD DENTON HWY DECATUR, TX 76234	>4.2 mi SW of WISETXGW10	No	Record is for storage or generation of chemicals in 2005 and 2006. No indication of a release and too distant to impact ground water quality in Location A.	
TIER 2 orphan	DECATUR S & G PLANT 1205	4798 US HWY 380 DECATUR, TX 76234	15.2 mi W of WISETXGW10	No	Record is for storage or manufacture of chemicals. No record of release and site too distant to impact water quality for Location A.	38 State Wells
TIER 2 orphan	SPS DECATUR	2379 N HWY 287 DECATUR, TX 76234	11.9 mi W of WISETXGW10	No	Aboveground storage of petroleum products. Based on the distance from a sampling point and the lack of a reported release, this is not a potential candiate site.	
2 TIER 2 orphan	AT&T COMMUNICATIONS OF TEXAS - TX6462	17889 HWY 380 EAST DECATUR, TX 76234	>0.8 mi S of WISETXGW10	No	Sulfuric Acid is stored at the facility; there is no mention of a release.	
2 TIER 2 orphan	BIG SKY "W" #1 LEASE	HIGHWAY 380 KRUM, TX 76249	>5.8 mi E of WISETXGW10	No	Record is for storage of crude petroleum and natural gas. No record of release.	
2 TIER 2 orphan	FOSTER #1 LEASE	HIGHWAY 380 DECATUR, TX 76234	>0.8 mi S of WISETXGW10	No	Record is for storage of crude petroleum and natural gas. No record of release.	
2 TIER 2 orphan	GRIFFIN #2, #3, #4, #6, #7 & #8 LEASE	HIGHWAY 380 PONDER, TX 76259	>5.4 mi SE of WISETXGW10	No	Record is for storage of crude petroleum and natural gas. No record of release.	
2 TIER 2 orphan	GRIFFIN-ADAMI #6 LEASE	HIGHWAY 380 PONDER, TX 76259	>5.4 mi SE of WISETXGW10	No	Record is for storage of crude petroleum and natural gas. No record of release.	
2 TIER 2 orphan	LOWE'S OF DECATUR, TX (STORE # 2235)	1201 WEST US HIGHWAY 380 BUSINESS DECATUR, TX 76234	11.5 mi W of WISETXGW10	No	This facility stores diesel fuel. Too distant to impact water quality of Location A samples.	
2 TIER 2 orphan	WILLIAMS #1 LEASE	HIGHWAY 380 PONDER, TX 76259	>5.4 mi SE of WISETXGW10	No	Record is for storage of crude petroleum and natural gas. No record of release.	
2 TIER 2 orphan	WILLIAMS #2 & #3 LEASE	HIGHWAY 380 PONDER, TX 76259	>5.4 mi SE of WISETXGW10	No	Record is for storage of crude petroleum and natural gas. No record of release.	
TIER 2 orphan	0902 WISE COUNTY	3188 E HWY 380 DECATUR, TX 76234	11.8 mi W of WISETXGW10	No	Based on the distance from sampling points and the lack of a reported release, this is not a potential candidate site.	
TIER 2 orphan	NABORS WELL SERVICES LTD.	223 N. HIGHWAY 287 DECATUR, TX 76234	10.6 mi WSW of WISETXGW10	No	This facility stores petroleum products. Based on distance, this site not likely to impact water quality in Location A.	
LPST, GCC orphan	S & J OIL COMPANY INC	1000 S BUSINESS HWY 287 DECATUR, TX 76234	10.8 mi WSW of WISETXGW10	No	Ground water was affected by a release of petroleum product. Based on distance, this is not likely to affect water quality in Location A.	
ENF orphan	COLE ROBERTS 1H & 2H GAS WELL SITE	WEST OF HIGHWAY FM 730 ON COUNTY ROAD 265 IN DECATUR TEXAS DECATUR, TX 76234	NI	No	A NOV of moderate level has been resolved. The violation involved failure to prevent discharge of air contaminants. A second moderate NOV has been resolved. It involved the failure to get a proper permit. Due to the lack of a ground water release, this site is not considered a potential candidate cause.	
2 TIER 2 orphan	NABORS WELL SERVICES CO. - DECATUR	2273 N. HIGHWAY 287 DECATUR, TX 76234	11.8 mi W of WISETXGW10	No	This facility stores diesel fuel. Based on distance, not likely to impact water quality in Location A.	
TIER 2 orphan	WINDSTREAM DECATUR PAETEC REGEN	2425 US HWY 287 DECATUR, TX 76234	9.7 mi SW of WISETXGW10	No	This facility stores sulfuric acid. Based on distance, this site is not likely to impact water quality in Location A.	
TIER 2 orphan	WARRIOR ENERGY SERVICES CORPORATION	3271 US HWY 287 SOUTH DECATUR, TX 76234	11.9 mi W of WISETXGW10	No	This facility stores propane and diesel. Based on distance, this site is not likely to impact water resources in Location A.	
UST, Financial Assurance	DECATUR QUICK TRACK EXPRESS	1789 N HWY 287 DECATUR, TX 76234	10.7 mi SW of WISETXGW10	No	Gasoline is stored at the site. Based on distance, this site is not likely to impact water quality in Location A.	
AST	TXDOT WISE COUNTY MAINT YARD	701 HWY 81 & US 287 DECATUR, TX 76234	9.9 mi W of WISETXGW10	No	There are diesel and gasoline ASTs at this site. Based on distance, this site is not likely to impact water quality in Location A.	

Table C13 Environmental Database Review Summary, Wise County, Texas - Location A

Database	Name of Facility	Site Location	Distance from Nearest Sampling Point	Potential Candidate Cause		Ground Water Wells
				Yes/No	Justification	

Primary Source: Environmental records search report by Environmental Data Resources, Inc. (EDR)

Notes:
EDR Inquiry Number: 3589232.2s
EDR Search Radius: 3 miles
Center of Search: Lat. 33.2677000 - 33° 16' 3.72'', Long. 97.4097000 - 97° 24' 34.92''
ORPHAN SITE: A site of potential environmental interest that appear in the records search but due to incomplete location information (i.e., address and coordinates) is unmappable and not included in the records search report provided by EDR Inc.

Key:
AST = Above ground storage tank.
FRDS = Federal Reporting Data System.
mi = Mile.
NI = No infromation.
NPDES = National Pollutant Discharge Elimination System.
USGS = United States Geological Survey.

Databases:
AIRS = Aerometric Information Retrieval System Facility Subsystem
AST = Aboveground storage tank
ERNS = Emergency Response Notification System
ENF = Administrative Orders issued to Municipal Solid Waste, Petroleum Storage Tank and Multi-Media sites.Multi-Media Sites
GCC = Groundwater contamination case
LPST = Leaking petroleum storage tank
RAP = Remedial action plan
SPILLS = Spills database
TIER 2 = A listing of facilities which store or manufacture hazardous materials and submit a chemical inventory report.chemical inventory report.
UST = Underground storage tank

Table C14 Well Inventory Summary for Wise County, Texas - Location A

API Number	Texas RRC Well ID	Lateral Length	Well Type	Surface Well Longitude	Surface Well Latitude	Bottom Well Longitude	Bottom Well Latitude
4249733129	800065	0	5	-97.441252	33.233552	-97.441252	33.233553
4249720082	800067	0	8	-97.452735	33.247803	-97.452735	33.247803
42497	800068	0	5	-97.445032	33.244987	-97.445032	33.244987
42497	800069	0	5	-97.436295	33.239768	-97.436296	33.239768
4249700254	800071	0	8	-97.429683	33.229586	-97.429683	33.229587
42497	800072	0	5	-97.423281	33.235919	-97.423281	33.235919
4249733111	800073	0	8	-97.421553	33.229660	-97.421553	33.229660
42497	800074	0	5	-97.426797	33.240589	-97.426797	33.240589
4249731806	800075	0	5	-97.419873	33.242816	-97.419873	33.242816
4249731583	800076	0	8	-97.418718	33.247370	-97.418718	33.247370
4249730225	800081	0	8	-97.412476	33.229100	-97.412476	33.229100
4249730146	800082	0	5	-97.408989	33.239168	-97.408989	33.239168
4249731805	800083	0	3	-97.448275	33.240197	-97.448275	33.240197
4249731991	800084	0	3	-97.440595	33.246240	-97.440595	33.246240
42497	800085	0	3	-97.439966	33.249673	-97.439966	33.249673
42497	800086	0	3	-97.433634	33.247252	-97.433634	33.247252
42497	800087	0	3	-97.429856	33.246929	-97.429856	33.246929
42497	800088	0	3	-97.413964	33.243277	-97.413964	33.243277
4249731808	800089	0	9	-97.424217	33.229776	-97.424217	33.229776
4249731359	800093	0	3	-97.403363	33.232547	-97.403363	33.232547
4249732123	800094	0	3	-97.397269	33.243650	-97.397269	33.243650
4249731807	800239	0	5	-97.431980	33.235526	-97.431980	33.235526
4249733458	800249	0	8	-97.415923	33.235573	-97.415923	33.235573
4249733581	800255	0	5	-97.427819	33.229772	-97.427819	33.229772
42121	800298	0	3	-97.388976	33.239931	-97.388976	33.239931
4212100060	800507	0	5	-97.372670	33.242025	-97.372670	33.242025
4212130289	800569	0	5	-97.371303	33.261840	-97.371304	33.261840
4212130099	800570	0	5	-97.368949	33.268607	-97.368949	33.268607
4212130290	800571	0	5	-97.361857	33.266315	-97.361857	33.266315
4212130052	800584	0	5	-97.368732	33.290625	-97.368732	33.290625
4249730160	800835	0	5	-97.424310	33.303869	-97.424310	33.303869
4249732678	800836	0	5	-97.431908	33.303588	-97.431908	33.303588
4249730140	800837	0	5	-97.420636	33.307778	-97.420636	33.307778
4249730152	800838	0	5	-97.412806	33.308958	-97.412806	33.308958
4249732852	800839	0	8	-97.408741	33.304106	-97.408741	33.304106
4249732503	800840	0	8	-97.421774	33.299020	-97.421774	33.299020
4249730175	800841	0	8	-97.415762	33.293692	-97.415762	33.293692
4249732886	800842	0	3	-97.413067	33.300404	-97.413067	33.300404
42497	800843	0	3	-97.399767	33.305399	-97.399767	33.305399
4249730216	800862	0	5	-97.452467	33.288807	-97.452467	33.288807
42497	800863	0	3	-97.451623	33.283182	-97.451623	33.283182
42497	800864	0	5	-97.455844	33.282564	-97.455844	33.282564
4249730212	800868	0	5	-97.442955	33.292795	-97.442955	33.292795
42497	800870	0	5	-97.431908	33.303577	-97.431908	33.303577
4249730235	800872	0	5	-97.442268	33.287467	-97.442268	33.287467
42497	800873	0	5	-97.439997	33.290507	-97.439997	33.290507
4249730276	800874	0	8	-97.435807	33.286374	-97.435807	33.286374
42497	800875	0	5	-97.428035	33.300530	-97.428035	33.300530
4249732490	800876	0	3	-97.427656	33.291416	-97.427656	33.291417
4249730169	800877	0	8	-97.408141	33.282995	-97.408141	33.282995
4249730282	800878	0	8	-97.400287	33.275885	-97.400287	33.275885
4249780915	800879	0	5	-97.390764	33.298287	-97.390764	33.298287
4249732246	800880	0	5	-97.390431	33.292265	-97.390431	33.292265
4249730239	800881	0	8	-97.435962	33.282978	-97.435962	33.282978
4249730231	800882	0	8	-97.440425	33.278060	-97.440425	33.278060
4249700612	800900	0	8	-97.461095	33.265748	-97.461095	33.265748
4249700611	800902	0	8	-97.453829	33.251498	-97.453829	33.251498
4249732549	800903	0	9	-97.454616	33.268484	-97.454616	33.268484
4249732268	800904	0	8	-97.448278	33.270722	-97.448279	33.270722
4249732578	800905	0	5	-97.449122	33.275530	-97.449122	33.275530
4249732597	800906	0	5	-97.448880	33.251971	-97.448880	33.251971
42497	800907	0	5	-97.444325	33.262968	-97.444325	33.262969
42497	800908	0	5	-97.441145	33.267555	-97.441145	33.267555
42497	800909	0	5	-97.430059	33.257920	-97.430060	33.257920
4249732437	800910	0	8	-97.429652	33.252191	-97.429652	33.252191
4249731864	800911	0	5	-97.424863	33.256201	-97.424863	33.256201
42497	800912	0	2	-97.446846	33.258195	-97.446846	33.258195
4249731865	800913	0	5	-97.432906	33.261986	-97.432906	33.261986
4249731469	800914	0	9	-97.449959	33.251002	-97.449959	33.251002
4249731990	800915	0	3	-97.427131	33.259121	-97.427131	33.259121
42497	800916	0	3	-97.446134	33.258775	-97.446134	33.258775
4249732626	800917	0	5	-97.430371	33.273316	-97.430371	33.273316
4249731468	800918	0	9	-97.431448	33.273779	-97.431448	33.273779
4249731782	800919	0	5	-97.422173	33.253202	-97.422173	33.253202
4249731717	800920	0	8	-97.402181	33.268059	-97.402181	33.268059
4249730328	800921	0	8	-97.412611	33.273830	-97.412611	33.273830
4249732284	800922	0	5	-97.415802	33.252099	-97.415802	33.252099
42497	800923	0	3	-97.416002	33.261716	-97.416002	33.261716
4249732122	800924	0	3	-97.406208	33.256072	-97.406208	33.256072
42497	800925	0	3	-97.396985	33.252175	-97.396985	33.252175
42497	800926	0	3	-97.391601	33.257185	-97.391601	33.257185
4249732462	800931	0	8	-97.438085	33.265012	-97.438085	33.265012
4249733577	800935	0	5	-97.454526	33.268509	-97.454526	33.268509
4249733703	800936	0	5	-97.459067	33.271951	-97.459067	33.271951
4249733725	800938	0	5	-97.459721	33.264789	-97.459721	33.264789
4212130123	800940	0	5	-97.383191	33.272480	-97.383191	33.272481
4212130060	800941	0	5	-97.375980	33.285933	-97.375980	33.285933
4212130050	800942	0	5	-97.375725	33.292192	-97.375725	33.292192
4212130073	800943	0	8	-97.375653	33.295843	-97.375653	33.295843
42121	800944	0	3	-97.376786	33.277083	-97.376786	33.277083
4249734025	800952	0	5	-97.410383	33.264326	-97.410383	33.264326
4249734222	800956	0	5	-97.433701	33.278462	-97.433701	33.278462

Table C14 Well Inventory Summary for Wise County, Texas - Location A

API Number	Texas RRC Well ID	Lateral Length	Well Type	Surface Well Longitude	Surface Well Latitude	Bottom Well Longitude	Bottom Well Latitude
4249734221	800957	0	5	-97.422118	33.270650	-97.422118	33.270650
4249734274	800958	0	5	-97.447961	33.269046	-97.447961	33.269046
4249734295	800960	0	5	-97.422378	33.276138	-97.422378	33.276138
4249734313	800962	0	3	-97.434489	33.291333	-97.434489	33.291333
4249734315	800963	0	5	-97.434536	33.291333	-97.434536	33.291333
4249734278	800964	0	5	-97.428650	33.286316	-97.428650	33.286316
4249734337	800965	0	5	-97.415607	33.281943	-97.415607	33.281943
4249734338	800966	0	5	-97.427121	33.281027	-97.427121	33.281027
4249734398	800967	0	5	-97.430641	33.267396	-97.430641	33.267396
4249734444	800970	0	5	-97.438233	33.274474	-97.438233	33.274475
4249734462	800971	0	5	-97.399450	33.264138	-97.399450	33.264138
4249734479	1051018	0	5	-97.426101	33.262924	-97.426101	33.262924
4249734482	1051157	0	5	-97.431284	33.256626	-97.431284	33.256626
4249734487	1052349	0	5	-97.438434	33.257302	-97.438434	33.257302
4249734498	1053008	0	5	-97.391521	33.268595	-97.391521	33.268595
4249734524	1055295	0	2	-97.411947	33.269919	-97.411947	33.269919
4249734565	1061474	0	5	-97.389785	33.285834	-97.389785	33.285834
4212130827	1061475	0	5	-97.380271	33.259188	-97.380271	33.259188
4249734602	1064419	0	8	-97.411011	33.274173	-97.411011	33.274173
4212130905	1065732	0	5	-97.388841	33.255158	-97.388841	33.255158
4249734619	1065790	0	5	-97.416866	33.279072	-97.416866	33.279072
4249734618	1065791	0	8	-97.418890	33.282112	-97.418890	33.282112
4249734644	1067426	0	5	-97.397287	33.229776	-97.397287	33.229776
4212130936	1067464	0	5	-97.359584	33.278623	-97.359584	33.278623
4249734650	1067727	0	5	-97.411063	33.290389	-97.411063	33.290389
4249734659	1068207	0	5	-97.406894	33.258684	-97.406894	33.258684
4212130957	1068363	0	5	-97.361579	33.264381	-97.361579	33.264381
4249734681	1069474	0	5	-97.407507	33.256817	-97.407507	33.256817
4212131012	1070509	0	5	-97.369597	33.256050	-97.369597	33.256050
4249734699	1070981	0	2	-97.444406	33.261593	-97.444406	33.261593
4249734702	1071504	0	5	-97.397697	33.235790	-97.397697	33.235790
4249734707	1071908	0	5	-97.395625	33.238945	-97.395625	33.238945
4212131051	1072142	0	5	-97.389433	33.232802	-97.389433	33.232802
4249734736	1073509	0	5	-97.420302	33.300091	-97.420302	33.300091
4249734752	1074470	0	5	-97.413343	33.248767	-97.413343	33.248767
4212131174	1075069	0	5	-97.387915	33.249370	-97.387915	33.249370
4212131186	1075383	0	5	-97.388240	33.258998	-97.388240	33.258998
4212131188	1075409	0	5	-97.363950	33.261753	-97.363950	33.261753
4249734791	1075851	0	5	-97.392702	33.235696	-97.392702	33.235696
4249734801	1076030	0	5	-97.399444	33.256777	-97.399444	33.256777
4249734802	1076052	0	5	-97.400663	33.231491	-97.400663	33.231491
4249734808	1076142	0	5	-97.403965	33.233043	-97.403965	33.233043
4212131220	1076174	0	5	-97.371878	33.278885	-97.371878	33.278885
4212131236	1076363	0	5	-97.371786	33.284434	-97.371786	33.284434
4249734816	1076465	0	8	-97.428012	33.280945	-97.428012	33.280945
4249734819	1076742	0	5	-97.401786	33.236592	-97.401786	33.236592
4212131265	1076796	0	5	-97.359283	33.268537	-97.359283	33.268537
4212131292	1077105	0	5	-97.383698	33.232715	-97.383698	33.232715
4212131283	1077148	0	5	-97.367350	33.278473	-97.367350	33.278473
4212131297	1077241	0	5	-97.365579	33.267791	-97.365579	33.267791
4212131342	1077820	0	5	-97.374644	33.262611	-97.374644	33.262611
4212131422	1079374	0	5	-97.389772	33.229342	-97.389772	33.229342
4249734902	1079823	0	5	-97.400777	33.258632	-97.400777	33.258632
4249734909	1080105	0	2	-97.431632	33.229181	-97.431632	33.229181
4249734918	1080400	0	5	-97.392848	33.250521	-97.392848	33.250521
4212131510	1080890	0	5	-97.362480	33.278836	-97.362480	33.278836
4212131530	1081418	0	5	-97.363992	33.284315	-97.363992	33.284315
4212131529	1081419	0	5	-97.367263	33.284361	-97.367263	33.284361
4212131533	1081621	0	5	-97.374629	33.259127	-97.374629	33.259127
4249734968	1082049	0	5	-97.397846	33.242616	-97.397846	33.242616
4249734969	1082057	0	5	-97.394964	33.255877	-97.394964	33.255877
4212131557	1082260	0	5	-97.382138	33.261626	-97.382138	33.261626
4249734995	1082638	0	5	-97.391867	33.261268	-97.391867	33.261268
4212131568	1082784	0	5	-97.383580	33.258261	-97.383580	33.258261
4212131581	1083288	0	5	-97.386714	33.261768	-97.386714	33.261768
4249735025	1083421	0	5	-97.402320	33.251775	-97.402320	33.251775
4249735026	1083422	0	5	-97.394417	33.253161	-97.394417	33.253161
4249735043	1084422	0	5	-97.394893	33.258487	-97.394893	33.258487
4249735049	1084882	0	5	-97.404682	33.255818	-97.404682	33.255818
4249735051	1085048	0	3	-97.406407	33.250872	-97.406407	33.250872
4212131640	1085150	0	5	-97.378083	33.261390	-97.378083	33.261390
4249735074	1085591	0	5	-97.395021	33.262268	-97.395021	33.262268
4249735084	1085895	0	5	-97.403130	33.243167	-97.403130	33.243167
4249735096	1086085	0	5	-97.400079	33.254139	-97.400079	33.254139
4212131699	1086594	0	3	-97.386439	33.304163	-97.386439	33.304163
4212131764	1088507	0	5	-97.366587	33.261789	-97.366587	33.261789
4212131790	1089678	0	5	-97.380090	33.239122	-97.380090	33.239122
4212131788	1089679	0	5	-97.379335	33.237039	-97.379335	33.237039
4212131783	1089683	0	5	-97.373972	33.236896	-97.373972	33.236896
4212131812	1089908	0	5	-97.376515	33.238118	-97.376515	33.238118
4212131893	1091850	0	5	-97.370746	33.250343	-97.370746	33.250343
4212131895	1091878	0	5	-97.368812	33.249524	-97.368812	33.249524
4212131896	1091879	0	5	-97.367119	33.248391	-97.367119	33.248391
4249735254	1092018	0	5	-97.407958	33.224936	-97.407958	33.224936
4212131908	1092287	0	5	-97.370137	33.240684	-97.370137	33.240684
4212131951	1093300	0	5	-97.364148	33.249460	-97.364148	33.249460
4249735305	1094312	0	5	-97.395935	33.271562	-97.395935	33.271562
4212132011	1095348	0	5	-97.373916	33.241309	-97.373916	33.241309
4249735326	1095524	0	5	-97.413582	33.243162	-97.413582	33.243162
4212132075	1096842	0	5	-97.373858	33.251522	-97.373858	33.251522
4212132104	1097406	0	5	-97.376087	33.255787	-97.376087	33.255787
4212132119H1	1097967	2280	86	-97.389873	33.238340	-97.383059	33.235797

Table C14 Well Inventory Summary for Wise County, Texas - Location A

API Number	Texas RRC Well ID	Lateral Length	Well Type	Surface Well Longitude	Surface Well Latitude	Bottom Well Longitude	Bottom Well Latitude
4249735422	1098461	0	5	-97.392821	33.238357	-97.392821	33.238357
4249735537H1	1098945	0	5	0.000000	0.000000	-97.400238	33.250163
4212132172	1099694	0	5	-97.364177	33.252188	-97.364177	33.252188
4212132171	1099695	0	5	-97.359499	33.256693	-97.359499	33.256693
4212132170	1099696	0	5	-97.365592	33.253785	-97.365592	33.253785
4249735462	1100090	0	5	-97.398446	33.272139	-97.398446	33.272139
4249735490D1	1100624	3603	87	-97.393201	33.263499	-97.401044	33.270891
4249735497D1	1101008	462	87	-97.398371	33.272189	-97.399322	33.273178
4249735523	1101858	0	5	-97.393720	33.231869	-97.393720	33.231869
4249735532H1	1102137	2923	86	-97.397274	33.227603	-97.391538	33.221176
4249735533D1	1102229	143	87	-97.392282	33.277325	-97.392441	33.276956
4249735534	1102255	0	5	-97.447161	33.269497	-97.447161	33.269497
	1102324	2559	86	-97.392446	33.247594	0.000000	0.000000
4249735542D1	1102746	1191	87	-97.403913	33.226140	-97.407478	33.227460
4249735550	1103176	0	5	-97.440415	33.250245	-97.440415	33.250245
4249735590H1	1105228	3023	86	-97.400525	33.240430	-97.408487	33.235505
4212132333	1106843	0	5	-97.372911	33.244509	-97.372911	33.244509
4212132342	1107105	0	5	-97.372078	33.247281	-97.372078	33.247281
4249735630H1	1107663	3529	86	-97.454013	33.251597	-97.461849	33.258719
4249731837	1108526	0	9	-97.415771	33.235777	-97.415771	33.235777
4249735665H1	1110073	3101	86	-97.428224	33.280816	-97.435768	33.286516
4249735725H1	1113612	2010	86	-97.392335	33.277399	-97.397075	33.281230
4212132475	1114605	0	5	-97.380113	33.250864	-97.380113	33.250864
4212132476	1114606	0	5	-97.383109	33.256103	-97.383109	33.256103
4249735755	1115417	0	2	-97.407833	33.251200	-97.407833	33.251200
4212132527	1116829	0	5	-97.365217	33.244939	-97.365217	33.244939
4249735811	1119568	0	5	-97.400443	33.226880	-97.400443	33.226880
4249735819H1	1120665	3646	86	-97.428113	33.280949	-97.420581	33.273176
4249735872H1	1124215	3443	86	-97.424970	33.281801	-97.416275	33.275782
4249735885	1125162	0	5	-97.413365	33.224179	-97.413365	33.224179
4212132688H1	1127503	2839	86	-97.355203	33.256080	-97.361102	33.262106
4249735916H1	1128900	3482	86	-97.424902	33.281707	-97.433665	33.287823
4249735923H1	1129541	3019	86	-97.422001	33.270677	-97.414835	33.264967
4249735924H1	1129581	3605	86	-97.436115	33.283543	-97.427954	33.276389
4249735926H1	1129787	2932	86	-97.441789	33.260389	-97.450925	33.262847
4249735927H1	1129889	2906	86	-97.428808	33.301605	-97.422014	33.296015
4212132720	1130054	0	5	-97.369115	33.244431	-97.369115	33.244431
4249735938H1	1131196	3639	86	-97.407177	33.266566	-97.398296	33.259904
4249735998	1136326	0	2	-97.405929	33.250526	-97.405929	33.250526
4212132859D1	1139456	126	87	-97.378199	33.234785	-97.377842	33.234956
4212132864D1	1139915	531	87	-97.378253	33.234813	-97.379895	33.234337
4249736070H1	1141860	3175	86	-97.437781	33.244936	-97.429456	33.239718
4249736086	1142952	0	5	-97.400872	33.224697	-97.400872	33.224697
4212132927H1	1143894	2359	86	-97.368133	33.264718	-97.373781	33.269137
4249736100	1143958	0	5	-97.440006	33.247199	-97.440006	33.247199
4249736120H1	1145389	4404	86	-97.403252	33.219612	-97.412259	33.229056
4249736286H1	1158546	3336	86	-97.400287	33.225939	-97.407380	33.232905
4212133276	1167197	0	5	-97.366546	33.255674	-97.366546	33.255674
4212133277	1167203	0	5	-97.370958	33.259351	-97.370958	33.259351
4249736529H1	1176936	2773	86	-97.402185	33.242736	-97.408086	33.248525
4212133435	1177233	0	5	-97.366958	33.259305	-97.366958	33.259305
4212133447	1177536	0	5	-97.370951	33.262757	-97.370951	33.262757
4249736546H1	1178272	2869	86	-97.402242	33.242707	-97.410068	33.247057
4249736633H1	1186055	4618	86	-97.399849	33.221055	-97.409311	33.230947
4249736649H1	1186620	2800	86	-97.400143	33.274478	-97.404763	33.281125
4249736658H1	1187039	3202	86	-97.400190	33.274399	-97.407625	33.280601
4249736659H1	1187040	3024	86	-97.400272	33.274339	-97.409012	33.278233
4212133618H1	1187237	4040	86	-97.359532	33.287168	-97.371222	33.292354
4249736683H1	1188102	4109	86	-97.415186	33.278335	-97.408082	33.268745
4249736686H1	1188198	3849	86	-97.415111	33.278385	-97.405107	33.271955
4249736689H1	1188325	2674	86	-97.413906	33.243524	-97.408056	33.238059
4249736690H1	1188350	2833	86	-97.413872	33.243614	-97.406062	33.239425
4249736693H1	1188677	3459	86	-97.400048	33.274515	-97.406039	33.282583
4249736789H1	1192616	2901	86	-97.461545	33.266807	-97.453427	33.262676
4249736816H1	1194783	3378	86	-97.431997	33.271820	-97.440787	33.277448
4249736822H1	1195048	3209	86	-97.432042	33.271805	-97.440845	33.276612
4249736823H1	1195050	3074	86	-97.432147	33.271859	-97.440889	33.276037
4249735542DW	1195051	0	2	0.000000	0.000000	-97.403913	33.226140
4249735542H1	1195052	1522	2	0.000000	0.000000	-97.408431	33.227894
4249736838H1	1195557	2908	86	-97.432078	33.271587	-97.440854	33.274675
4249736887H1	1198016	3343	86	-97.432346	33.290721	-97.424960	33.283941
4249736891H1	1198270	2018	86	-97.432248	33.290782	-97.427007	33.287408
4249736892H1	1198413	3410	86	-97.407973	33.267997	-97.416339	33.274200
4249736907H1	1199289	2877	86	-97.436524	33.287502	-97.430616	33.281346
4249736908H1	1199292	2865	86	-97.436013	33.287177	-97.428654	33.282298
4249736915H1	1199467	3576	86	-97.411078	33.265999	-97.418196	33.273801
4249736916H1	1199473	2574	86	-97.411102	33.265918	-97.417579	33.270440
4249736948H1	1201091	2737	86	-97.424415	33.279933	-97.419332	33.273740
4249736949H1	1201136	3001	86	-97.424617	33.279989	-97.417561	33.274250
4212133928	1205883	0	5	-97.376933	33.246934	-97.376933	33.246934
4249737031H1	1206931	3854	86	-97.431994	33.271671	-97.439809	33.279984
4249737034H1	1207233	2780	86	-97.431987	33.271614	-97.440747	33.273675
4249737071H1	1209733	3408	86	-97.417230	33.255866	-97.407344	33.251534
4249737074H1	1209764	3374	86	-97.416931	33.255910	-97.406858	33.252119
4249737107H1	1211371	4228	86	-97.418792	33.246306	-97.430763	33.252127
4249737111H1	1211540	3419	86	-97.418790	33.246210	-97.427297	33.252311

Table C14 Well Inventory Summary for Wise County, Texas - Location A

API Number	Texas RRC Well ID	Lateral Length	Well Type	Surface Well Longitude	Surface Well Latitude	Bottom Well Longitude	Bottom Well Latitude
4249737119H1	1212575	3000	86	-97.425818	33.246081	-97.433434	33.251281
4249737120H1	1212840	3604	86	-97.425727	33.246453	-97.436533	33.250416
4249737154H1	1215602	2861	86	-97.418667	33.256384	-97.423599	33.263069
4249737161H1	1215975	3193	86	-97.418729	33.256367	-97.425499	33.263051
4249737162H1	1215990	4006	86	-97.393813	33.262940	-97.405618	33.267724
4249737163H1	1216002	3791	86	-97.393801	33.262899	-97.402718	33.270143
4249737164H1	1216054	3849	86	-97.393824	33.262935	-97.404255	33.268862
4212134110H1	1219454	3553	86	-97.361673	33.286108	-97.372312	33.290046
	1220477	4929	0	0.000000	0.000000	0.000000	0.000000
	1220627	3892	0	0.000000	0.000000	0.000000	0.000000
	1220645	4907	0	0.000000	0.000000	0.000000	0.000000
	1220799	3542	0	0.000000	0.000000	0.000000	0.000000
4249737228H1	1223659	3544	86	-97.443470	33.267282	-97.451977	33.273903
4212134129H1	1224380	4077	86	-97.374110	33.299728	-97.387170	33.302029
4212134131H1	1224961	5388	86	-97.375013	33.281948	-97.386232	33.293372
4212134132H1	1224964	4741	86	-97.375013	33.281907	-97.386197	33.290938
4212134133H1	1224965	4932	86	-97.375014	33.281866	-97.384368	33.292912
4212134134H1	1224966	5442	86	-97.375015	33.281825	-97.387949	33.292106
4212134153H1	1225728	5500	86	-97.375015	33.281783	-97.389121	33.291175
4212134187H1	1229740	4345	86	-97.373847	33.295389	-97.387264	33.299347
4212134188H1	1229741	4146	86	-97.373847	33.295306	-97.387344	33.296467
4212134208	1234119	0	5	-97.373875	33.252996	-97.373875	33.252996
	1244495	4868	0	0.000000	0.000000	0.000000	0.000000
4212134271H1	1247726	5349	86	-97.381717	33.276903	-97.389885	33.289905
4212134273H1	1247860	5346	86	-97.381664	33.276901	-97.391256	33.289188
4212134274H1	1247861	5266	86	-97.381730	33.276904	-97.392494	33.288208
4249737504H1	1252301	2746	86	-97.406425	33.257413	-97.399074	33.253076
4249737505H1	1252406	2677	86	-97.406417	33.257373	-97.400121	33.252258
4249737506H1	1252472	2681	86	-97.406409	33.257332	-97.401497	33.251226
4212134346H1	1262906	5670	86	-97.387763	33.273047	-97.372278	33.264466
4212134347H1	1262934	5375	86	-97.387777	33.273008	-97.373424	33.264472
4212134348H1	1263049	5056	86	-97.387791	33.272968	-97.374690	33.264484
4212134356H1	1264111	4805	86	-97.387805	33.272929	-97.375717	33.264484
4212134357H1	1264159	4532	86	-97.387935	33.272891	-97.376981	33.264495

Well Type Legend

2	Permitted Location
3	Dry Hole
5	Gas Well
8	Plugged Gas Well
9	Canceled Location
86	Horizontal Drainhole
87	Sidetrack Well Surface Location

Table C15 Number of Oil and Gas Wells in Wise County Texas - Location A

Search Area Name	Search Area Radius (miles)	EPA Samples	Total Number of Oil and Gas Wells	Oil and Gas Wells within 1 Mile of EPA Sample Points
Location A	3	WISETXGW09 WISETXGW10 WISETXGW11 WISETXGW12 WISETXSW01 WISETXSW02 WISETXSW03	304	62

Table C16 Impoundments within 1 Mile of EPA Samples, Wise County, Texas - Location A

EPA Sample	Approximate Distance from EPA Sample to Nearest Well Pad and API Number	No. of Wells within 1 Mile of the EPA Sample	No. of Impoundments within 1 Mile of the EPA sample	Approximate Distance from EPA Sample to the Nearest Impoundment	Date of Google Earth Aerial Imagery showing Impoundment Nearest to EPA Sample
WISETXGW09	0.11 miles SSE 49736892	41	0	1.6 miles SE	6/11 – 4/13
WISETXGW10	0.2 miles NE 49734025	38	0	1.5 miles SE	6/11 – 4/13
WISETXGW11	0.17 miles SW 49734525	35	0	1.6 miles SE	6/11 – 4/13
WISETXGW12	0.8 miles SE 49736916	40	0	1.7 miles ESE	6/11 – 4/13
WISETXSW01	0.4 NE 49736892	41	0	1.5 miles ESE	6/11 – 4/13
WISETXSW02	0.4 NE 49736892	41	0	1.5 miles ESE	6/11 – 4/13
WISETXSW03	0.9 miles NE 49736892	41	0	1.6 miles ESE	6/11 – 4/13

Table C17 Environmental Database Review Summary, Wise County, Texas - Location B

Database	Name of Facility	Site Location and Address	Distance from Nearest Sample	Potential Candidate Cause Yes/No	Potential Candidate Cause Justification	Groundwater Wells
ENF, FINDS, RCRA-CESQG	COFFMAN TANK TRUCKS INC.	105 BROOKVIEW DR DECATUR, TX 76234	2.80 mi NE of WISETXGW15	No	Record is for a transporter of hazardous waste. One enforcement action taken against the company for failing to prevent transportation of solid municipal waste to an unauthorized location. Registered as a conditionally exempt small quantity generator. Not a likely contributor of chlorides.	1 Federal USGS Well 189 State Wells
CLI	OLD DECATUR SITE	1 MI SW OF HWY 28/HWY 380 JCT WISE, TX	0.45 mi NE of WISETXGW15	Yes	Historic landfill closed in 1972. Landfills can impact water quality over large areas and release a variety of contaminants.	
CLI	Landfill	2.5 mi W of City Square DECATUR, TX 76234	2.34 mi NNW of WISETXGW05	No	Active landfill with potential contaminants that could affect GW quality. However, based on distance it is not likely to impact at site.	
LPST, UST	CIRCLE S 5	1510 S FM 51 DECATUR, TX 76234	2.78 mi NE of WISETXGW15	No	This site had a UST containing gasoline. Based on distance, any potential contaminants not likely to impact site. Final concurrance issued for the site.	
FINDS, UST, EDR US Historical Auto Stat	TIMEOUT CHEVRON	2806 S FM 51 DECATUR, TX 76234	1.23 mi NE of WISETXGW15	Yes	This site had a UST containing gasoline. Old USTs were often built using single wall design and commonly leaked impacting groundwater.	
UST, AST	J E HAYNES CONSTRUCTION	2112 PRESKITT RD DECATUR, TX 76234	1.52 mi NE of WISETXGW05	Yes	This site had a AST and UST containing diesel. Old USTs were often built using single wall design and commonly leaked impacting groundwater.	
AST, FINDS, TIER 2	WISE REGIONAL HEALTH SYSTEM	609 MEDICAL CENTER DR DECATUR, TX 76234	2.15 mi NE of WISETXGW15	No	This site had an AST containing diesel. Leaks of diesel are not likely to have impacts on Location B groundwater at this distance.	
FINDS	FRENCH JE UNIT 1BH	100 CR 3170 DECATUR, TX 76234	0.40 mi NE of WISETXGW16	No	The site is reported as "Criteria and Hazardous Air Pollutant Inventory" on the FINDS database. No reported or likely impacts to groundwater.	
FINDS	FINA FOOD MART	2801 S FM 51 DECATUR, TX 76234	1.23 mi NE of WISETXGW15	No	The database indicates that TCEQ provides regulation for this facility but is not specified. This is likely a Food store and not a likely source of groundwater contamination.	
FINDS	TOWN & COUNTRY MHP	3500 S MURVIL ST DECATUR, TX 76234	1.40 mi NE of WISETXGW15	No	The database indicates that TCEQ provides some regulation for this facility but it is not specified. Record is for a hospital. Not a likely source for groundwater contamination.	
FINDS	DECATUR HOSPITAL CAMPUS	2000 S FM 51 DECATUR, TX 76234	2.15 mi NE of WISETXGW15	No	The database indicates that TCEQ provides regulation for this facility but is not specified. Record is for a hospital. Not a likely source for groundwater contamination.	
FINDS, drycleaners	DRY CLEAN SUPER CENTER	1801 S FM 51 DECATUR, TX 76234	2.40 mi NE of WISETXGW15	No	The database indicates that TCEQ provides regulation for this facility but is not specified. Record is for a dry cleaner. No indication of a release.	
2 FINDS	DECATUR MIDDLE	1200 W EAGLE DR DECATUR, TX 76234	2.58 mi NE of WISETXGW04	No	Record is for National Center for Education Statistics and US Geographic Names Information Systems. No indication of a contaminant source.	
FINDS	DECATUR MIDDLE	1201 WEST THOMPSON ST DECATUR, TX 76234	2.76 mi NE of WISETXGW04	No	Record is for National Center for Education Stattistics. No inciation of a contaminant source.	
FINDS	RANN ELEMENTARY	1300 DEER PARK RD DECATUR, TX 76234	2.80 mi NE of WISETXGW04	No	Record is for National Center for Education Stattistics. No inciation of a contaminant source.	
ENF	DECATUR WASTE WATER TREATMENT	300 BENNETT RD DECATUR, TX 76234	2.77 mi NE of WISETXGW15	No	This site is a waste water treatment facility. Record indicates that it failed to meet the requirements of the "No Exposure Certification" because the facility had almost the entire operation exposed to stormwater. Although un-permitted release(s) may have occured at this site to surface water. Becauseof the distance of the site from sample location it is unlikely to be a source of contamination.	
ERNS, 3 TIER 2	WISE REGIONAL HEALTH SYSTEM	2000 S. FM 51 DECATUR, TX 76234	2.15 mi NE of WISETXGW15	No	Diesel fuel was stored at this site. No indication of a release. Distance from sample loccations makes this an unlikely source of contamination for study area.	
EDR US Historical Auto Stat	NOT REPORTED	3585 S FM 51 DECATUR, TX 76234	0.31 mi NE of WISETXGW16	Yes	A historic automotive site has potential for unreported releases.	
EDR US Historical Auto Stat	NOT REPORTED	3100 S LIPSEY ST DECATUR, TX 76234	1.70 mi NE of WISETXGW15	No	A historic automotive site has potential for unreported releases. Distance from sample locations makes groundwater contamination in study area unlikely.	
TIER 2 orphan	RYDER SCOTT MANAGEMENT, LLC -WAGGONER-WALKER # 2	OLD DENTON HWY DECATUR, TX 76234	>4 mi NE of WISETXGW15	No	Tier 2 sites are facilities which store or manufacture hazardous materials and submit a chemical inventory report. Chemical type(s) not specified. No indication of a release.	
TIER 2 orphan	DECATUR S & G PLANT 1205	4798 US HWY 380 DECATUR, TX 76234	3.85 mi NW of WISETXGW04	No	Tier 2 sites are facilities which store or manufacture hazardous materials and submit a chemical inventory report. Chemical type(s) not specified. No indication of a release.	
TIER 2 orphan	SPS DECATUR	2379 N HWY 287 DECATUR, TX 76234	5.3 mi N of WISETXGW04	No	Tier 2 sites are facilities which store or manufacture hazardous materials and submit a chemical inventory report. Chemical type(s) not specified. No indication of a release.	
4 TIER 2 orphan	TARGA MIDSTREAM SERVICES LLC "DECATUR STATION"	HIGHWAY 287 DECATUR, TX 76234	>3.0 mi NE of WISETXGW04	No	Natural gas liquids were stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
TIER 2 orphan	TXI - PARADISE SAND & GRAVEL	1795 S HWY 114 PARADISE, TX 76073	Approximately 5.0 mi W of WISETXGW14	No	Gasoline and diesel fuel were stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
2 TIER 2 orphan	AT&T COMMUNICATIONS OF TEXAS - TX6462	17889 HWY 380 EAST DECATUR, TX 76234	Approximately 3.5 mi NNE of WISETXGW04	No	Lead and sulfuric acid were stored at this site. No indication of a release. Because of distance to sample locations, this site is not considered a potential candidate source.	
TIER 2 orphan	CITY OF RUNAWAY BAY	855 US HWY 380W RUNAWAY BAY, TX 76426	Approximately 13 mi W of WISETXGW14	No	Tier 2 sites are facilities which store or manufacture hazardous materials and submit a chemical inventory report. Chemical type(s) not specified. Because of distance to sample locations, this site is not considered a potential candidate source.	
2 TIER 2 orphan	FOSTER #1 LEASE	HIGHWAY 380 DECATUR, TX 76234	>3.0 mi NE of WISETXGW04	No	Petroleum products were stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
2 TIER 2 orphan	LOWE'S OF DECATUR, TX (STORE # 2235)	1201 WEST US HIGHWAY 380 BUSINESS DECATUR, TX 76234	Approximately 3 mi NE of WISETXGW04	No	Diesel fuel was stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
TIER 2 orphan	NOV BRANDT BRIDGEPORT (5756 US HWY 380)	5756 US HWY 380 BRIDGEPORT, TX 76426	Approximately 7 mi W of WISETXGW14	No	Facility is a provider of major mechanichal components for drilling rigs. Tier 2 sites are facilities which store or manufacture hazardous materials and submit a chemical inventory report. Because of distance to sample locations, this site is not considered a potential candidate source.	
TIER 2 orphan	TXI BRIDGEPORT STONE	1795 S HIGHWAY 101 BRIDGEPORT, TX 76426	10 mi WNW of WISETXGW04	No	Calcium carbonate, propane, gasoline, and diesel fuel were stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
TIER 2 orphan	0902 WISE COUNTY	3188 E HWY 380 DECATUR, TX 76234	3.28 mi NNW of WISETXGW04	No	Concrete and petroleum products were stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	

Table C17 Environmental Database Review Summary, Wise County, Texas - Location B

Database	Name of Facility	Site Location and Address	Distance from Nearest Sample	Potential Candidate Cause Yes/No	Potential Candidate Cause Justification	Groundwater Wells
2 TIER 2 orphan	CITY OF RUNAWAY BAY WATER TREATMENT	855 US HWY 380 W RUNAWAY BAY, 76426	14 mi W of WISETXGW14	No	Chlorine was stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
3 TIER 2 orphan	NABORS WELL SERVICES LTD.	223 N. HIGHWAY 287 DECATUR, TX 76234	3.45 mi NE of WISETXGW04	No	Diesel fuel was stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
LPST, GCC orphan	S & J OIL COMPANY INC	1000 S BUSINESS HWY 287 DECATUR, TX 76234	4.0 mi NE of WISETXGW04	No	Petroleum products were stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
ENF orphan	COLE ROBERTS 1H & 2H GAS WELL SITE	WEST OF HIGHWAY FM 730 ON COUNTY ROAD 265 DECATUR, TX 76234	>4.0 mi. NE of WISETXGW04	No	Nuisance odors associated with crude petroleum and natural gas drilling activities have been associated with this site. No record of a release or brine contaminants.	
TIER 2 orphan	SANDFORD PETROLEUM, INC.	206 US HWY 380 BRIDGEPORT, TX 76426	>2.8 mi N of WISETXGW04	No	Crude oil was stored at this site. No indication of a release.	
TIER 2 orphan	WINDSTREAM DECATUR PAETEC REGEN	2425 US HWY 287 DECATUR, TX 76234	5.36 mi N of WISETXGW04	No	Sulfuric acid was stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
TIER 2 orphan	PARADISE PLANT 1390	2939 W. HWY 114 PARADISE, TX 76073	4.4 mi SW of WISETXGW14	No	Diesel fuel was stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
TIER 2 orphan	WARRIOR ENERGY SERVICES CORPORATION DECATUR, TX	3271 US HWY 287 SOUTH DECATUR, TX 76234	15 mi NNW of WISETXGW04	No	Propane, nitrogen, and diesel fuel were stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
LPST, UST orphan	LEON MARTIN INC ESTATE	HWY 380 E OF BRIDGEPORT BRDIGEPORT, TX 76026	>2.8 mi N of WISETXGW04	No	Petroleum products were stored at this site. Tanks removed in 1990, minor soil contamination encountered, no RAP required, Additionally, because of distance to sample locations, this site is not considered a potential candidate source.	
UST, Financial Assurance orphan	DECATUR QUICK TRACK EXPRESS	1789 N HWY 287 DECATUR, TX 76234	3.0 mi NE of WISETXGW04	No	Petroleum products were stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
AST, UST orphan	WISE COUNTY PRECINCT 1	N HWY 51 AND US 380 DECATUR, TX 76234	4.8 mi NE of WISETXGW04	No	Diesel fuel was stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
AST orphan	TXDOT WISE COUNTY MAINT YARD	701 HWY 81 & US 287 DECATUR, TX 76234	3.7 mi NNE of WISETXGW04	No	Gasoline was stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
UST orphan	MCCOMIS OILFIELD SERVICES	HWY 114 BRIDGEPORT, TX 76426	4..4 mi SW of WISETXGW14	No	Petroleum products were stored at this site. Petroleum is not a contaminant of concern for the EPA study area.	
UST orphan	WISE COUNTY PRECT BARN 4	E HWY 380 BRIDGEPORT, TX 76426	>3.0 mi NE of WISETXGW04	No	Petroleum products were stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
UST, AST orphan	DRY CREEK DISTRIBUTING STORAGE	HWY 380 BRIDGEPORT, TX 76426	>3.0 mi NE of WISETXGW04	No	Petroleum products were stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	

Primary Source: Environmental records search report by Environmental Data Resources, Inc. (EDR)

Notes:

EDR Inquiry Number: 3589232.9s
EDR Search Radius: 3 miles
Center of Search: Lat. 33.1858000 - 33° 11' 8.88'', Long. 97.6261000 - 97° 37' 33.96''

ORPHAN SITE: A site of potential environmental interest that appear in the records search but due to incomplete location information (i.e., address and coordinates) is unmappable and not included in the records search report provided by EDR Inc.

Key:

AST = Above ground storage tank.
FRDS = Federal Reporting Data System.
mi = Mile.
NI = No infromation.
NPDES = National Pollutant Discharge Elimination System.
USGS = United States Geological Survey.

Databases:

CLI = Closed Landfill Inventory
CESQG = Conditionally Exempt Small Quantity Generators
DRYCLEANERS = Drycleaner Registration Database Listing
EDR = Environmental Data Resources
ENF = Administrative Orders issued to Municipal Solid Waste, Petroleum Storage Tank and Multi-Media sites.Multi-Media Sites
ERNS = Emergency Response Notification System
FINDS = Facility Index System
GCC = Groundwater contamination case
LPST = Leaking Petroleum Storage Tank
RCRA = Resource Conservation and Recovery Act
TIER 2 =A listing of facilities which store or manufacture hazardous materials and submit a chemical inventory report.chemical inventory report.
UST = Underground Storage Tank

Table C18 Well Inventory Summary for Wise County, Texas - Location B

API Number	Texas RRC Well ID	Lateral Length	Well Type	Surface Well Longitude	Surface Well Latitude	Bottom Well Longitude	Bottom Well Latitude
4249701857	802837	0	5	-97.648439	33.213372	-97.648439	33.213372
4249731556	802838	0	5	-97.644964	33.220830	-97.644964	33.220830
4249701696	802840	0	5	-97.635226	33.225924	-97.635226	33.225924
4249701705	802841	0	5	-97.625979	33.222320	-97.625979	33.222320
4249701700	802842	0	5	-97.634411	33.219157	-97.634411	33.219157
4249701134	802843	0	10	-97.628303	33.213788	-97.628303	33.213788
4249733218	802844	0	5	-97.641803	33.215881	-97.641803	33.215881
4249732758	802845	0	9	-97.641774	33.215458	-97.641774	33.215458
42497	802846	0	3	-97.655498	33.216423	-97.655498	33.216424
42497	802847	0	3	-97.656541	33.211257	-97.656541	33.211257
4249731277	802848	0	5	-97.660895	33.203175	-97.660895	33.203175
4249701136	802849	0	5	-97.651711	33.204134	-97.651711	33.204134
4249700525	802850	0	8	-97.645015	33.203853	-97.645015	33.203853
4249731069	802851	0	5	-97.657232	33.199540	-97.657232	33.199540
4249731086	802852	0	5	-97.639402	33.210762	-97.639402	33.210762
4249701631	802853	0	5	-97.631907	33.206535	-97.631908	33.206535
4249702187	802854	0	5	-97.641384	33.197603	-97.641384	33.197603
4249730214	802855	0	5	-97.631283	33.200691	-97.631283	33.200691
4249732075	802856	0	8	-97.627725	33.197040	-97.627725	33.197040
42497	802857	0	5	-97.652444	33.193109	-97.652444	33.193109
4249700993	802858	0	5	-97.647954	33.184114	-97.647954	33.184114
42497	802859	0	5	-97.660117	33.183856	-97.660117	33.183856
4249732000	802860	0	5	-97.638932	33.192355	-97.638932	33.192355
4249731884	802861	0	5	-97.634079	33.192788	-97.634079	33.192788
4249701852	802862	0	5	-97.626724	33.192555	-97.626724	33.192555
4249732085	802863	0	5	-97.641750	33.188254	-97.641750	33.188254
4249730973	802864	0	5	-97.639973	33.182934	-97.639973	33.182934
4249702005	802865	0	5	-97.630770	33.184972	-97.630770	33.184972
4249702052	802866	0	5	-97.634593	33.178712	-97.634593	33.178712
4249731026	802867	0	5	-97.642117	33.173580	-97.642117	33.173580
4249731603	802868	0	5	-97.633673	33.172959	-97.633673	33.172959
4249732357	802869	0	7	-97.641694	33.171768	-97.641694	33.171768
42497	802870	0	7	-97.637112	33.172005	-97.637112	33.172005
42497	802871	0	2	-97.659506	33.191484	-97.659506	33.191484
4249733299	802872	0	5	-97.653459	33.189315	-97.653459	33.189315
4249732954	802913	0	5	-97.674064	33.180477	-97.674064	33.180477
4249701088	802915	0	5	-97.671121	33.174240	-97.671121	33.174240
4249731025	802916	0	5	-97.672411	33.187768	-97.672411	33.187768
4249731764	802917	0	8	-97.674802	33.192852	-97.674802	33.192852
4249702152	802921	0	8	-97.667819	33.197258	-97.667819	33.197258
4249701089	802923	0	5	-97.664759	33.179606	-97.664759	33.179606
4249731425	802924	0	5	-97.657592	33.173663	-97.657592	33.173663
4249732093	802925	0	5	-97.648456	33.175208	-97.648456	33.175208
4249731256	802926	0	5	-97.647285	33.177778	-97.647285	33.177778
42497	802927	0	5	-97.651664	33.170015	-97.651664	33.170015
4249732826	802928	0	5	-97.666311	33.169483	-97.666311	33.169483
4249731870	802929	0	5	-97.645263	33.164601	-97.645263	33.164601
4249701660	802930	0	5	-97.637855	33.165990	-97.637856	33.165990
4249701989	802931	0	5	-97.627985	33.170939	-97.627985	33.170939
42497	802932	0	7	-97.635139	33.170369	-97.635139	33.170369
42497	802955	0	5	-97.665075	33.160331	-97.665075	33.160331
4249733195	802956	0	5	-97.661529	33.156764	-97.661529	33.156764
4249731992	802976	0	5	-97.649430	33.151819	-97.649430	33.151819
42497	802990	0	5	-97.659186	33.154097	-97.659186	33.154097
4249701662	802995	0	8	-97.630647	33.162127	-97.630647	33.162127
4249732170	802996	0	5	-97.636706	33.156516	-97.636706	33.156516
4249701663	802997	0	5	-97.652054	33.160660	-97.652054	33.160660
4249731684	802998	0	5	-97.628294	33.153845	-97.628294	33.153845
4249732094	803000	0	5	-97.637594	33.148367	-97.637594	33.148367
4249780434	803004	0	5	-97.629092	33.147131	-97.629092	33.147131
42497	803005	0	5	-97.634571	33.144551	-97.634571	33.144551
4249701664	803010	0	5	-97.642307	33.152082	-97.642307	33.152082
42497	803138	0	4	-97.662089	33.213859	-97.662089	33.213859
4249732227	803143	0	5	-97.665706	33.204887	-97.665706	33.204887
42497	803187	0	3	-97.657756	33.212289	-97.657756	33.212289
4249700989	803189	0	7	-97.659528	33.214708	-97.659528	33.214708
4249700991	803190	0	5	-97.658752	33.214597	-97.658752	33.214597
4249733281	803198	0	5	-97.649173	33.188051	-97.649173	33.188051
4249730097	803203	0	5	-97.661572	33.166031	-97.661572	33.166032
4249733621	803228	0	8	-97.646424	33.190872	-97.646424	33.190872
4249733650	803229	0	5	-97.668061	33.183450	-97.668061	33.183450
4249733651	803230	0	8	-97.646612	33.157018	-97.646612	33.157018
4249733642	803231	0	7	-97.641335	33.161647	-97.641335	33.161647
4249733653	803232	0	7	-97.655209	33.165659	-97.655209	33.165659
4249733663	803234	0	5	-97.650791	33.198683	-97.650791	33.198683
4249733711	803239	0	5	-97.632316	33.213960	-97.632316	33.213960
4249733745	803240	0	5	-97.625396	33.210576	-97.625397	33.210576
4249733746	803241	0	8	-97.637180	33.171744	-97.637180	33.171744
4249733764	803243	0	5	-97.661934	33.196733	-97.661934	33.196733
4249733806	803249	0	5	-97.666754	33.191565	-97.666754	33.191565

Table C18 **Well Inventory Summary for Wise County, Texas - Location B**

API Number	Texas RRC Well ID	Lateral Length	Well Type	Surface Well Longitude	Surface Well Latitude	Bottom Well Longitude	Bottom Well Latitude
4249733807	803250	0	5	-97.639294	33.219599	-97.639294	33.219599
4249733856	803255	0	5	-97.663306	33.187663	-97.663306	33.187663
4249733863	803256	0	5	-97.640961	33.224517	-97.640961	33.224517
4249733866	803257	0	5	-97.642181	33.155917	-97.642181	33.155917
4249733947	803262	0	5	-97.633577	33.151401	-97.633577	33.151401
4249733951	803263	0	5	-97.640511	33.168538	-97.640511	33.168538
4249733985	803264	0	5	-97.636401	33.186804	-97.636401	33.186804
4249733988	803265	0	5	-97.628609	33.166488	-97.628609	33.166489
4249733994	803266	0	5	-97.628881	33.178092	-97.628881	33.178092
4249734051	803269	0	5	-97.644678	33.168421	-97.644678	33.168421
4249734326	803273	0	22	-97.629636	33.158378	-97.629637	33.158378
4249734328	803274	0	5	-97.627035	33.227513	-97.627035	33.227513
4249734391	803278	0	2	-97.665640	33.166158	-97.665640	33.166158
4249731247	803286	0	5	-97.601991	33.220204	-97.601992	33.220204
42497	803300	0	3	-97.597020	33.220607	-97.597020	33.220607
4249700811	803305	0	5	-97.610620	33.220626	-97.610620	33.220626
42497	803309	0	3	-97.617195	33.226466	-97.617195	33.226466
4249732275	803310	0	5	-97.611681	33.227109	-97.611681	33.227109
4249732895	803363	0	5	-97.620411	33.214578	-97.620411	33.214578
4249730255	803364	0	8	-97.619383	33.209256	-97.619383	33.209256
4249730185	803365	0	5	-97.614259	33.210250	-97.614259	33.210250
4249731700	803366	0	5	-97.599766	33.207665	-97.599766	33.207665
4249702017	803367	0	6	-97.618418	33.202216	-97.618418	33.202216
4249730379	803368	0	5	-97.616785	33.198066	-97.616785	33.198066
4249730284	803369	0	5	-97.614119	33.200715	-97.614119	33.200715
42497	803370	0	5	-97.591461	33.210931	-97.591461	33.210931
4249732755	803373	0	9	-97.619804	33.218158	-97.619804	33.218158
42497	803374	0	2	-97.613811	33.203240	-97.613811	33.203240
4249731159	803375	0	9	-97.594002	33.204906	-97.594002	33.204906
4249733355	803376	0	5	-97.592877	33.206499	-97.592877	33.206499
4249701998	803377	0	6	-97.602652	33.201023	-97.602652	33.201023
4249701571	803378	0	8	-97.605809	33.213990	-97.605809	33.213990
4249701853	803379	0	8	-97.606764	33.206343	-97.606764	33.206343
4249732509	803380	0	5	-97.616410	33.219208	-97.616410	33.219208
42497	803381	0	3	-97.597352	33.215585	-97.597352	33.215585
42497	803382	0	5	-97.598132	33.215980	-97.598132	33.215980
42497	803383	0	3	-97.592991	33.207488	-97.592991	33.207488
4249731315	803384	0	3	-97.586989	33.208264	-97.586989	33.208264
42497	803385	0	7	-97.587021	33.205936	-97.587022	33.205936
4249731574	803386	0	5	-97.612455	33.193500	-97.612455	33.193500
4249730210	803387	0	5	-97.621916	33.196361	-97.621916	33.196361
4249701413	803388	0	5	-97.604192	33.194310	-97.604192	33.194310
4249730524	803389	0	5	-97.598805	33.197384	-97.598805	33.197384
4249731630	803390	0	5	-97.598082	33.190880	-97.598082	33.190880
4249731137	803391	0	5	-97.582366	33.201541	-97.582366	33.201541
4249730968	803392	0	5	-97.584607	33.197453	-97.584607	33.197453
4249700303	803393	0	8	-97.576837	33.190683	-97.576837	33.190683
4249700209	803394	0	8	-97.589295	33.185107	-97.589295	33.185107
42497	803404	0	8	-97.588662	33.200095	-97.588662	33.200095
4249700205	803405	0	8	-97.576735	33.197392	-97.576735	33.197392
4249730526	803433	0	5	-97.597151	33.186226	-97.597151	33.186226
4249731799	803434	0	5	-97.606544	33.186262	-97.606544	33.186262
4249702917	803435	0	5	-97.618155	33.182854	-97.618155	33.182854
4249731614	803436	0	5	-97.624568	33.178646	-97.624568	33.178647
4249701521	803437	0	5	-97.612551	33.180742	-97.612551	33.180742
4249701988	803438	0	5	-97.618645	33.173147	-97.618645	33.173147
4249730075	803439	0	5	-97.604846	33.171983	-97.604846	33.171983
4249731416	803440	0	5	-97.598257	33.177984	-97.598257	33.177984
4249732358	803441	0	8	-97.593631	33.176030	-97.593631	33.176030
4249701170	803442	0	5	-97.593601	33.182327	-97.593601	33.182327
4249701522	803443	0	8	-97.601680	33.179372	-97.601680	33.179372
4249702000	803444	0	8	-97.618482	33.187966	-97.618482	33.187966
4249730405	803445	0	5	-97.577542	33.179730	-97.577542	33.179730
42497	803454	0	8	-97.581980	33.179572	-97.581980	33.179572
4249730402	803455	0	8	-97.587009	33.173663	-97.587009	33.173663
4249730248	803460	0	5	-97.576945	33.174877	-97.576945	33.174877
42497	803480	0	4	-97.619531	33.168691	-97.619531	33.168691
4249730347	803481	0	5	-97.619223	33.164728	-97.619223	33.164728
4249730972	803482	0	5	-97.613971	33.163143	-97.613971	33.163143
4249702020	803483	0	5	-97.616554	33.158319	-97.616554	33.158320
4249700453	803484	0	5	-97.603447	33.158154	-97.603447	33.158154
4249700676	803485	0	5	-97.595282	33.161295	-97.595282	33.161295
4249730525	803486	0	5	-97.599792	33.165001	-97.599792	33.165001
4249731160	803487	0	8	-97.596159	33.167446	-97.596159	33.167446
4249701414	803488	0	5	-97.605501	33.169235	-97.605501	33.169235
4249730439	803489	0	5	-97.586341	33.167187	-97.586342	33.167187
4249730563	803490	0	5	-97.588923	33.156076	-97.588923	33.156076
4249700035	803492	0	8	-97.593708	33.170625	-97.593708	33.170625
4249730326	803493	0	8	-97.585739	33.167757	-97.585739	33.167757
4249720105	803494	0	3	-97.591572	33.165051	-97.591572	33.165051

Table C18 **Well Inventory Summary for Wise County, Texas - Location B**

API Number	Texas RRC Well ID	Lateral Length	Well Type	Surface Well Longitude	Surface Well Latitude	Bottom Well Longitude	Bottom Well Latitude
4249700969	803522	0	5	-97.621043	33.151495	-97.621043	33.151495
4249701343	803524	0	5	-97.612515	33.151420	-97.612515	33.151420
4249732812	803525	0	8	-97.611318	33.144907	-97.611318	33.144907
4249732658	803529	0	5	-97.603557	33.147492	-97.603557	33.147492
4249733404	803537	0	5	-97.605924	33.152387	-97.605924	33.152387
4249733327	803541	0	5	-97.599020	33.152818	-97.599020	33.152819
42497	803544	0	3	-97.621006	33.145093	-97.621006	33.145093
4249701990	803587	0	8	-97.593628	33.194617	-97.593628	33.194617
4249700825	803592	0	5	-97.597040	33.151247	-97.597040	33.151247
42497	803595	0	5	-97.619435	33.213307	-97.619435	33.213307
42497	803597	0	2	-97.598060	33.192244	-97.598060	33.192244
4249733443	803601	0	5	-97.589941	33.175400	-97.589942	33.175400
4249733507	803610	0	5	-97.617562	33.147245	-97.617562	33.147245
4249733627	803621	0	5	-97.621054	33.218916	-97.621054	33.218916
4249733667	803623	0	5	-97.580623	33.170918	-97.580623	33.170918
4249733671	803624	0	5	-97.618888	33.161503	-97.618888	33.161503
4249733700	803629	0	5	-97.606701	33.161560	-97.606701	33.161560
4249733722	803631	0	6	-97.622803	33.205064	-97.622803	33.205065
4249733730	803633	0	5	-97.582690	33.174848	-97.582690	33.174848
4249733739	803634	0	5	-97.582551	33.187581	-97.582551	33.187581
4249733766	803636	0	5	-97.608902	33.197418	-97.608902	33.197418
4249733768	803637	0	5	-97.585664	33.180313	-97.585664	33.180313
4249733816	803638	0	5	-97.624733	33.162142	-97.624733	33.162142
4249733858	803642	0	5	-97.621952	33.159332	-97.621952	33.159332
4249733925	803645	0	5	-97.591783	33.199683	-97.591783	33.199683
4249733940	803647	0	5	-97.592816	33.158049	-97.592817	33.158049
4249733945	803648	0	5	-97.597700	33.202555	-97.597700	33.202555
4249733944	803649	0	3	-97.621053	33.191650	-97.621053	33.191650
4249733946	803650	0	5	-97.591994	33.203710	-97.591994	33.203710
4249733957	803653	0	5	-97.615915	33.177461	-97.615915	33.177461
4249733964	803654	0	5	-97.623798	33.174601	-97.623798	33.174601
4249733984	803655	0	5	-97.582104	33.193171	-97.582104	33.193171
4249733993	803656	0	5	-97.589095	33.193849	-97.589095	33.193849
4249734011	803658	0	5	-97.579748	33.197284	-97.579748	33.197284
4249734026	803660	0	5	-97.610844	33.172488	-97.610844	33.172488
4249734040	803661	0	8	-97.592551	33.191002	-97.592551	33.191002
4249734067	803664	0	5	-97.623951	33.183322	-97.623951	33.183322
4249734081	803665	0	3	-97.590258	33.168826	-97.590258	33.168826
4249733878	803666	0	5	-97.588459	33.160636	-97.588459	33.160636
4249734126	803670	0	5	-97.583699	33.191211	-97.583699	33.191211
4249734245	803674	0	2	-97.590258	33.168752	-97.590259	33.168752
4249734662	1068303	0	5	-97.587130	33.211662	-97.587130	33.211662
4249734669	1068661	0	8	-97.608512	33.224608	-97.608512	33.224608
4249734706	1071907	0	2	-97.610714	33.165301	-97.610714	33.165301
4249734754	1074581	0	5	-97.578033	33.185073	-97.578033	33.185073
4249734784	1075249	0	8	-97.613059	33.193175	-97.613059	33.193175
4249734790	1075384	0	5	-97.596252	33.210044	-97.596252	33.210044
4249734817	1076560	0	5	-97.588590	33.205128	-97.588590	33.205128
4249734827	1076968	0	8	-97.614362	33.184882	-97.614362	33.184882
4249734837	1077772	0	5	-97.615699	33.177877	-97.615699	33.177877
4249734840	1078038	0	5	-97.601679	33.215695	-97.601679	33.215695
4249734922	1080567	0	5	-97.582790	33.200785	-97.582790	33.200785
4249734975	1082248	0	5	-97.623724	33.177630	-97.623724	33.177630
4249735015	1083100	0	5	-97.596417	33.203004	-97.596417	33.203004
	1083121	0	86	-97.596146	33.200864	0.000000	0.000000
4249735017	1083123	0	2	-97.601939	33.201758	-97.601939	33.201758
4249735032	1083597	0	8	-97.592742	33.190448	-97.592742	33.190448
4249735034	1083639	0	5	-97.592714	33.206647	-97.592714	33.206647
4249735046	1084716	0	5	-97.617903	33.168254	-97.617903	33.168254
4249735062	1085251	0	5	-97.588143	33.215380	-97.588143	33.215380
4249735129HW	1087493	0	86	-97.596476	33.158852	-97.596476	33.158852
4249735130HW	1087494	0	86	-97.589779	33.158548	-97.589779	33.158548
4249735181D1	1089770	523	87	-97.599024	33.214878	-97.599015	33.213442
4249735285	1093502	0	5	-97.605252	33.221553	-97.605252	33.221553
4249735861H1	1094251	0	5	0.000000	0.000000	-97.617415	33.208634
4249735362	1096271	0	5	-97.591250	33.203773	-97.591250	33.203773
4249735016H1	1097582	2290	5	0.000000	0.000000	-97.603265	33.202813
4249735429	1098681	0	5	-97.615251	33.221863	-97.615251	33.221863
4249735430	1098682	0	3	-97.609509	33.221929	-97.609509	33.221929
4249735431	1098683	0	5	-97.611463	33.225771	-97.611463	33.225771
4249735438	1099082	0	5	-97.609688	33.222176	-97.609688	33.222176
4249735455H1	1100044	2171	86	-97.588388	33.207773	-97.593576	33.211845
4249735471H1	1100348	2853	86	-97.596955	33.157192	-97.587804	33.155698
4249735528	1101933	0	5	-97.594964	33.151243	-97.594964	33.151243
4249735562H1	1103664	2491	86	-97.663013	33.180270	-97.655975	33.176826
4249735581H1	1104472	3009	86	-97.572518	33.193540	-97.580439	33.198447
4249735604H1	1105688	2701	86	-97.612663	33.170229	-97.620825	33.173061
4249735614	1106586	0	5	-97.584342	33.202855	-97.584342	33.202855
4249735616	1106672	0	5	-97.654447	33.183759	-97.654447	33.183759
4249735618H1	1106826	2392	86	-97.647500	33.209084	-97.644593	33.202980

Table C18 Well Inventory Summary for Wise County, Texas - Location B

API Number	Texas RRC Well ID	Lateral Length	Well Type	Surface Well Longitude	Surface Well Latitude	Bottom Well Longitude	Bottom Well Latitude
4249735619	1107012	0	5	-97.593325	33.204371	-97.593325	33.204371
4249735625	1107204	0	5	-97.623903	33.179889	-97.623903	33.179889
4249735636	1107970	0	5	-97.611033	33.167460	-97.611033	33.167460
4249731999	1108572	0	9	-97.593628	33.176579	-97.593628	33.176579
4249735710H1	1112567	2585	86	-97.577255	33.204654	-97.584465	33.208360
4249735767	1116257	0	5	-97.622255	33.175899	-97.622255	33.175899
4249735768	1116260	0	5	-97.613317	33.168321	-97.613317	33.168321
4249735777	1117130	0	5	-97.615550	33.226852	-97.615550	33.226852
4249735797H1	1118444	2539	86	-97.631287	33.184407	-97.627633	33.178140
4249735851	1122885	0	2	-97.620454	33.179613	-97.620454	33.179613
	1123566	1625	86	-97.621601	33.211383	0.000000	0.000000
4249735904H1	1126989	206	86	-97.601532	33.165510	-97.601222	33.165008
4249735905D1	1127309	928	87	-97.590489	33.217535	-97.590520	33.214983
4249735922	1129343	0	5	-97.615685	33.175882	-97.615685	33.175882
4249735944H1	1131506	2803	86	-97.590199	33.163588	-97.581094	33.162742
4249735964H1	1133345	2111	86	-97.669764	33.166703	-97.664475	33.162980
4249735972H1	1134519	2248	86	-97.606957	33.213372	-97.612885	33.217027
4249735973H1	1134614	3075	86	-97.642937	33.190220	-97.634198	33.186042
4249735983H1	1135335	2911	86	-97.595931	33.175316	-97.604909	33.177968
4249736024	1137966	0	5	-97.656289	33.207664	-97.656289	33.207664
4249736029H1	1138401	4223	86	-97.606862	33.213230	-97.596359	33.205695
4249736046H1	1139654	3272	86	-97.618480	33.198345	-97.625106	33.205404
4249736077H1	1142249	2463	86	-97.602681	33.195947	-97.600708	33.189383
4249736079	1142611	0	5	-97.587031	33.206286	-97.587031	33.206286
4249736095H1	1143691	3181	86	-97.654261	33.175889	-97.645129	33.171708
4249736111H1	1144661	3391	86	-97.626746	33.156594	-97.635216	33.162607
4249736128H1	1146272	2969	86	-97.675736	33.193640	-97.666949	33.190171
4249736129H1	1146273	3141	86	-97.626197	33.146376	-97.633718	33.152249
4249736200H1	1151312	2202	86	-97.602192	33.159975	-97.604879	33.165590
4249736207H1	1151420	3007	86	-97.612431	33.179276	-97.607608	33.172073
4249736218H1	1152697	3444	86	-97.625482	33.187090	-97.634247	33.193030
4249736247H1	1155824	2391	86	-97.655673	33.159224	-97.663242	33.160858
4249736252H1	1156427	5146	86	-97.644057	33.167765	-97.660675	33.169945
4249736256H1	1156837	2570	86	-97.614091	33.203227	-97.606495	33.200208
4249736273H1	1158047	2537	86	-97.577663	33.176665	-97.581629	33.182790
4249736274	1158048	0	2	-97.582573	33.177440	-97.582573	33.177440
4249736272	1158063	0	2	-97.576960	33.182346	-97.576960	33.182346
4249736276H1	1158281	3625	86	-97.665587	33.198709	-97.659560	33.190129
4249736281H1	1158370	2607	86	-97.606503	33.208220	-97.614261	33.211187
4249736292H1	1159328	2927	86	-97.575768	33.169371	-97.582402	33.175166
4249736306H1	1160475	2912	86	-97.586954	33.211619	-97.588056	33.219570
4249736310D1	1160994	112	87	-97.590423	33.217535	-97.590254	33.217260
4249736317	1161480	0	11	-97.633855	33.191176	-97.633855	33.191176
4249736324H1	1161772	2047	86	-97.609096	33.228375	-97.604728	33.224113
4249736331H1	1162415	3010	86	-97.595269	33.165385	-97.585431	33.165378
4249736336H1	1162670	2215	86	-97.620663	33.214686	-97.613735	33.212907
4249736345H1	1163505	3513	86	-97.633447	33.172335	-97.626651	33.164550
4249736359H1	1164623	2388	86	-97.577744	33.176618	-97.582689	33.181697
4249736360H1	1164692	2216	86	-97.602063	33.160065	-97.603171	33.166086
4249736369H1	1165159	2639	86	-97.622729	33.170519	-97.618058	33.164422
4249736370H1	1165184	3025	86	-97.622729	33.170574	-97.613584	33.167416
4249736455H1	1171381	2038	86	-97.574763	33.185758	-97.568705	33.183430
4249736456H1	1171399	2714	86	-97.594519	33.179550	-97.585673	33.178997
4249736457H1	1171400	2483	86	-97.594559	33.179443	-97.592665	33.172805
4249736462H1	1171687	2925	86	-97.603152	33.171384	-97.610892	33.176104
4249736467H1	1172002	3126	86	-97.603086	33.171398	-97.609988	33.177733
4249736471H1	1172833	3037	86	-97.600125	33.180171	-97.609809	33.182007
4249736492H1	1174603	1999	86	-97.576523	33.192119	-97.583025	33.192670
4249736493H1	1174610	2226	86	-97.576376	33.192122	-97.580907	33.196909
4249736494H1	1174639	2037	86	-97.576450	33.192119	-97.581855	33.195391
4249736500H1	1174806	3959	86	-97.628393	33.228178	-97.616421	33.224032
4249736506H1	1174859	2294	86	-97.585839	33.180382	-97.593254	33.181326
4249736513H1	1175229	3636	86	-97.603031	33.171436	-97.609441	33.179853
4249736514H1	1175416	2723	86	-97.600054	33.180295	-97.606468	33.185485
4249736515H1	1175417	3254	86	-97.600090	33.180233	-97.609652	33.184151
4249736541H1	1178161	3170	86	-97.594771	33.167534	-97.584425	33.167089
4249736551H1	1178401	2486	86	-97.588715	33.203473	-97.591041	33.196925
4249736552H1	1178403	2808	86	-97.588081	33.203530	-97.584240	33.196518
4249736555H1	1178514	3638	86	-97.596005	33.174981	-97.606832	33.179115
4249736591H1	1181912	3858	86	-97.600012	33.180277	-97.611796	33.184051
4249736609H1	1183188	3409	86	-97.599984	33.180419	-97.609506	33.185289
4249736641H1	1186494	3200	86	-97.635005	33.174255	-97.626882	33.168714
4249736642H1	1186536	3533	86	-97.634951	33.174414	-97.623413	33.174009
4249736644H1	1186563	4068	86	-97.595923	33.174995	-97.607761	33.180090
4249736647H1	1186576	4172	86	-97.595845	33.175005	-97.607738	33.180614
4249736648H1	1186601	3321	86	-97.634978	33.174335	-97.624451	33.172110
4249736654H1	1186973	3751	86	-97.617780	33.159644	-97.605766	33.157598
4249736655H1	1186975	3523	86	-97.617781	33.159590	-97.606855	33.156539
4249736656H1	1187044	4067	86	-97.671878	33.202179	-97.684850	33.204641
4249736660H1	1187051	4233	86	-97.670577	33.200782	-97.684417	33.200924

Table C18 Well Inventory Summary for Wise County, Texas - Location B

API Number	Texas RRC Well ID	Lateral Length	Well Type	Surface Well Longitude	Surface Well Latitude	Bottom Well Longitude	Bottom Well Latitude
4249736661H1	1187052	3825	86	-97.671878	33.202124	-97.684329	33.203117
4249736662H1	1187077	4270	86	-97.670578	33.200837	-97.684505	33.201667
4249736687H1	1188314	3689	86	-97.597244	33.200403	-97.603518	33.209066
4249736688H1	1188315	2755	86	-97.597299	33.200469	-97.603766	33.205741
4249736696H1	1189040	2991	86	-97.577657	33.166743	-97.582590	33.173840
4249736732H1	1190092	2198	86	-97.615098	33.165421	-97.607917	33.165273
4249736733H1	1190093	1956	86	-97.615098	33.165363	-97.609411	33.162911
4249736734H1	1190100	2852	86	-97.618361	33.163247	-97.609209	33.161763
4249736736H1	1190314	2927	86	-97.618361	33.163192	-97.609427	33.160317
4249736744H1	1190560	2775	86	-97.601218	33.165683	-97.608423	33.170319
4249736749H1	1190757	2941	86	-97.601300	33.165545	-97.608512	33.170888
4249736752H1	1190809	2736	86	-97.601217	33.165549	-97.607235	33.171112
4249736801H1	1193881	3446	86	-97.600963	33.149027	-97.600099	33.158473
4249736803H1	1194043	3532	86	-97.600964	33.149082	-97.602014	33.158751
4249736804H1	1194053	3555	86	-97.600963	33.148972	-97.603403	33.158527
4249736814H1	1194642	96	86	-97.575993	33.190162	-97.576173	33.189946
4249736826H1	1195182	3569	86	-97.596564	33.162551	-97.585239	33.160208
4249736909H1	1199441	2807	86	-97.644804	33.179922	-97.636743	33.176237
4249736910H1	1199442	3491	86	-97.644803	33.179977	-97.633725	33.177675
4249736911H1	1199445	3452	86	-97.644803	33.180032	-97.633541	33.179460
4249736914H1	1199453	3362	86	-97.644392	33.183195	-97.633562	33.181631
4249736917H1	1199474	3355	86	-97.644391	33.183253	-97.633429	33.183552
4249736923H1	1200461	4134	86	-97.646143	33.177243	-97.647898	33.188511
4249736924H1	1200462	4255	86	-97.649406	33.188828	-97.648195	33.177177
4249736925H1	1200463	4813	86	-97.649099	33.177322	-97.651132	33.190441
4249736926H1	1200464	4910	86	-97.652086	33.177305	-97.653014	33.190778
4249736927H1	1200465	4963	86	-97.652119	33.177305	-97.654721	33.190771
4249737030H1	1206750	4265	86	-97.621208	33.156971	-97.633121	33.163055
4249737032H1	1207088	3088	86	-97.594583	33.169055	-97.584492	33.168852
4249737082H1	1210627	3472	86	-97.648010	33.209211	-97.650876	33.218447
4249737098H1	1211039	3474	86	-97.648010	33.209211	-97.655693	33.216245
4249737105H1	1211345	5540	86	-97.605394	33.149322	-97.622342	33.154679
4249737106H1	1211349	5089	86	-97.605396	33.149212	-97.621811	33.151456
4249737110H1	1211473	3383	86	-97.648010	33.209211	-97.654012	33.217022
4249737113H1	1211611	5493	86	-97.623252	33.150323	-97.605911	33.146428
4249737114H1	1211612	5896	86	-97.623307	33.150377	-97.605141	33.144983
4249737117H1	1212345	3417	86	-97.615223	33.221609	-97.604745	33.218348
4249737129H1	1213672	3047	86	-97.594615	33.170954	-97.584659	33.170814
4249737135H1	1214185	5561	86	-97.621110	33.145314	-97.603266	33.142438
4249737136H1	1214186	4676	86	-97.621111	33.145259	-97.606552	33.141357
4249737149H1	1215291	5108	86	-97.605400	33.149267	-97.621467	33.153076
4249737187H1	1217638	5321	86	-97.625993	33.143412	-97.643337	33.144436
4249737188H1	1217642	5262	86	-97.625993	33.143357	-97.643165	33.142666
4249735129H1	1221815	2915	5	0.000000	0.000000	-97.586949	33.158899
4249735130H1	1221816	2097	5	0.000000	0.000000	-97.596465	33.157286
4249737210H1	1221817	3555	86	-97.596956	33.156917	-97.585650	33.154666
4249737296H1	1228389	8607	86	-97.665271	33.167970	-97.680496	33.187866
4249737343H1	1232415	5420	86	-97.682702	33.208790	-97.665211	33.206385
4249737376H1	1236761	7904	86	-97.675298	33.218713	-97.651285	33.210674

Well Type Legend

2	Permitted Location
3	Dry Hole
4	Oil Well
5	Gas Well
6	Oil/Gas Well
7	Plugged Oil Well
8	Plugged Gas Well
9	Canceled Location
10	Plugged Oil/Gas Well
11	Injection/Disposal Well
22	Injection/Disposal From Gas
86	Horizontal Drainhole
87	Sidetrack Well Surface Location

Table C19 Number of Oil and Gas Wells in Wise County, Texas - Location B

Search Area Name	Search Area Radius (miles)	EPA Samples	Total Number of Oil and Gas Wells	Oil and Gas Wells within 1 Mile of EPA Sample Points
Location B	3	WISETXGW01 WISETXGW02 WISETXGW03 WISETXGW04 WISETXGW05 WISETXGW08 WISETXGW13 WISETXGW14 WISETXGW15 WISETXGW16	369	76

Table C20 Impoundments within 1 Mile of EPA Samples, Wise County, Texas - Location B

EPA Sample	Approximate Distance from EPA Sample to Nearest Well Pad and API Number	No. of Wells within 1 Mile of the EPA Sample	No. of Impoundments within 1 Mile of the EPA sample	Approximate Distance from EPA Sample to the Nearest Impoundment	Date of Google Earth Aerial Imagery showing Impoundment Nearest to the EPA Sample
WISETXGW01	<0.1miles N 49736218	38	2	0.15 miles N	10/08
WISETXGW02	0.2 miles SE 49734067	41	2	0.3 miles N	10/08
WISETXGW03	0.2 miles N 49736218	39	2	0.2 miles N	10/08
WISETXGW04	0.1 miles SE 4973618	34	2	<0.1 miles SE	10/08
WISETXGW05	<0.1 miles S 49736317	28	2	0.6 miles SE	10/08
WISETXGW08	<0.1 miles SW 49734067	40	2	0.3 miles NW	10/08
WISETXGW13	0.1 miles SE 49734067	41	2	0.3 miles N	10/08
WISETXGW14	0.2 miles SE 49734067	39	2	0.3miles N	10/08
WISETXGW15	<0.1 miles W 49736218	33	2	0.2 miles NW	10/08

Table C21 Environmental Database Review Summary, EPA - Wise County, Texas - Location C

Database	Name of Facility	Site Location and Address	Distance from Nearest Sample Point	Potential Candidate Cause		Ground Water Wells
				Yes/No	Justification	
TIER 2	TARGA MIDSTREAM SERVICES LLC	4944 FM 1655 FORESTBURG, TX 76239	1.28 mi. NNW from WISETXGW07	No	Natural gas condensates are listed in the chemical inventory for this site (above ground storage). Natural gas condensates may be a potential BTEX source. However there is no record of release.	1 Federal USGS Well 49 State wells
orphan Ind. Haz Waste	S & W GARAGE	RR 1 BOX 1 01 ALVORD, TX 76225	NI	No	Facility listed as a generator. However, it appears as inactive since 1999. No releases found.	
orphan UST	LBJ WORK CENTER	RT 1 ALVORD, TX 76225	NI	No	Petroleum products were stored at this site (1 installed in 1977 and removed in 1999 and the other Permanently Filled in Place in1987) Site currently inactive and owned by USDA NATIONAL FORESTS IN TEXAS .	
orphan FINDS, UST, AST	WISE COUNTY	FM 1655 & US 81-287 ALVORD, TX 76225	Approximately 7 mi. SSW from WISETXGW06.	No	Petroleum products were stored at this site. Removed from ground in 1993. However, the site is too far from the sample point to have an impact on the ground water if a release had occurred. Therefore, this site is not a potential candidate cause.	
orphan FINDS orphan site AST	WISE COUNTY PCT 2	FM 1655 WEST ALVORD, TX 76225	Approximately 1.3 mi. NNW from WISETXGW07.	No	Gasoline AST at the site. No record of a release found.	
orphan AST	MRS H R THOMPSON	RT 2 ALVORD, TX 76225	NI	No	Diesel AST. Out of use since 2001. No record of a release found.	
orphan AST	WISE CO PCT 2	HWY 287 ALVORD, TX 76225	Approximately 5 mi. WSW from WISETXGW06.	No	Gasoline AST at the site. No record of a release found.	
orphan Ind. Haz Waste	ALVORD GULF	HWY 287 ALVORD, TX 76225	Approximately 5 mi. WSW from WISETXGW06.	No	No record of a release found.	
orphan UST	COX AUTOMOTIVE & ELEC	HWY 287 ALVORD, TX 76225	Approximately 5 mi. WSW from WISETXGW06.	No	3 gasoline USTs removed in 1990. No record of a release found.	
orphan AST	HUDSON BUTANE ALVORD KEYLOCK	HWY 287 & WICKHAM ALVORD, TX 76225	Approximately 5 mi. SW from WISETXGW06.	No	A diesel and a gasoline AST. Out of use since 2001. No record of a release. >1 mi away from sample point.	
orphan AST	FFP 832	S HWY 287 ALVORD, TX 76225	Approximately 5 mi. SW from WISETXGW06.	No	5 ASTs (3 diesel and 2 gasoline). No record of a release.	
5 orphan TIER 2	SMITH, C.P.	LAT: 33.263000 LONG: -97.669700 ALVORD, TX 76225	Approximately 10 mi. SW from WISETXGW06.	No	Oil and gas processing operation. AST. No record of a release. BTEX sources may exist, but because of the distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	DEVON ENERGY ANDERSON, C B 1	LAT: 33.346782 LONG: -97.767724 ALVORD, TX 76225	Approximately 10 mi. SW from WISETXGW06.	No	Oil and Gas Processing operation. AST. No record of releases. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	DEVON ENERGY O'NEAL, JACK 2 C	LAT: 33.325999 LONG: -97.732915 ALVORD, TX 76225	Approximately 10 mi. SW from WISETXGW06.	No	Oil and Gas Processing operation. AST. No record of releases. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	DEVON ENERGY SMITH, J M 1 C	LAT: 33.348911 LONG: -97.751018 ALVORD, TX 76225	Approximately 10 mi. SW from WISETXGW06.	No	Oil and Gas Processing operation. AST. No record of releases. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	DEVON ENERGY HOWELL, W E 1 C	LAT: 33.31391 LONG: -97.749783 ALVORD, TX 76225	Approximately 10 mi. SW from WISETXGW06.	No	Oil and Gas Processing operation. AST. No record of releases. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	DEVON ENERGY - SMITH, C M ETAL 3	LAT: 33.34115 LONG: -97.366327 ALVORD, TX 76225	Approximately 10 mi. SW from WISETXGW06.	No	Oil and Gas Processing operation. AST. No record of releases. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	DEVON ENERGY - SMITH, C M A 2	LAT: 33.33906 LONG: -97.65626 ALVORD, TX 76225	Approximately 10 mi. SW from WISETXGW06.	No	Oil and Gas Processing operation. AST. No record of releases. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	DEVON ENERGY - SMITH, C M ETAL 2	LAT: 33.34115 LONG: -97.66327 ALVORD, TX 76225	Approximately 10 mi. SW from WISETXGW06.	No	Oil and Gas Processing operation. AST. No record of releases. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	DEVON ENERGY - SMITH, C M A 3	LAT: 33.34193 LONG: -97.65685 ALVORD, TX 76225	Approximately 10 mi. SW from WISETXGW06.	No	Oil and Gas Processing operation. AST. No record of releases. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	DEVON ENERGY - O'NEAL, JACK 2 C	LAT: 33.32631 LONG: -97.73439 ALVORD, TX 76225	Approximately 10 mi. SW from WISETXGW06.	No	Oil and Gas Processing operation. AST. No record of releases. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	DEVON ENERGY - SMITH, J M 1 C	LAT: 33.34655 LONG: -97.75043 ALVORD, TX 76225	Approximately 10 mi. SW from WISETXGW06.	No	Oil and Gas Processing operation. AST. No record of releases. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	DEVON ENERGY - BOND, OLIVER C 2H	LAT: 33.29968 LONG: -97.64271 ALVORD, TX 76225	Approximately 10 mi. SW from WISETXGW06.	No	Oil and Gas Processing operation. AST. No record of releases. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	DEVON ENERGY - HANNA, JOE C 1	LAT: 33.35598 LONG: -97.65021 ALVORD, TX 76225	Approximately 10 mi. SW from WISETXGW06.	No	Oil and Gas Processing operation. AST. No record of releases. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	DEVON ENERGY - ANDERSON, C B 1	LAT: 33.34306 LONG: -97.75997 ALVORD, TX 76225	Approximately 10 mi. SW from WISETXGW06.	No	Oil and Gas Processing operation. AST. No record of releases. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	DEVON ENERGY - HOWELL, W E 1 C	LAT: 33.31391 LONG: -97.749783 ALVORD, TX 76225	Approximately 10 mi. SW from WISETXGW06.	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
2 orphan TIER 2	LES RALEY #2 LEASE - RRC# 19934	US 81 ALVORD, TX 76225	Approximately 5 mi. SW from WISETXGW06.	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan ICIS	DIAMOND RIDGE SUBDIVISION	IN WISE COUNTY ALVORD TX 76225	Approximately 5 mi. SW from WISETXGW06.	No	Site had NPDES permit. Also site in ICIS program (ICIS-06-1999-0518 FORMAL ENFORCEMENT ACTION). However no other informatin is available. Site is approximately 5 miles SW of the nearest sampling point. Due to distance from sample the site is not considered a potential candidate source.	
orphan UST	JERKY STATION	HWY 287 & FM 1125 BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Petroleum products were stored at this site. because of distance to sample locations, this site is not considered a potential candidate source.	
2 orphan TIER 2	GIFFORD LEASE	HIGHWAY 287 BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Oil and Gas Extraction/Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	LIPSCOMB AUTO CENTER	HIGHWAY 287 NORTH BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Petroleum products were stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
2 orphan TIER 2	IESI BOWIE	12888 HIGHWAY 287 NORTH BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Petroleum products were stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
2 orphan TIER 2	PAUL DONALD LEASE	HIGHWAY 287 BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Petroleum products might have been stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
orphan AST	POLK OPERATING	1121 HIGHWAY 59 N BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Petroleum products were stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	DEATON & LONG "C" LEASE	HIGHWAY 59 BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Petroleum products were stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
2 orphan TIER 2	BRANSFORD LEASE	HIGHWAY 59 BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Petroleum products might have been stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
2 orphan TIER 2	J. E. MEYERS LEASE	HWY 59/W. CLAY STREET BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Petroleum products might have been stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	BRITE LEASE	HIGHWAY 59 BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Petroleum products might have been stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	LONG "C" LEASE	HIGHWAY 59 BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Petroleum products might have been stored at this site. Because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	DEATON LEASE	HIGHWAY 59 BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Site in Chemical Inventory Reports (TIER 2 database). No other oinformation known. Because of distance to sample locations, this site is not considered a potential candidate source.	
orphan RCRA-SQG orphan site Ind. Haz Waste	CVS PHARMACY INC - STORE 7445	1419 HIGHWAY 59 N BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Small Small Quantity Generator for Silver. No violations found. Because of distance to sample locations, this site is not considered a potential candidate source.	
orphan UST	K-C OIL 16 (US FOOD STORES)	1601 HIGHWAY 59 N BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Petroleum stored at this site. Leaking UST at the site. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	

Table C21 Environmental Database Review Summary, EPA - Wise County, Texas - Location C

Database	Name of Facility	Site Location and Address	Distance from Nearest Sample Point	Potential Candidate Cause		Ground Water Wells
				Yes/No	Justification	
orphan UST, Financial Assurance	MURPHY USA 7101	289 HIGHWAY 81 N BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Petroleum stored at this site. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	TXDOT-WICHITA FALLS-BOWIE MAINTENANCE	905 HWY 81 N BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Several USTs on site. Some removed, some still inplace. One record for LUST. Because of distance to sample locations, this site is not considered a potential candidate source.	
CERCLIS, FINDS orphan	GOLD-BURG HIGH SCHOOL	RT. 1 BOX 35 BOWIE, TX 76230	> 20 mi. NW from WISETXGW06.	No	This site consists of a public water supply (PWS) I.D. #1690014A at Goldburg High School, which was reported to be contaminated with 1,1-DCE, 1,1-DCA, and 1,1,1-TCA in 1991, during a routine sampling event. Subsequent sampling confirmed the presence of VOCs. NFRAP-Site does not qualify for the NPL based on existing information These were detected in the study samples. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
2 orphan TIER 2	PEMBROKE C UNIT #4H	Latitude: 33.6139 Longitude: -97.6755 BOWIE, TX	> 14 mi from WISETXGW07	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	PACIFIC C #2H	Latitude: 33.5563 Longitude: -97.7563: BOWIE, TX	> 12.7 Approximately	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	KRAMER C #6H	Latitude: 33.5370 Longitude: -97.6945 BOWIE, TX	> 9 mi from WISETXGW07	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	KNIGHT A #1H, A #2H, C #1H	Latitude: 33.6325 Longitude: -97.5645 BOWIE, TX	Approximately 15.5 mi from WISETXGW07	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	WHITESIDE C #1H, C #2H	Latitude: 33.5669 Longitude: -97.5405 BOWIE, TX	> 11 mi from WISETXGW06	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	SAINT JO COMPRESSOR SITE	Latitude: 33.6239 Longitude: -97.5497 BOWIE, TX	>14 mi from WISETXGW07	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	DUNN FAMILY TRUST A #1H, B #1H, C #1H	Latitude: 33.6244 Longitude: -97.5702 BOWIE, TX	Approximately 14.mi from WISETXGW06	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	PACIFIC C #1H	Latitude: 33.5564 Longitude: -97.7564 BOWIE, TX	> 12. mi from WISETXGW07	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	T&T A #1H, B #2H, C #3H	Latitude: 33.5040 Longitude: -97.6543 BOWIE, TX	Approximately 6 mi from WISETXGW06	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	UMBERSON B #2H, C #1H, C #2H	Latitude: 33.6069 Longitude: -97.6152 BOWIE, TX	> 13 mi from WISETXGW06	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	HUDSPETH B #1H, C #2H	Latitude: 33.5263 Longitude: -97.5552 BOWIE, TX	Approximately 8 mi from WISETXGW07	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	SETTLE C #3H	Latitude: 33.5354 Longitude: -97.4616 BOWIE, TX	> 12 mi from WISETXGW06	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	GREENWOOD A #2H, C #3H	Latitude: 33.5027 Longitude: -97.6035 BOWIE, TX	Approximately 6.5 miles mi from WISETXGW06.	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	KRAMER C #5H	Latitude: 33.5370 Longitude: -97.6945 BOWIE, TX	> 10, mi from WISETXGW06.	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	BOWIE EAST COMPRESSOR SITE	Latitude: 33.5801 Longitude: -97.7700 BOWIE, TX	> 14 mi from WISETXGW06.	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but Because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	CAIN C #4H, D #5H	Latitude: 33.5800 Longitude: -97.5835 BOWIE, TX	Approximately 11 mi from WISETXGW07	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	BROWN C #1H	Latitude: 33.5080 Longitude: -97.6227 BOWIE, TX	> 6 mi from WISETXGW07	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	CHRISTIAN C #2H-#4H	Latitude: 33.5138 Longitude: -97.4544 BOWIE, TX 76230	Approximately 11 mi from WISETXGW07	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	CHRISTIAN C #1H	Latitude: 33.5120 Longitude: -97.4557 BOWIE, TX	Approximately 11 mi from WISETXGW07	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	BILLY HENDERSON A #3H, A #3H, B #1H, C #2H, D #3H	Latitude: 33.5879 Longitude: -97.6561 BOWIE, TX	Approximately 11 mi from WISETXGW07	No	Oil and Gas Processing operation. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan FINDS	UNAUTHORIZED DUMP SITE SH 1816 MONTAGUE	FROM BOWIE ON STATE HIGHWAY 1816 ON DEER RIDGE RD. BOWIE, TX 76230	> 12 mi from WISETXGW07	No	Unknown contamination. Because of distance to sample locations, this site is not considered a potential candidate source.	
2 orphan TIER 2	BOWIE TRUCK (AKA TEPPCO BOWIE)	FROM JCT. HWY 287 AND FM174 APPROX 2.25 MI NW OF BOWIE TURN BOWIE, TX 76230	> 15 mi. NW from WISETXGW06.	No	Listed in TIER 2 listing (listing of facilities which store or manufacture hazardous materials and submit a chemical inventory report). Because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	BOWIE STATION	1.2 MILES SOUTHEAST ON HWY 174 FROM HWY 287 BOWIE, TX 76230	> 15 mi. NW from WISETXGW06.	No	Oil Processing/Transportation facility. . BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
2 orphan TIER 2	HINDS CLARK C	J. HARDY SVY-SEC. A-970 BOWIE, TX 76230 Latitude: 33.5291 Longitude: 97.1822	Approximately 15 mi. NW from WISETXGW06.	No	Records and coordinates indicate this is a dam. Because of distance to sample locations, this site is not considered a potential candidate source.	
orphan RCRA-CESQG	ALL AMERICAN OIL SERVICES INC	HWY 297 AND FRUITLAND RD BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Conditionally Exempt Small Quantity Generator. No violartions found. Because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	J.C. GOSSETT # 2	RRC# 20656 BOWIE, TX 76230 Latitude: 33.47933 Longitude: 97.97260	> 20 mi. from WISETXGW06.	No	No contaminant information is reported for this site. Storage Tank at site. Because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	WISE PRODUCTION COMPANY - HUTH	RRC# 14116 BOWIE, TX 76230 Latitude: 33.61573 Longitude: 97.88792	> 20 mi. from WISETXGW07	No	Crude Petroleum and Natural Gas Extraction. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	WISE PRODUCTION COMPANY - DENSON	RRC# 149353 BOWIE, TX 76230 Latitude: 33.57124 Longitude: 97.90881	> 20 mi. from WISETXGW07	No	Crude Petroleum and Natural Gas Extraction. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	CHRISTIE A,B,C,D	Latitude: 33.656031 Longitude: 97.764273 BOWIE, TX	Approximately 19 mi. from WISETXGW06.	No	Crude Petroleum and Natural Gas Extraction. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
Ind. Haz Waste, RCRA NonGen / NLR, FINDS orphan	ARCO PIPE LINE BOWIE STATION	US HIGH WA Y 287 BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Pipeline operations BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan Ind. Haz Waste	TEXAS DEPARTMENT OF TRANSPORTATION	US HIGH WAY 81 N BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	NON INDUS, CESQG-Petroleum UST (6)- 4 removed-Possibly a LUST in 1992-BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	

Table C21 Environmental Database Review Summary, EPA - Wise County, Texas - Location C

Database	Name of Facility	Site Location and Address	Distance from Nearest Sample Point	Potential Candidate Cause		Ground Water Wells
				Yes/No	Justification	
2 TIER 2 orphan	GILMORE LEASE	NEAR US 81 BOWIE, TX 76230 USA Latitude: 33.61257 Longitude: 97.87832	> 20 mi. from WISETXGW07	No	Crude Petroleum and Natural Gas Extraction. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
2 orphan TIER 2	MAYFIELD LEASE - RRC# 23679	NEAR US 287 BOWIE, TX 76230 Latitude: 33.60803 Longitude: 97.96200	> 24 mi. from WISETXGW07	No	Crude Petroleum storage. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
2 orphan TIER 2	MCB LEASE - RRC# 29981	NEAR US 81 BOWIE, TX 76230 Latitude: 33.65470 Longitude: 97.89083	> 23 mi. from WISETXGW07	No	Crude Petroleum storage. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan FINDS, US AIRS	TEPPCO BOWIE PIPELINE STATION	ON U.S. HWY 287 (BUSINESS ROUTE BOWIE, TX 76230	Approximately 15 mi. NW from WISETXGW06.	No	Pipeline operations BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan UST	VACANT SITE	HWY 455 & 922 FORESTBURG, TX 76239	Approximately 8 mi. NNE from WISETXGW07	No	Petroleum products were stored at this site. USTs removed since 1974. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan Ind. Haz Waste, UST	DILLS GARAGE	HIGHWAY 455 FORESTBURG, TX 76239	Approximately 8 mi. NNE from WISETXGW07	No	BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan LPST, UST	RUBY FANNING EXXON	HWY 455 FORESTBURG, TX 76239	Approximately 8 mi. NNE from WISETXGW07	No	Petroleum products were stored at this site. USTs removed since 1995. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	DAN #1 LEASE	HIGHWAY 922 FORESTBURG, TX 76239 Latitude: 33.49792 Longitude: 97.48044	> 10 mi. from WISETXGW07	No	BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan AST	GRANDPAS CORNER STORE	CORNER HWY 455 & HWY 6 FORESTBURG, TX 76239	Approximately 8 mi. NNE from WISETXGW07.	No	AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
2 orphan TIER 2	FORESTBURG - AMERICAN TOWER CORP SITE #89151	PT. S.D. HUGHS SURVEY FORESTBURG, TX 76239	Approximately 8 mi. NNE from WISETXGW07.	No	BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan ICIS	TE PRODUCTS PIPELINE COMPANY, L.P. - 8" CRUDE OIL PIPELINE F	W OF S HWY. 81, APPROX. 6.7 M S OF S HWY 82 STONEBURG, TX 76230	> 20 mi. NW from WISETXGW06.	No	Listed in ICIS database (ICIS-06-2002-4851 FORMAL ENFORCEMENT ACTION). No other information found. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan TIER 2	KEY ENERGY SERVICES / BANDERA SWD #1 & #3	11844 US HWY 287 N SUNSET, TX 76230	Approximately 8 mi. WNW from WISETXGW06.	No	Support Activities for Oil and Gas Operations. AST. BTEX sources may exist, but because of distance to sample locations, this site is not considered a potential candidate source.	
orphan ENF	WEST WISE RURAL WSC WATER PLANT	CORNER OF FM1658 AND FM2954 WISE COUNTY	Approximately 15 mi. SW from WISETXGW06.	No	Several violations: Inadequate written backflow assembly prevention assembly testing program. Failure to provide adequate containment facilities for all liquid chemical storage tanks. Failure to calibrate the flow measuring device for treated discharge water. Failure to conduct quarterly calibration for the online turbidimeter for 2010. Failed to prevent an unauthorized discharge of sewage, municipal waste, agricultural waste, or industrial waste into or adjacent to any water in the state. Because of distance to sample locations, this site is not considered a potential candidate source.	
orphan ENF	BIG SANDY CREEK WS SCS SITE 44 DAM	2.5 MILES NW OF RHOME WISE COUNTY	Approximately 20 mi. SSE from WISETXGW06.	No	Flood control notices of violations. Because of distance to sample locations, this site is not considered a potential candidate source.	
orphan ENF	BIG SANDY CREEK WS SCS SITE 43 DAM	3 MILES NW OF RHOME WISE COUNTY	Approximately 20 mi. SSE from WISETXGW06.	No	Flood control notices of violations. Because of distance to sample locations, this site is not considered a potential candidate source.	

Primary Source: Environmental records search report by Environmental Data Resources, Inc. (EDR)

Notes:

EDR Inquiry Number: 3589232.16s
EDR Search Radius: 3 miles
Center of Search: Lat. 33.4127000 - 33° 24' 45.72'', Long. 97.6189000 - 97° 37' 8.04''
ORPHAN SITE: A site of potential environmental interest that appear in the records search but due to incomplete location information (i.e., address and coordinates) is unmappable and not included in the records search report provided by EDR Inc.

Key:

AST = Above ground storage tank.
FRDS = Federal Reporting Data System.
mi = Mile.
NI = No infromation.
NPDES = National Pollutant Discharge Elimination System.
USGS = United States Geological Survey.

Databases:

AST = Aboveground Storage Tank
CERCLIS = Comprehensive Environmental Response, Compensation, and Liability Information System
CESQG = Conditionally Exempt Small Quantity Generator

ENF = Administrative Orders issued to Municipal Solid Waste, Petroleum Storage Tank and Multi-Media sites. Multi-Media Sites
FINDS = Facility Index System
ICIS = Integrated Compliance Information System (ICIS)
Ind. Haz Waste = Industrial Hazardous Waste
LPST = Leaking petroleum storage tank
NonGen/NLR = Non-Generator/No Longer Listed
NOV = Notice of Violation
NPL = National priority list
RCRA = Resource Conservation and Recovery Act
SQG = Small Quantity Generator
TIER 2 = A listing of facilities which store or manufacture hazardous materials and submit a
US AIRS = United States Aerometric Information Retrieval System
UST = Underground storage tank

Table C22 Well Inventory Sumary for Wise County Texas - Location C

API Number	Texas RRC Well ID	Lateral Length	Well Type	Surface Well Longitude	Surface Well Latitude	Bottom Well Longitude	Bottom Well Latitude
42497	808100	0	4	-97.624324	33.371043	-97.624324	33.371043
4249731452	808106	0	3	-97.615792	33.373566	-97.615792	33.373566
4249731461	808492	0	4	-97.635240	33.372028	-97.635240	33.372028
4249731495	808516	0	10	-97.629027	33.371613	-97.629027	33.371613
4249731975	809274	0	4	-97.629190	33.430291	-97.629190	33.430291
4249731846	809275	0	4	-97.636405	33.430352	-97.636405	33.430352
4249733212	809276	0	2	-97.631914	33.430000	-97.631914	33.430000
42497	809277	0	4	-97.638617	33.428404	-97.638617	33.428404
4249731031	809278	0	2	-97.667706	33.426581	-97.667706	33.426581
4249731863	809279	0	7	-97.632966	33.432065	-97.632966	33.432065
4249731857	809280	0	7	-97.640003	33.430977	-97.640003	33.430977
4249731928	809281	0	8	-97.637409	33.427418	-97.637409	33.427418
4249731032	809282	0	3	-97.658712	33.424044	-97.658712	33.424044
42497	809283	0	3	-97.639271	33.424797	-97.639271	33.424797
42497	809284	0	3	-97.633508	33.418851	-97.633508	33.418851
4249730479	809285	0	7	-97.625815	33.412870	-97.625815	33.412870
4249731537	809288	0	7	-97.634806	33.376457	-97.634806	33.376457
4249731580	809289	0	4	-97.630761	33.377660	-97.630761	33.377660
4249731897	809290	0	7	-97.627315	33.385089	-97.627315	33.385089
4249731646	809291	0	10	-97.638851	33.376401	-97.638851	33.376401
4249731651	809292	0	7	-97.627346	33.381005	-97.627346	33.381005
4249731898	809293	0	7	-97.633258	33.385095	-97.633258	33.385095
4249731936	809294	0	9	-97.638650	33.384413	-97.638650	33.384413
42497	809295	0	8	-97.626438	33.404503	-97.626438	33.404503
4249731455	809296	0	10	-97.630642	33.397748	-97.630642	33.397748
42497	809297	0	3	-97.642108	33.406207	-97.642108	33.406207
4249731311	809298	0	3	-97.625615	33.407341	-97.625615	33.407341
4249732480	809299	0	10	-97.625212	33.405786	-97.625212	33.405786
4249731706	809300	0	3	-97.628172	33.389364	-97.628172	33.389364
42497	809301	0	3	-97.640126	33.381104	-97.640126	33.381105
4249731741	809302	0	4	-97.627325	33.376087	-97.627325	33.376087
4249731297	809344	0	7	-97.662472	33.397248	-97.662472	33.397248
42497	809349	0	3	-97.631315	33.433523	-97.631315	33.433523
4233731355	809484	0	7	-97.632012	33.436169	-97.632012	33.436169
4233731838	809485	0	9	-97.626443	33.438417	-97.626443	33.438417
4233731505	809486	0	7	-97.634931	33.434639	-97.634931	33.434639
42337	809487	0	3	-97.631951	33.434552	-97.631951	33.434552
4249731641	809504	0	7	-97.632004	33.381603	-97.632004	33.381603
4249732156	809505	0	7	-97.615777	33.383367	-97.615777	33.383367
4249732878	809506	0	7	-97.614357	33.388066	-97.614357	33.388066
4249732230	809509	0	2	-97.601079	33.433218	-97.601079	33.433218
4249732220	809510	0	2	-97.595649	33.424295	-97.595649	33.424295
4249732238	809511	0	9	-97.611598	33.386056	-97.611598	33.386056
4249732326	809512	0	9	-97.609464	33.383339	-97.609465	33.383339
4249732327	809513	0	9	-97.602522	33.382654	-97.602522	33.382654
4249731852	809515	0	9	-97.574953	33.410781	-97.574953	33.410781
4249731851	809516	0	9	-97.585147	33.408504	-97.585147	33.408504
4249731483	809517	0	9	-97.620374	33.399615	-97.620374	33.399615
4249730421	809519	0	7	-97.623096	33.421838	-97.623096	33.421839
4249730348	809520	0	7	-97.622102	33.431369	-97.622102	33.431369
4249732146	809521	0	7	-97.604370	33.431988	-97.604370	33.431988
4249732229	809522	0	7	-97.602806	33.431774	-97.602806	33.431774
4249732184	809523	0	3	-97.619471	33.433597	-97.619471	33.433597
42497	809524	0	3	-97.614091	33.425412	-97.614091	33.425412
42497	809525	0	3	-97.610431	33.428119	-97.610431	33.428119
42497	809526	0	3	-97.591402	33.427801	-97.591402	33.427801
4249730017	809527	0	7	-97.583717	33.402448	-97.583717	33.402448
42497	809528	0	3	-97.588166	33.416089	-97.588166	33.416089
4249732498	809529	0	3	-97.621426	33.402047	-97.621426	33.402047
4249731596	809530	0	3	-97.617773	33.394848	-97.617773	33.394848
4249732021	809531	0	7	-97.623224	33.386393	-97.623224	33.386393
4249732298	809532	0	3	-97.615796	33.380608	-97.615796	33.380608
4249732322	809533	0	7	-97.612717	33.381438	-97.612717	33.381438
4249732272	809534	0	3	-97.608281	33.387819	-97.608281	33.387819
4249732130	809535	0	3	-97.595078	33.381932	-97.595078	33.381932
4249732235	809536	0	10	-97.599503	33.379251	-97.599504	33.379251
4249731874	809537	0	3	-97.590697	33.388148	-97.590697	33.388148
4249731667	809538	0	7	-97.586453	33.387013	-97.586453	33.387013
4249731636	809539	0	3	-97.581251	33.386638	-97.581251	33.386638
4249731410	809540	0	8	-97.583477	33.381614	-97.583477	33.381614
4249731853	809570	0	3	-97.585779	33.411412	-97.585779	33.411412
4233731659	809584	0	9	-97.619054	33.448067	-97.619054	33.448067
4233731918	809585	0	9	-97.617861	33.447168	-97.617861	33.447168
4233731342	809586	0	3	-97.619241	33.438878	-97.619241	33.438878
4233731778	809587	0	3	-97.602806	33.433934	-97.602806	33.433934
42337	809588	0	3	-97.597266	33.447971	-97.597266	33.447971
42337	809590	0	3	-97.604420	33.452706	-97.604420	33.452706
42337	809591	0	3	-97.604438	33.444955	-97.604438	33.444955
4249734703	1071546	0	4	-97.610366	33.421786	-97.610366	33.421786
4233733425	1073749	0	4	-97.612372	33.440809	-97.612372	33.440809
4249734741	1074075	0	7	-97.583917	33.422870	-97.583917	33.422870
4249735485	1093858	0	2	0.000000	0.000000	-97.613621	33.390505
4249735486	1093859	0	2	0.000000	0.000000	-97.616714	33.388736
4249735487	1093860	0	4	0.000000	0.000000	-97.615783	33.382837
	1100541	0	2	-97.613621	33.390505	0.000000	0.000000
	1100542	0	2	-97.616714	33.388736	0.000000	0.000000
	1100543	0	4	-97.615783	33.382837	0.000000	0.000000
4249732257	1108596	0	9	-97.599685	33.431165	-97.599685	33.431165
4249733134	1108654	0	2	-97.632170	33.430136	-97.632170	33.430136
4249735890	1125715	0	4	-97.621361	33.388499	-97.621361	33.388499
4249735898	1126651	0	4	-97.625057	33.388084	-97.625057	33.388084

Table C22 Well Inventory Sumary for Wise County Texas - Location C

API Number	Texas RRC Well ID	Lateral Length	Well Type	Surface Well Longitude	Surface Well Latitude	Bottom Well Longitude	Bottom Well Latitude
4249735901	1126782	0	4	-97.601040	33.423625	-97.601040	33.423625
4249735902	1126784	0	2	-97.613117	33.416285	-97.613117	33.416285
4249735908	1127820	0	6	-97.631217	33.386186	-97.631217	33.386186
4249735921	1129192	0	4	-97.635244	33.396376	-97.635244	33.396376
4249735928	1130007	0	6	-97.631617	33.400093	-97.631617	33.400093
4249735937	1131002	0	4	-97.629585	33.394533	-97.629585	33.394533
4249735995	1136054	0	5	-97.650844	33.424078	-97.650844	33.424078
4249736008	1137190	0	5	-97.657149	33.418847	-97.657149	33.418847
4249736026	1138168	0	5	-97.661670	33.421813	-97.661670	33.421813
4249736042	1139544	0	5	-97.592681	33.401726	-97.592681	33.401726
4249736044	1139619	0	5	-97.591454	33.398524	-97.591454	33.398524
4249736103	1144010	0	4	-97.614105	33.417274	-97.614105	33.417274
4249736176	1148769	0	5	-97.655404	33.430644	-97.655404	33.430644
4249736163	1149653	0	5	-97.625776	33.407103	-97.625776	33.407103
4249736341H1	1163101	2825	86	-97.588094	33.416399	-97.578838	33.416231
4249736357H1	1164529	2317	86	-97.658240	33.428836	-97.665056	33.431646
4249736377H1	1165678	2964	86	-97.631313	33.430262	-97.628020	33.422596
4249736400H1	1167472	2486	86	-97.669621	33.417918	-97.677443	33.419835
4249736401H1	1167549	3343	86	-97.576915	33.427143	-97.587842	33.426460
4233733978H1	1169039	2090	86	-97.617147	33.444596	-97.621923	33.448717
4249736439H1	1170547	3333	86	-97.613966	33.417374	-97.603058	33.416850
4233734010H1	1172870	2546	86	-97.642601	33.439692	-97.634472	33.441275
4249736483H1	1173414	2702	86	-97.616442	33.370502	-97.624396	33.373763
4249736502H1	1174841	3147	86	-97.577777	33.431087	-97.570600	33.424875
4249736549H1	1178651	3204	86	-97.641221	33.426610	-97.631424	33.423435
4249736620H1	1178652	0	86	-97.667908	33.399725	-97.658160	33.397299
4249736592H1	1181921	2598	86	-97.618737	33.413750	-97.622410	33.420192
	1184351	3103	86	0.000000	0.000000	0.000000	0.000000
4233734134	1184635	0	19	-97.595333	33.438914	-97.595333	33.438914
4233734174	1189256	0	2	-97.612787	33.455742	-97.612787	33.455742
4249737005H1	1205416	4789	86	-97.654277	33.394959	-97.666485	33.403231
4249737009H1	1205684	4361	86	-97.607415	33.402239	-97.618131	33.410170
4249737010H1	1205688	5303	86	-97.644211	33.391001	-97.656780	33.401069
4249737038H1	1207540	3218	86	-97.589620	33.412920	-97.597391	33.418901
4249737039H1	1207831	4720	86	-97.603220	33.406000	-97.614706	33.414691
4249737047H1	1208029	4815	86	-97.669648	33.418098	-97.679776	33.428249
4249737099H1	1211070	3971	86	-97.590374	33.388738	-97.599857	33.396213
4249737100H1	1211074	4338	86	-97.590409	33.388567	-97.582399	33.378716
4233734385H1	1212741	4288	86	-97.591393	33.439040	-97.583144	33.429495
4233734386H1	1212746	4315	86	-97.591355	33.439070	-97.582217	33.430016
4233734387H1	1212748	4144	86	-97.591317	33.439100	-97.581402	33.431313
4233734421H1	1215347	4306	86	-97.591387	33.439051	-97.583327	33.429335
4249737167H1	1216136	3892	86	-97.666970	33.392630	-97.658072	33.384966
4233734447H1	1216541	4131	86	-97.612755	33.454182	-97.606406	33.444152
4233734448H1	1216542	4540	86	-97.612678	33.454207	-97.604044	33.444040
4233734449H1	1216543	4722	86	-97.612648	33.454193	-97.602288	33.444549
4233734447HW	1216593	0	2	0.000000	0.000000	-97.612755	33.454182
4249737192H1	1219160	5386	86	-97.592900	33.401720	-97.605306	33.412251
4249737193H1	1219497	4519	86	-97.657942	33.428641	-97.667389	33.438210
4249737259H1	1225160	5347	86	-97.611509	33.383790	-97.597976	33.374456
4249736401HW	1225850	0	2	0.000000	0.000000	-97.576915	33.427143
4249737271H1	1226513	5352	86	-97.576600	33.411520	-97.563193	33.402034
4249737272H1	1226538	4583	86	-97.576515	33.411471	-97.568734	33.400697
4249737281H1	1226781	5507	86	-97.672289	33.414676	-97.659989	33.403597
4233734638H1	1228611	4132	86	-97.652075	33.450317	-97.643519	33.441509
4249737323H1	1230627	4083	86	-97.617492	33.379943	-97.608302	33.371787
4249737362H1	1234810	3758	86	-97.641113	33.426549	-97.632704	33.419001
4249737363H1	1234811	3798	86	-97.641093	33.426519	-97.633820	33.418044
4249737365H1	1234827	3937	86	-97.641073	33.426489	-97.634882	33.416995
4249737369H1	1235760	5182	86	-97.627189	33.407355	-97.641985	33.414346
4249737370H1	1235813	5745	86	-97.627152	33.407414	-97.614485	33.395729
4249737375H1	1236230	7617	86	-97.640596	33.400179	-97.658852	33.414459
4233734756H1	1240820	6090	86	-97.615138	33.451007	-97.627812	33.463944
4233734757H1	1240821	6201	86	-97.615101	33.450975	-97.626711	33.464968
4233734758H1	1240825	6016	86	-97.615175	33.451038	-97.628905	33.462913
4249737436H1	1246920	3988	86	-97.609819	33.423560	-97.618809	33.431517
4249737486H1	1250412	4929	86	-97.668010	33.428500	-97.659600	33.416930
4249737489H1	1250899	3986	86	-97.614245	33.432787	-97.606709	33.423836
4249737490H1	1250906	3968	86	-97.614248	33.432875	-97.604535	33.425620
4233735008H1	1261798	5269	86	-97.660140	33.453333	-97.654010	33.439791

Well Type Legend

2	Permitted Location
3	Dry Hole
4	Oil Well
5	Gas Well
6	Oil/Gas Well
7	Plugged Oil Well
8	Plugged Gas Well
9	Canceled Location
10	Plugged Oil/Gas Well
19	Shut-In Well (Oil)
86	Sidetrack Well Surface Location

Table C23 Number of Oil and Gas Wells in Wise County, Texas - Location C

Search Area Name	Search Area Radius (miles)	EPA Samples	Total Number of Oil and Gas Wells	Oil and Gas Wells within 1 Mile of EPA Sample Points
Location C	3	WISETXGW06 WISETXGW07	161	30

Table C24 Impoundments within 1 Mile of EPA Samples, Wise County, Texas - Location C

EPA Sample	Approximate Distance from EPA Sample to Nearest Well Pad and API Number	No. of Wells within 1 Mile of the EPA Sample	No. of Impoundments within 1 Mile of the EPA sample	Approximate Distance from EPA Sample to the Nearest Impoundment	Date of Google Earth Aerial Imagery showing Impoundment Nearest to the EPA Sample
WISETXGW06	0.3 miles SW 49731311	18	2	0.7 miles NE	10/8 – 4/12
WISETXGW07	0.3 NE 49736439	17	2	0.2 miles NE	10/8 – 4/12

Table C25 Notable Notice of Violations Summary, Wise County, Texas

Operator	API Permit	Lease Name	Well Number	Lease ID	Latitide	Longitude	Date of Violation	Job No.	Complaint/Violation	Corrected	Distance From Nearest EPA Sample	Search Area
Silver Creek Oil and Gas, LLC	33701437	Lynch R.S.	3	17786	33.42969	97.62985	04/08/13	2013-6235	Concerns about an abandoned well and possible casing leak. No leak observed, and no further action required.	NA	1.25 mi NW from WISETXGW07	C
375 Energy, LLC	49736592	Inogene Lynch 44	2H	31122	33.4132	97.6192186	09/06/11	2011-14425	Concerns about an oil and brine spill from a leaking valve inside the compressor station walls. The spill was contained inside the walls. Three 300-bbl steel tanks at the 2H well were also inspected; the tanks were not leaking. The operator performed delineation sampling to determine the extent of the contamination. Chlorides were detected up to 91,600 mg/kg; TPH up to 7,630 mg/kg; and several metals all below TCLP regulatory limits. The operator removed the affected area of soil. No violations were noted.	Yes	0.3 mi NE from WISETXGW06	C
375 Energy, LLC	49736592	Inogene Lynch 44	2H	31122	33.4132	97.6192186	02/09/13	2013-2505	Areas at the storage facility were found to be contaminated with produced fluids as a result of a storage tank overflow. The operator was directed to immediately remove all free-standing produced fluids form the ground surface; repair or replace all leaking equipment; conduct excavation operations to vertically and horizontally delineate all areas affected by produced fluids; and initiate and complete remedial cleanup operations for all areas affected by produced fluids to promote aeration and natural remediation. The site was re-inspected on 3/1/13 and cleanup had not been performed.	Unknown	0.3 mi NE from WISETXGW06	C

Source: Texas RailRoad Commission

Notes:

NA - Not applicable

NI - No information

Appendix C Figures

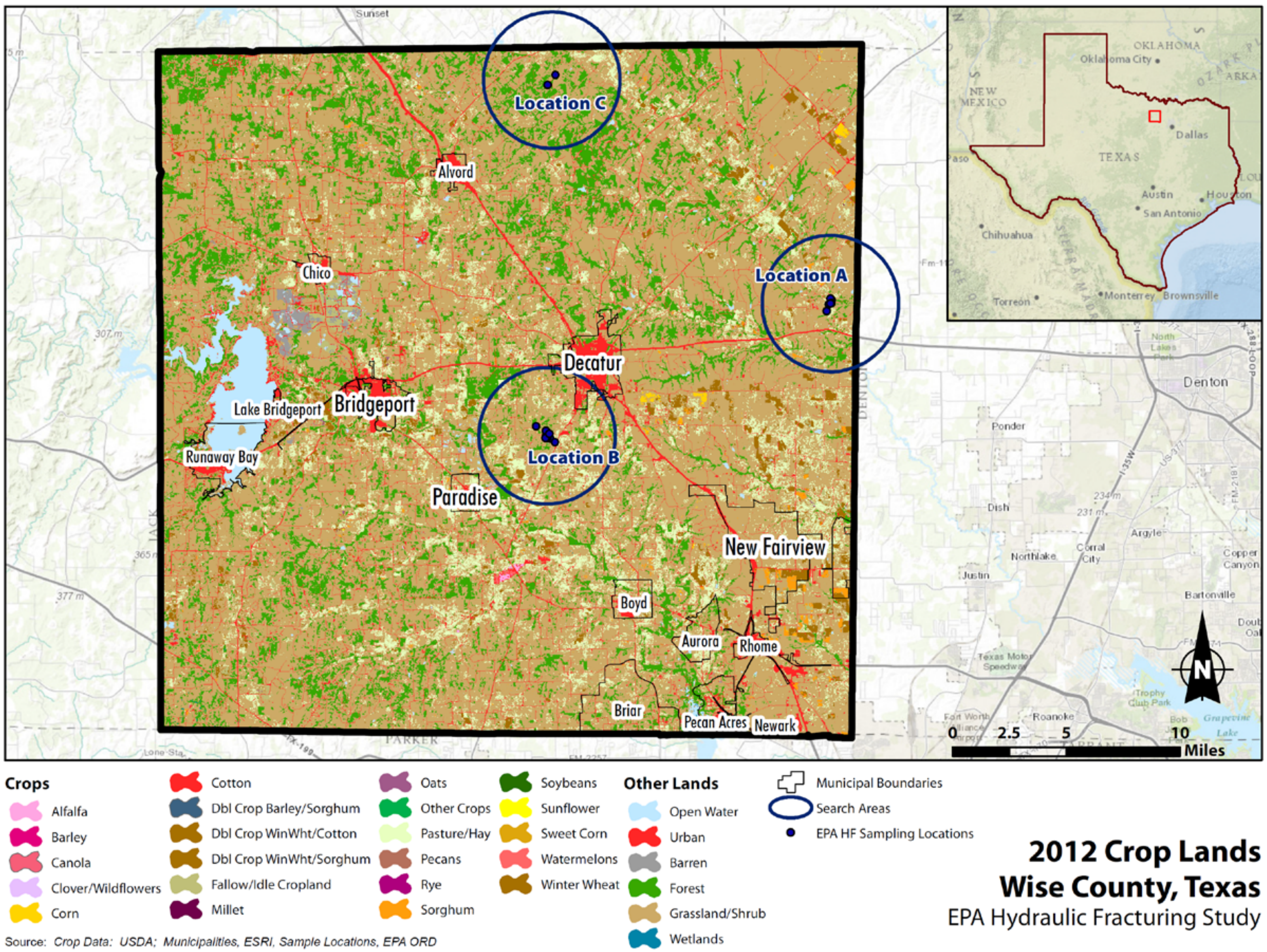

Figure C1 2012 Crop Lands

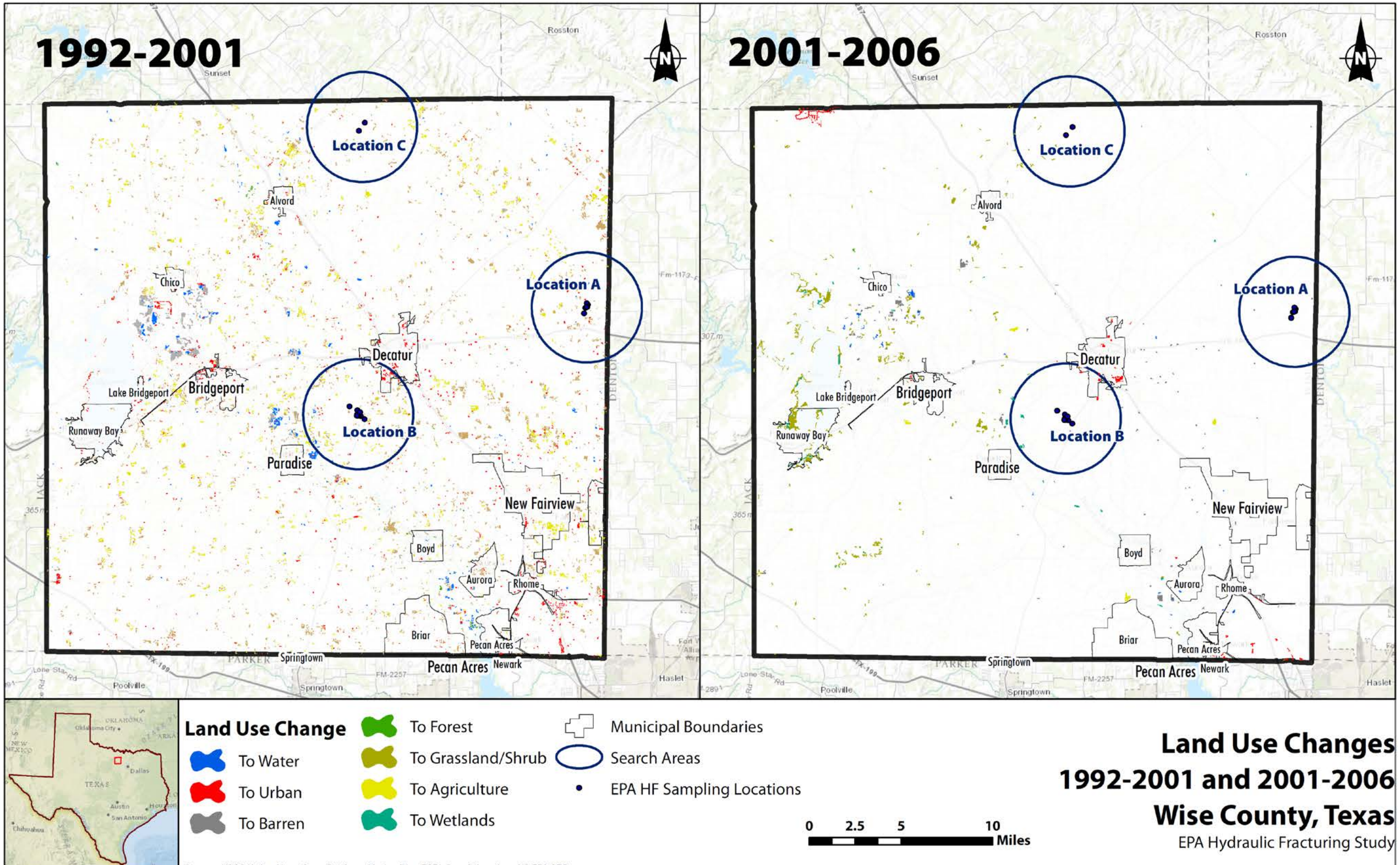

Figure C2 Land Use Changes, 1992-2001 and 2001-2006

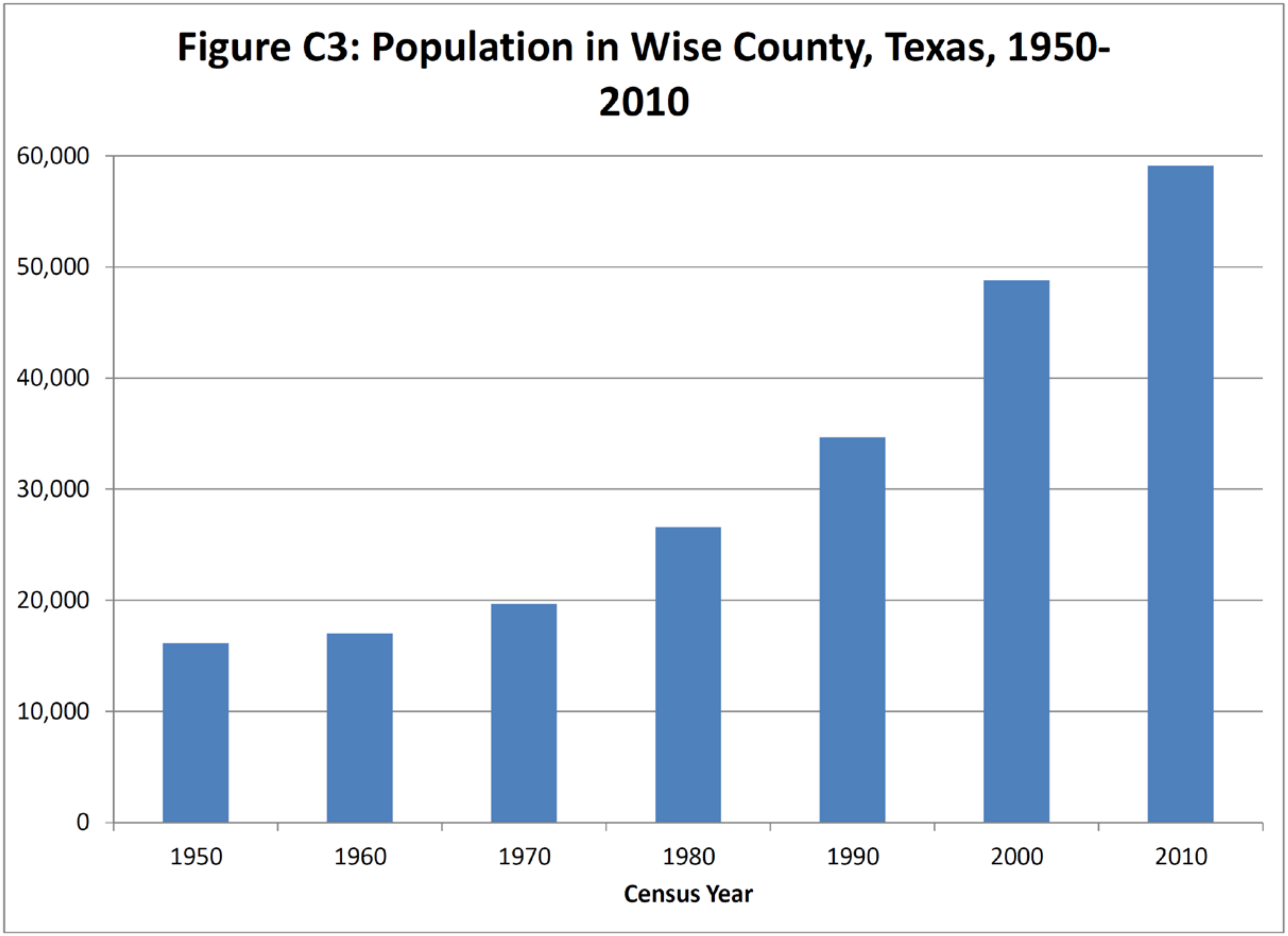
Figure C3: Population in Wise County, Texas, 1950-2010
60,000
50,000
40,000
30,000
20,000
10,000
0
1950
1960
1970
1980
1990
2000
2010
Census Year

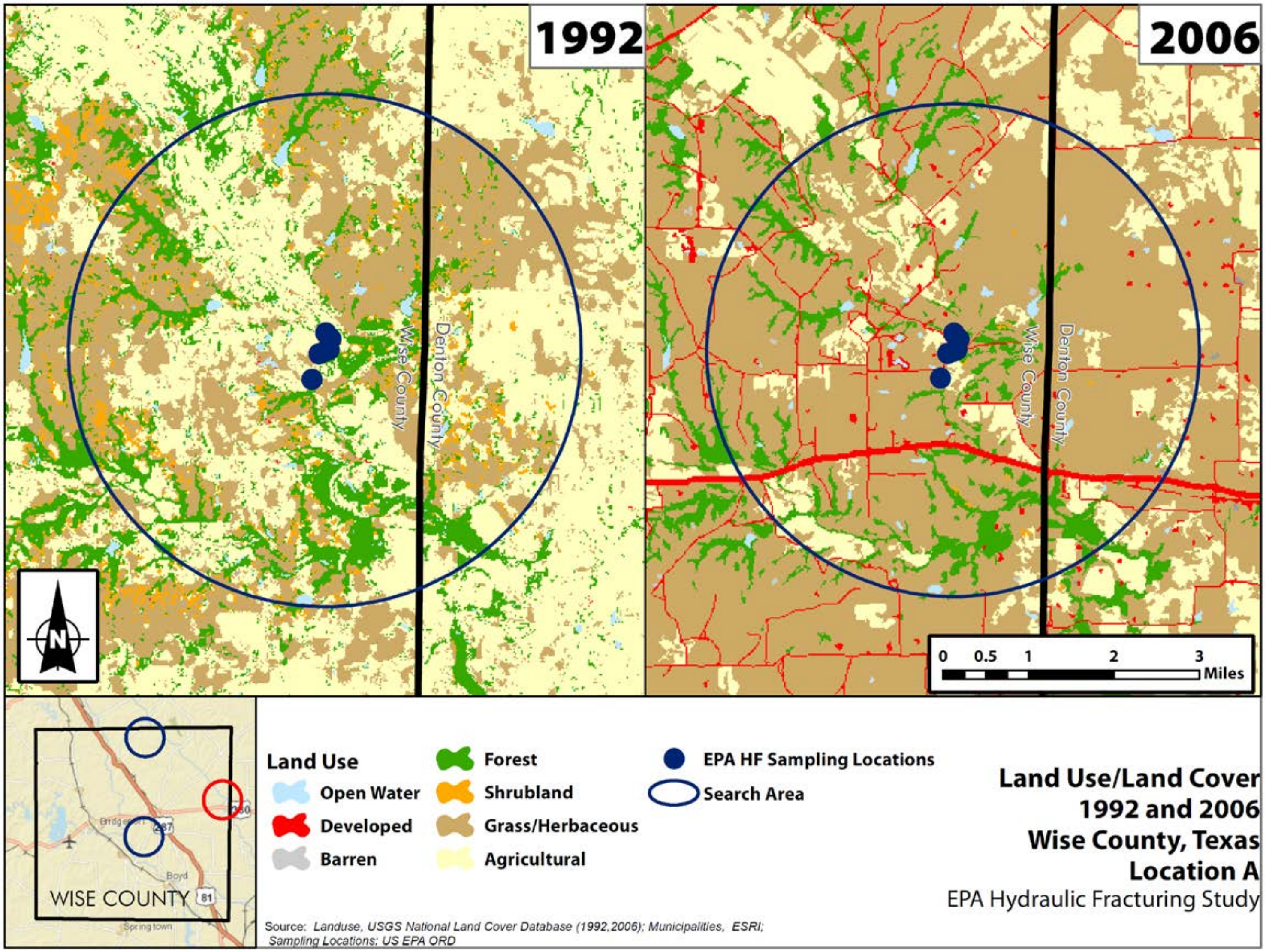

Figure C4 Land Use/Land Cover 1992 and 2006, Location A

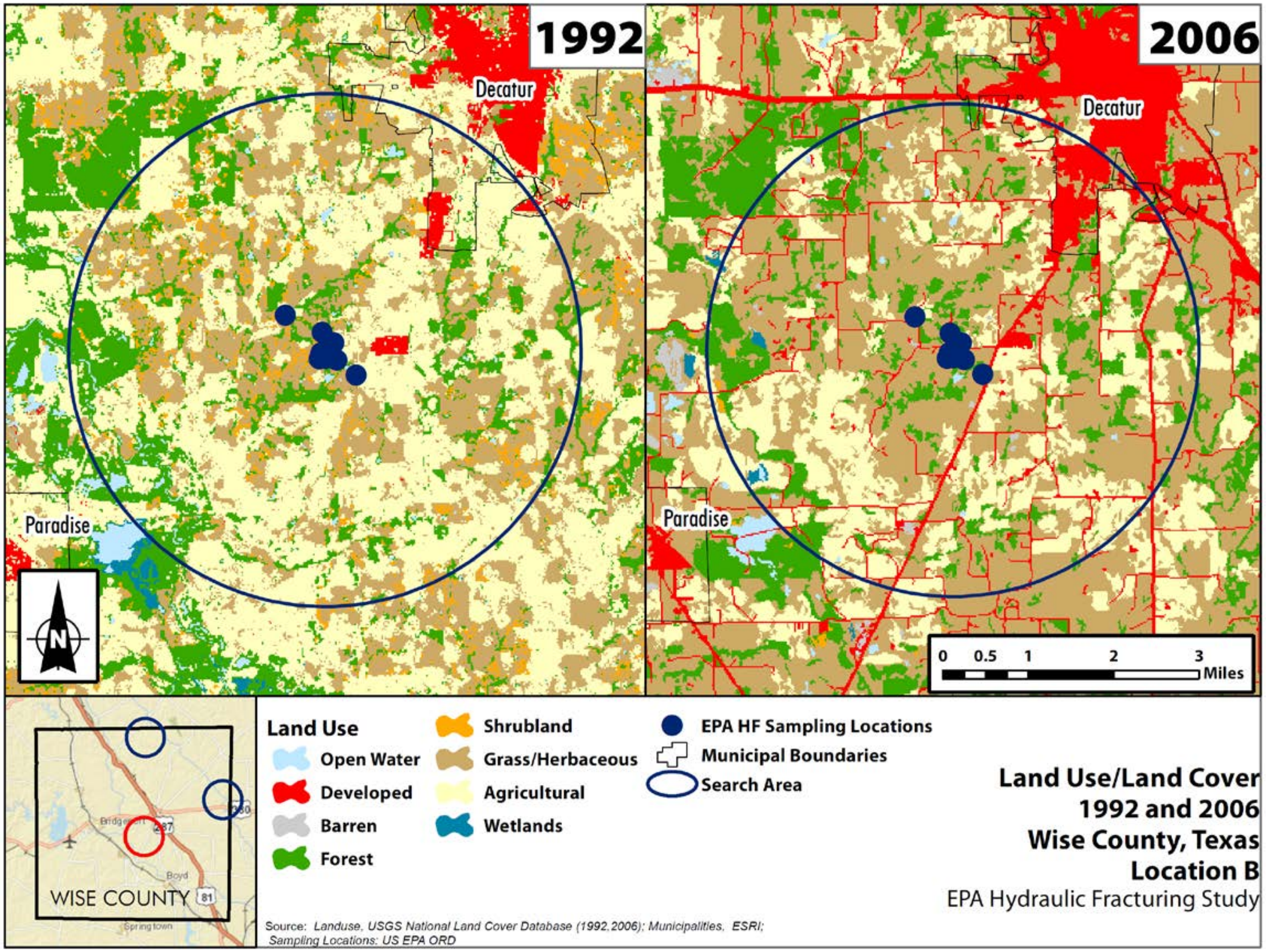

Figure C5 Land Use/Land Cover 1992 and 2006, Location B

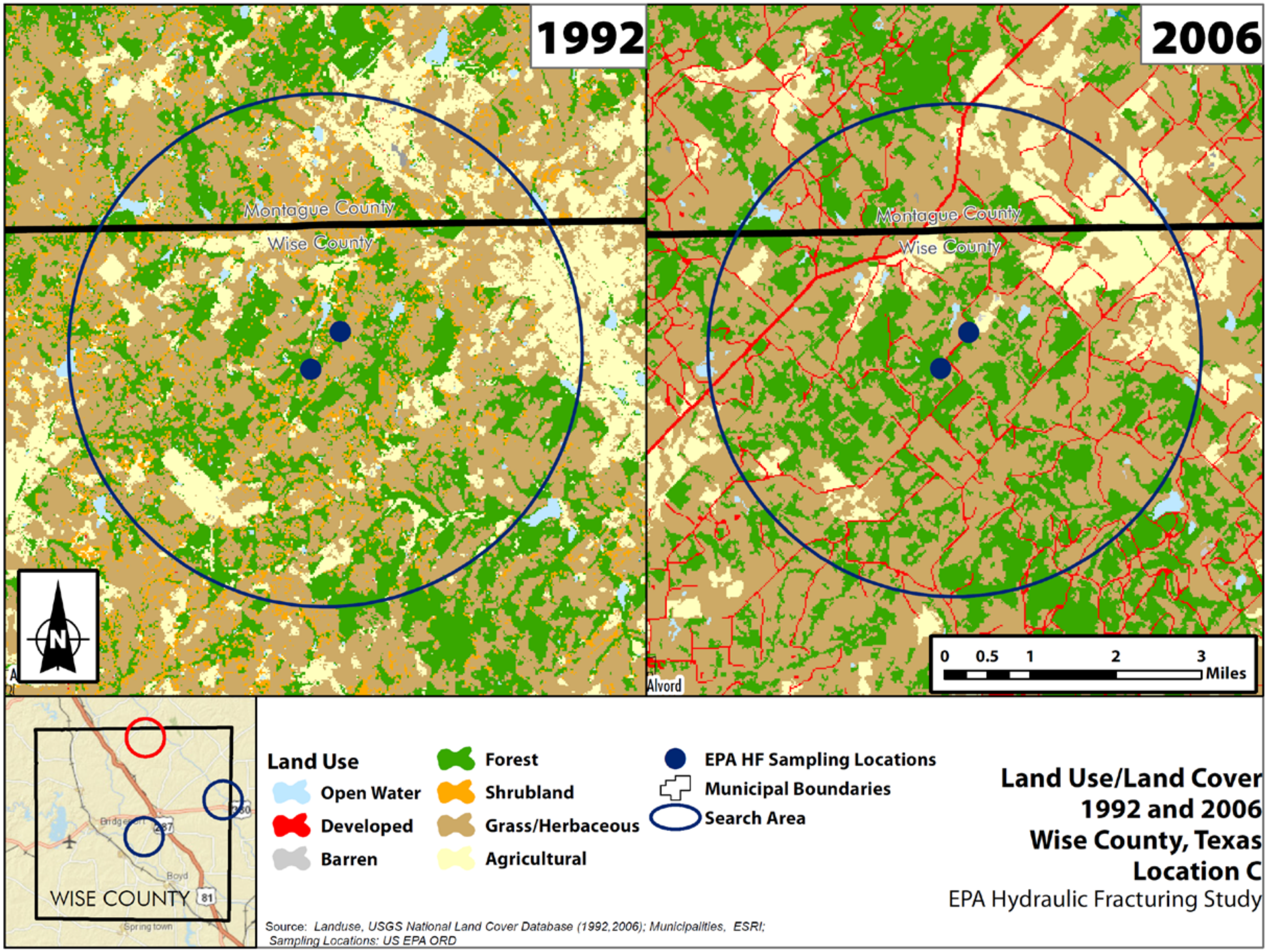

Figure C6 Land Use/Land Cover 1992 and 2006, Location C

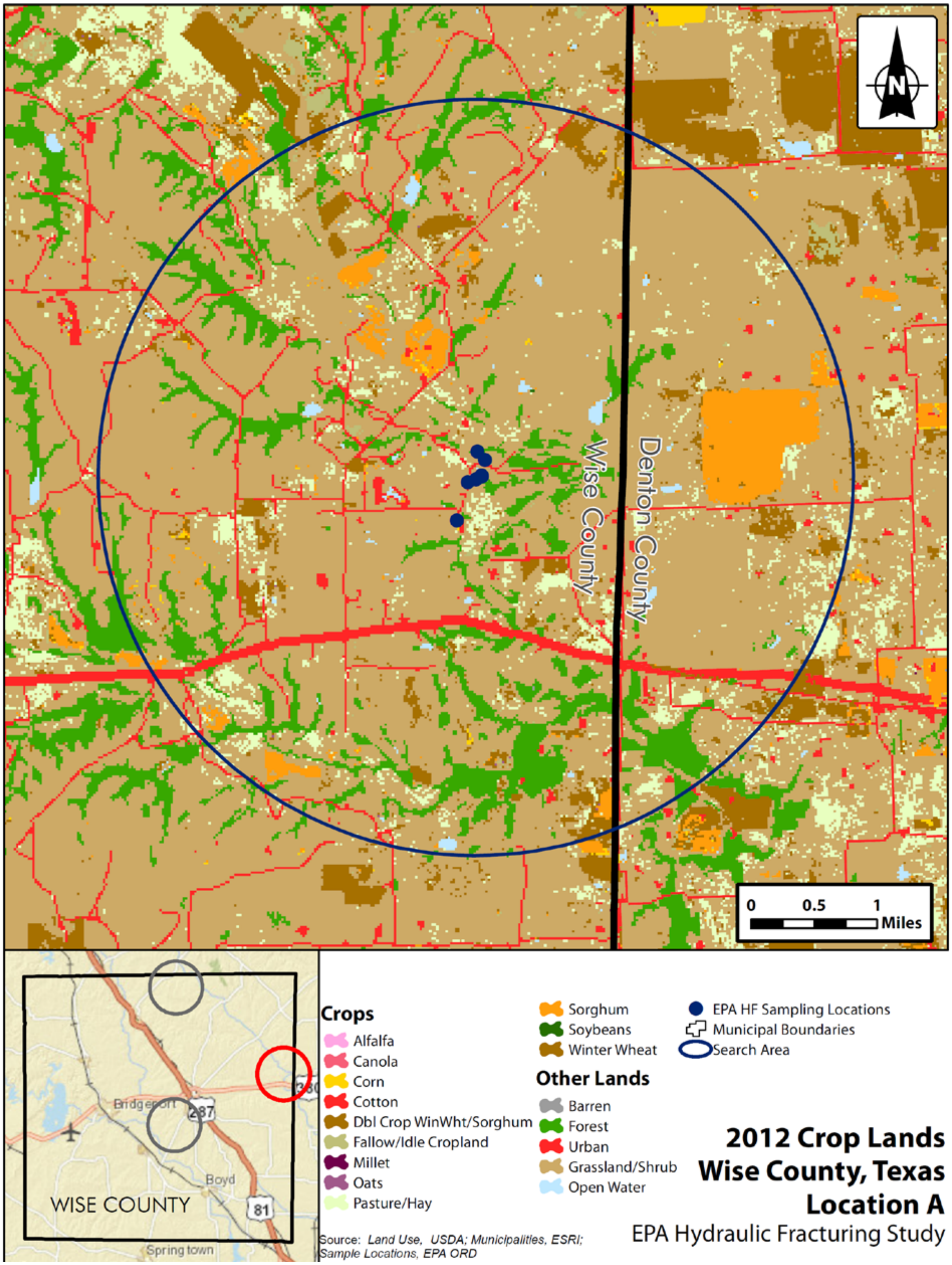

Figure C7 2012 Crop Lands, Location A

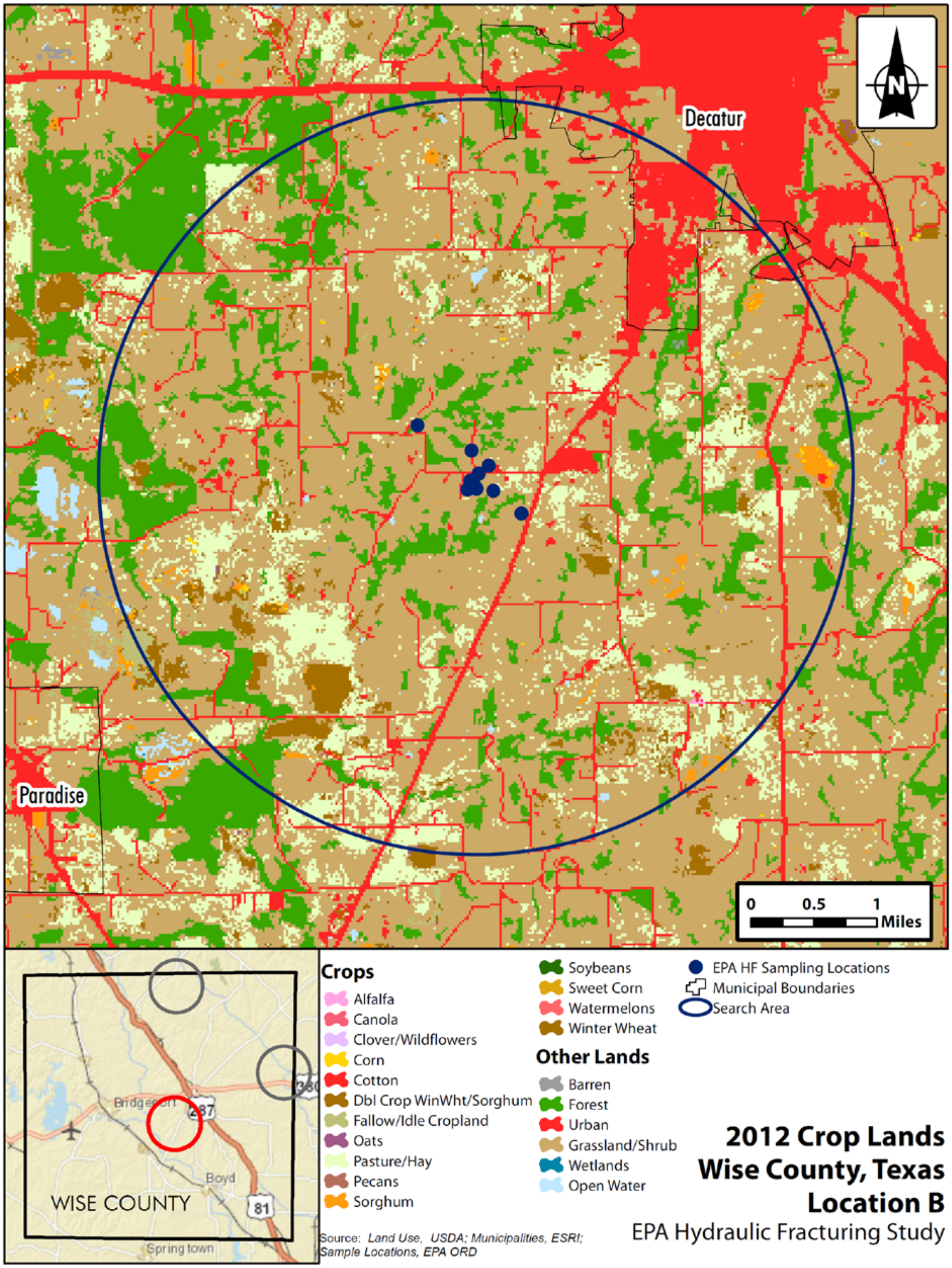

Figure C8 2012 Crop Lands, Location B

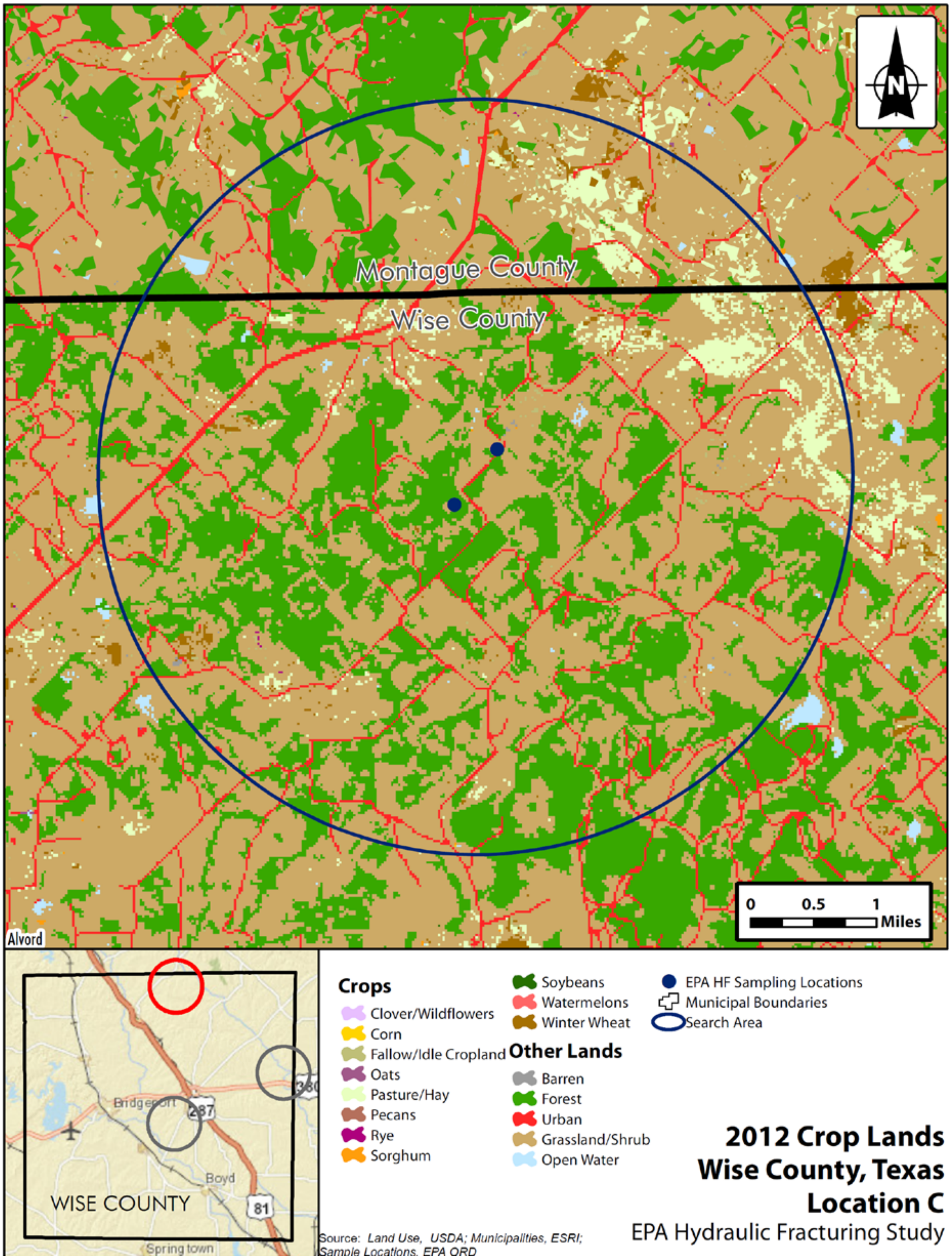

Figure C9 2012 Crop Lands, Location C

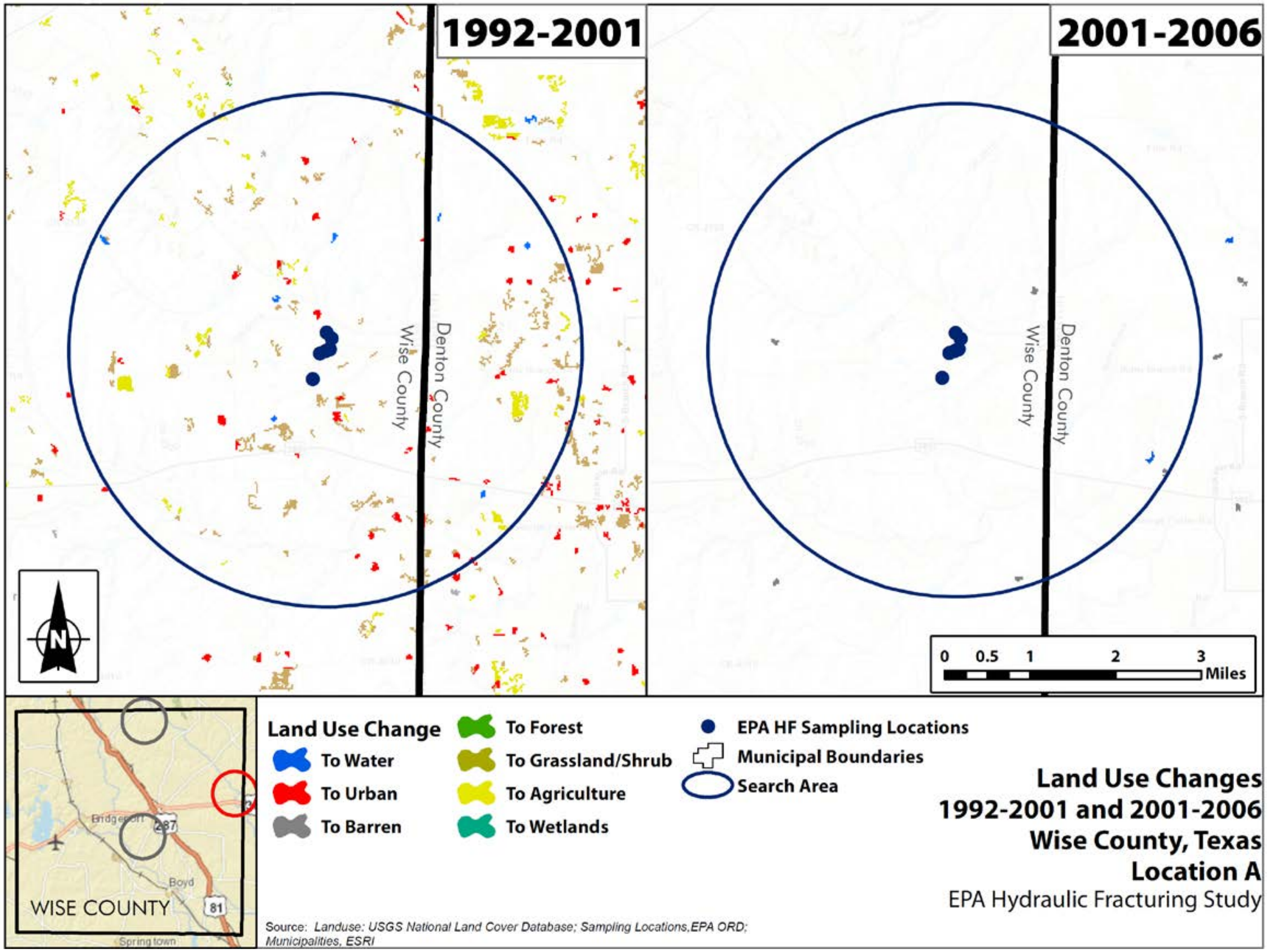

Figure C10 Land Use Change, 1992-2001 and 2001-2006, Location A

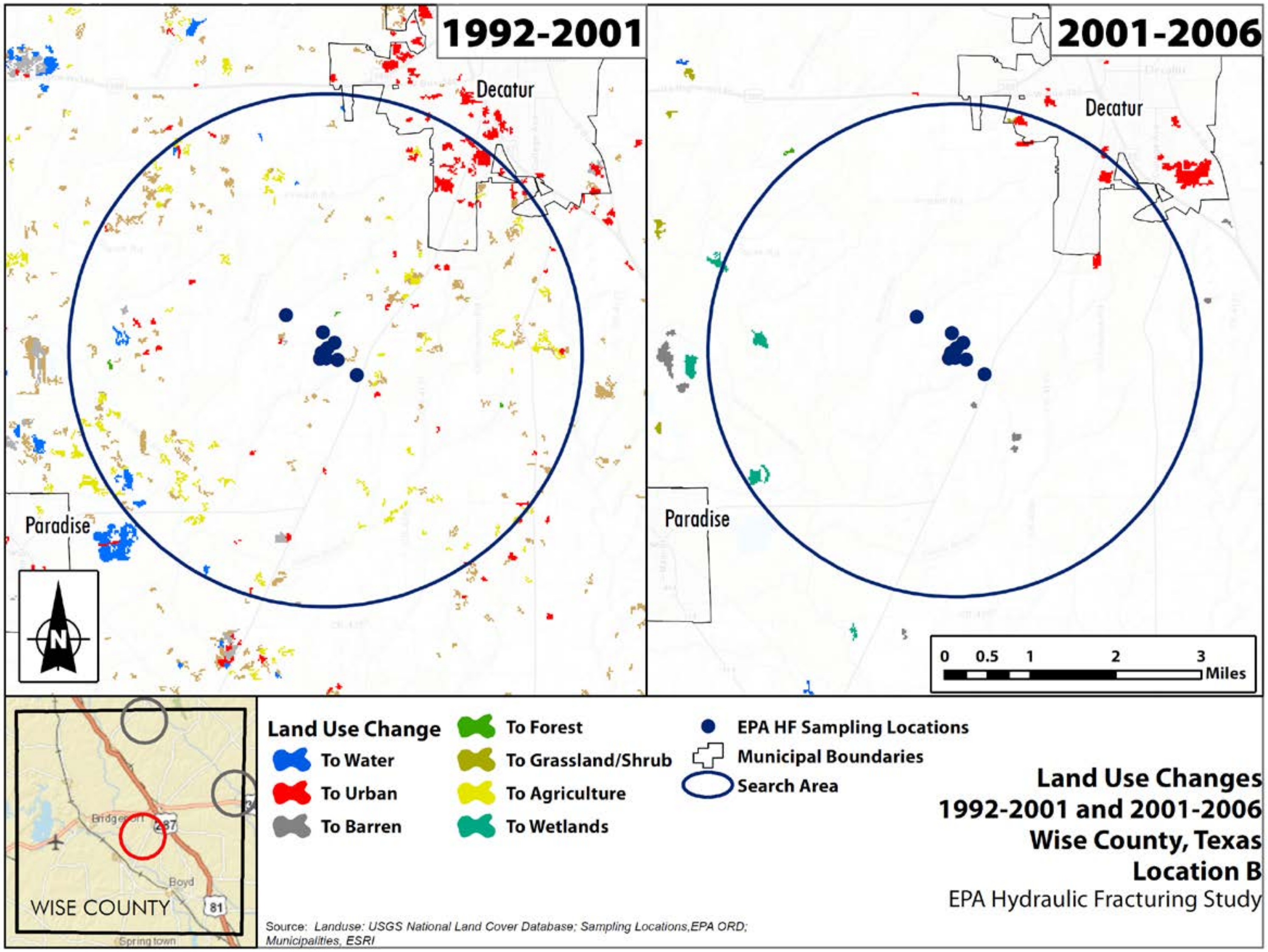

Figure C11 Land Use Change, 1992-2001 and 2001-2006, Location B

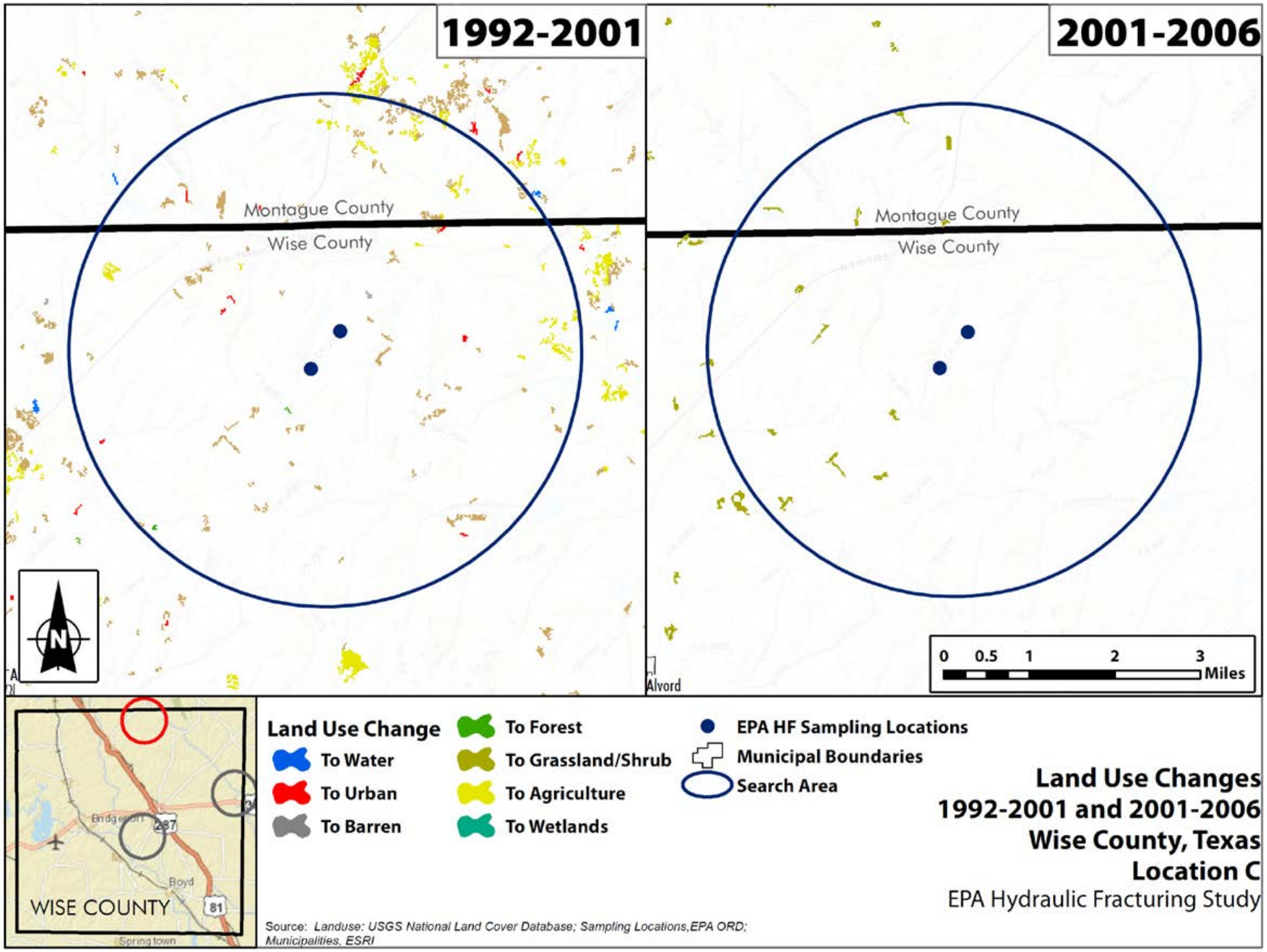

Figure C12 Land Use Change, 1992-2001 and 2001-2006, Location C

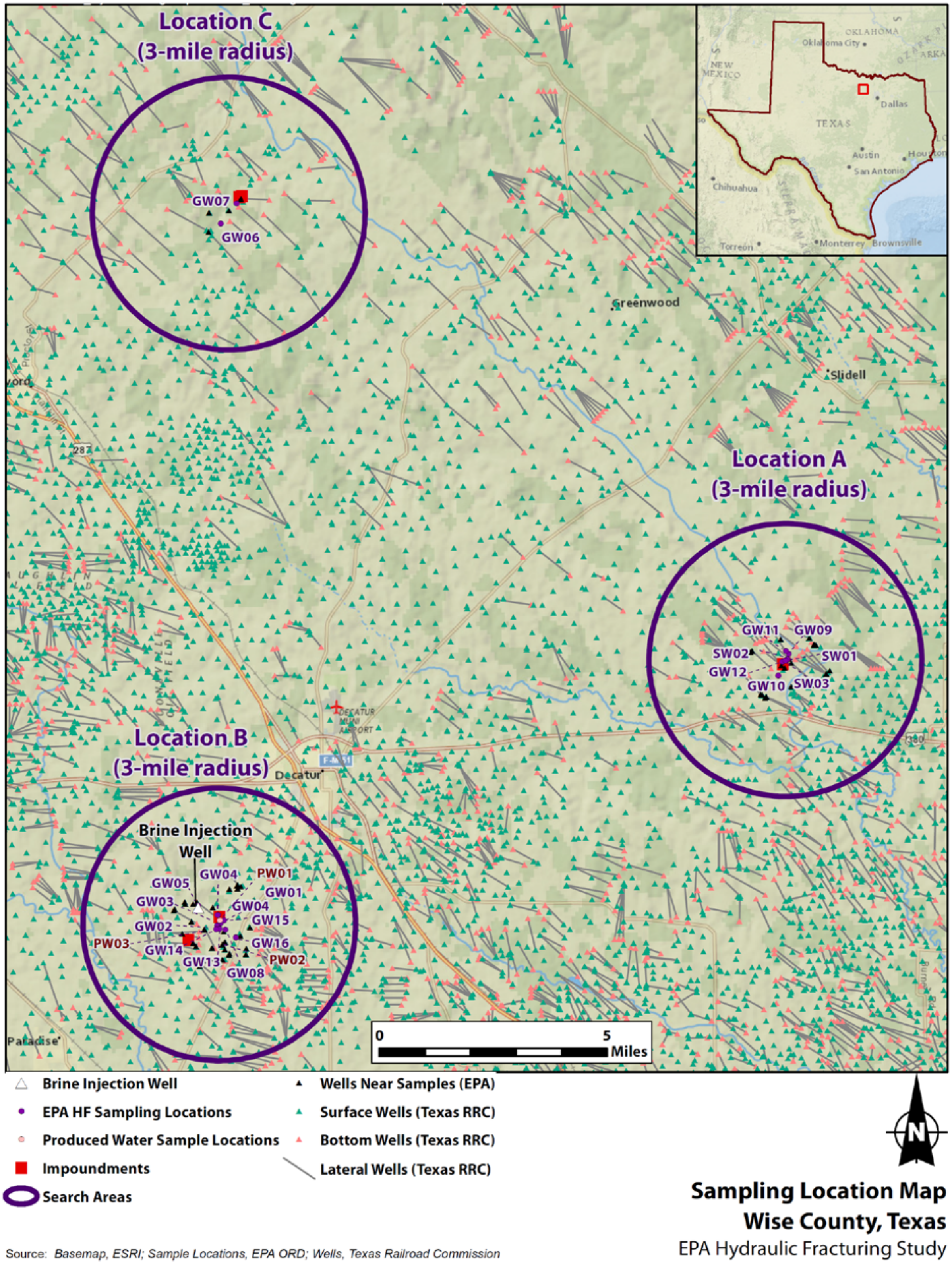

Figure C13 Case Study Sample Location Map

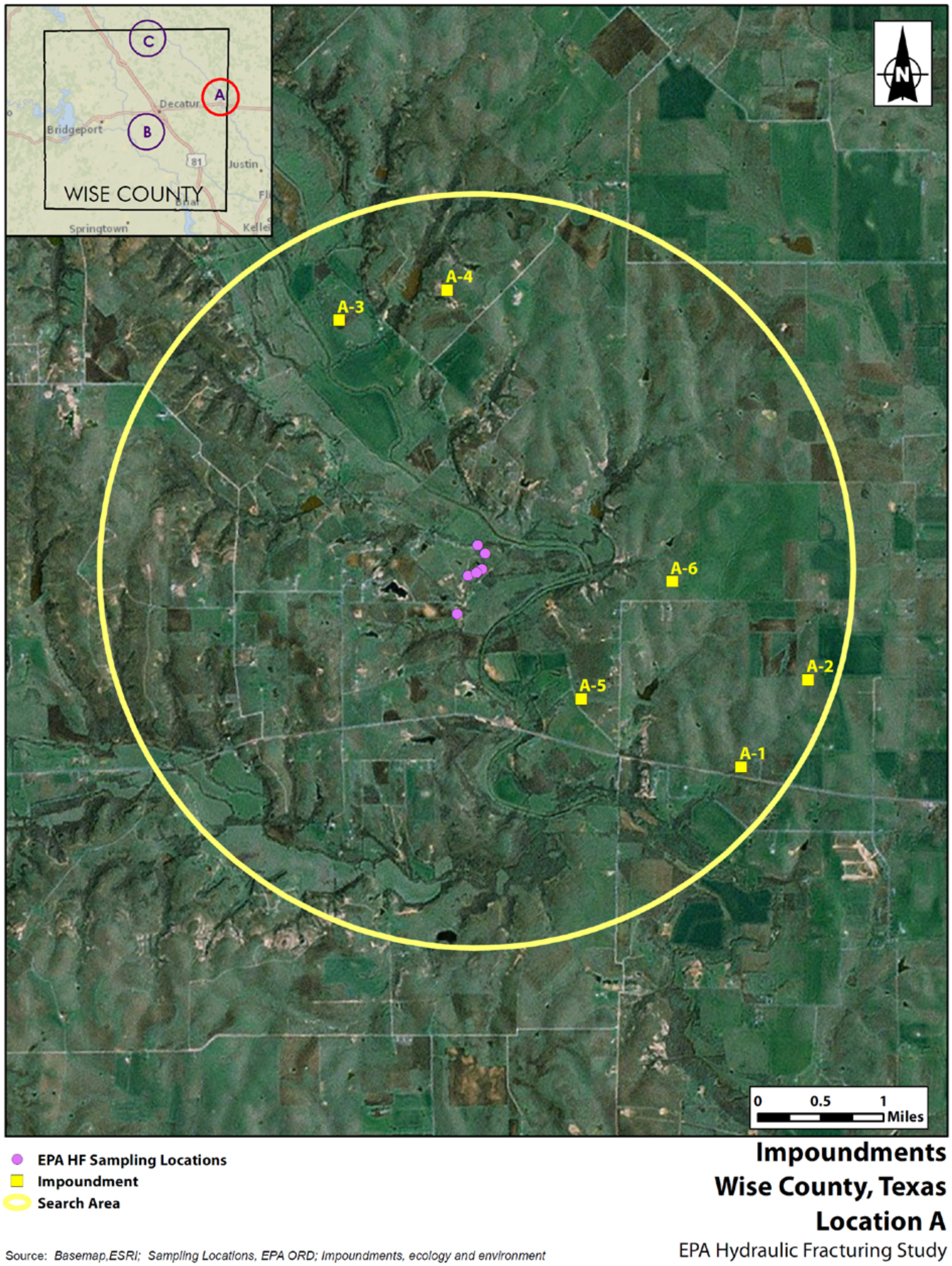

Figure C14 Impoundments, Location A

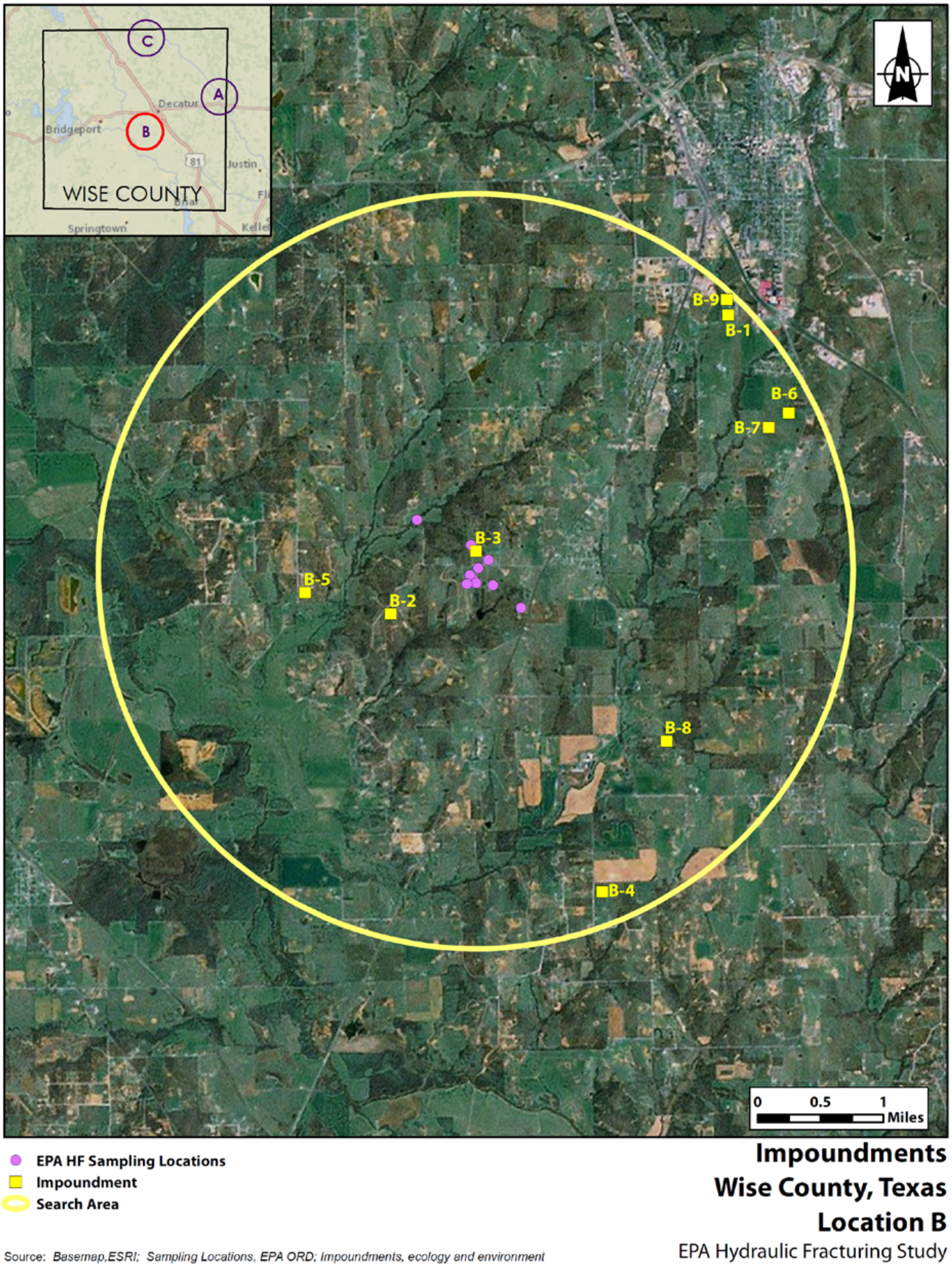

Figure C15 Impoundments, Location B

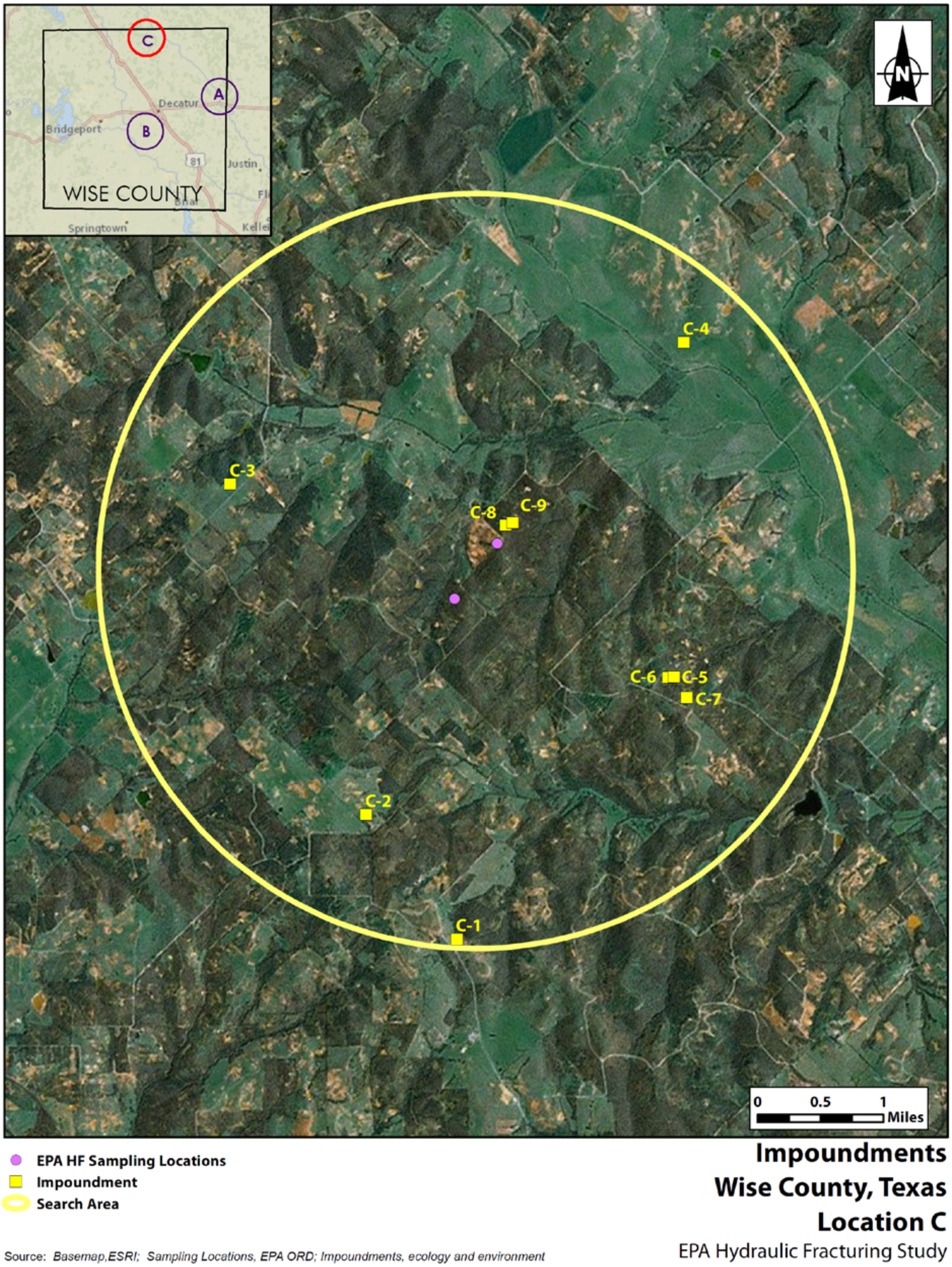

Figure C16 Impoundments, Location C

Attachment 1 EDR Record Search

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Number of Days to Update: Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL: National Priority List

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 02/01/2013
Date Data Arrived at EDR: 03/01/2013
Date Made Active in Reports: 03/13/2013
Number of Days to Update: 12

Source: EPA
Telephone: N/A
Last EDR Contact: 05/09/2013
Next Scheduled EDR Contact: 07/22/2013
Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 3
Telephone 215-814-5418

EPA Region 4
Telephone 404-562-8033

EPA Region 5
Telephone 312-886-6686

EPA Region 10
Telephone 206-553-8665

EPA Region 6
Telephone: 214-655-6659

EPA Region 7
Telephone: 913-551-7247

EPA Region 8
Telephone: 303-312-6774

EPA Region 9
Telephone: 415-947-4246

Proposed NPL: Proposed National Priority List Sites

A site that has been proposed for listing on the National Priorities List through the issuance of a proposed rule in the Federal Register. EPA then accepts public comments on the site, responds to the comments, and places on the NPL those sites that continue to meet the requirements for listing.

Date of Government Version: 02/01/2013
Date Data Arrived at EDR: 03/01/2013
Date Made Active in Reports: 03/13/2013
Number of Days to Update: 12

Source: EPA
Telephone: N/A
Last EDR Contact: 05/09/2013
Next Scheduled EDR Contact: 07/22/2013
Data Release Frequency: Quarterly

NPL LIENS: Federal Superfund Liens

Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991
Date Data Arrived at EDR: 02/02/1994
Date Made Active in Reports: 03/30/1994
Number of Days to Update: 56

Source: EPA
Telephone: 202-564-4267
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Federal Delisted NPL site list

DELISTED NPL: National Priority List Deletions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 02/01/2013
Date Data Arrived at EDR: 03/01/2013
Date Made Active in Reports: 03/13/2013
Number of Days to Update: 12

Source: EPA
Telephone: N/A
Last EDR Contact: 05/09/2013
Next Scheduled EDR Contact: 07/22/2013
Data Release Frequency: Quarterly

Federal CERCLIS list

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System

CERCLIS contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to or on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 02/04/2013
Date Data Arrived at EDR: 03/01/2013
Date Made Active in Reports: 03/13/2013
Number of Days to Update: 12

Source: EPA
Telephone: 703-412-9810
Last EDR Contact: 04/05/2013
Next Scheduled EDR Contact: 06/10/2013
Data Release Frequency: Quarterly

FEDERAL FACILITY: Federal Facility Site Information listing

A listing of National Priority List (NPL) and Base Realignment and Closure (BRAC) sites found in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Database where EPA Federal Facilities Restoration and Reuse Office is involved in cleanup activities.

Date of Government Version: 07/31/2012
Date Data Arrived at EDR: 10/09/2012
Date Made Active in Reports: 12/20/2012
Number of Days to Update: 72

Source: Environmental Protection Agency
Telephone: 703-603-8704
Last EDR Contact: 04/10/2013
Next Scheduled EDR Contact: 07/22/2013
Data Release Frequency: Varies

Federal CERCLIS NFRAP site List

CERCLIS-NFRAP: CERCLIS No Further Remedial Action Planned

Archived sites are sites that have been removed and archived from the inventory of CERCLIS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list this site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. This decision does not necessarily mean that there is no hazard associated with a given site; it only means that, based upon available information, the location is not judged to be a potential NPL site.

Date of Government Version: 02/05/2013
Date Data Arrived at EDR: 03/01/2013
Date Made Active in Reports: 03/13/2013
Number of Days to Update: 12

Source: EPA
Telephone: 703-412-9810
Last EDR Contact: 04/05/2013
Next Scheduled EDR Contact: 03/11/2013
Data Release Frequency: Quarterly

Federal RCRA CORRACTS facilities list

CORRACTS: Corrective Action Report

CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: 02/12/2013
Date Data Arrived at EDR: 02/21/2013
Date Made Active in Reports: 02/27/2013
Number of Days to Update: 6

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 05/02/2013
Next Scheduled EDR Contact: 07/15/2013
Data Release Frequency: Quarterly

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF: RCRA - Treatment, Storage and Disposal

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 02/12/2013
Date Data Arrived at EDR: 02/15/2013
Date Made Active in Reports: 02/27/2013
Number of Days to Update: 12

Source: Environmental Protection Agency
Telephone: 800-438-2474
Last EDR Contact: 05/02/2013
Next Scheduled EDR Contact: 07/15/2013
Data Release Frequency: Quarterly

Federal RCRA generators list

RCRA-LQG: RCRA - Large Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

Date of Government Version: 02/12/2013
Date Data Arrived at EDR: 02/15/2013
Date Made Active in Reports: 02/27/2013
Number of Days to Update: 12

Source: Environmental Protection Agency
Telephone: 800-438-2474
Last EDR Contact: 05/02/2013
Next Scheduled EDR Contact: 07/15/2013
Data Release Frequency: Quarterly

RCRA-SQG: RCRA - Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

Date of Government Version: 02/12/2013
Date Data Arrived at EDR: 02/15/2013
Date Made Active in Reports: 02/27/2013
Number of Days to Update: 12

Source: Environmental Protection Agency
Telephone: 800-438-2474
Last EDR Contact: 05/02/2013
Next Scheduled EDR Contact: 07/15/2013
Data Release Frequency: Quarterly

RCRA-CESQG: RCRA - Conditionally Exempt Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

Date of Government Version: 02/12/2013
Date Data Arrived at EDR: 02/15/2013
Date Made Active in Reports: 02/27/2013
Number of Days to Update: 12

Source: Environmental Protection Agency
Telephone: 800-438-2474
Last EDR Contact: 05/02/2013
Next Scheduled EDR Contact: 07/15/2013
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Federal institutional controls / engineering controls registries

US ENG CONTROLS: Engineering Controls Sites List

A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 12/19/2012
Date Data Arrived at EDR: 12/26/2012
Date Made Active in Reports: 02/27/2013
Number of Days to Update: 63

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 03/11/2013
Next Scheduled EDR Contact: 06/24/2013
Data Release Frequency: Varies

US INST CONTROL: Sites with Institutional Controls

A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 12/19/2012
Date Data Arrived at EDR: 12/26/2012
Date Made Active in Reports: 02/27/2013
Number of Days to Update: 63

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 03/11/2013
Next Scheduled EDR Contact: 06/24/2013
Data Release Frequency: Varies

LUCIS: Land Use Control Information System

LUCIS contains records of land use control information pertaining to the former Navy Base Realignment and Closure properties.

Date of Government Version: 12/09/2005
Date Data Arrived at EDR: 12/11/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 31

Source: Department of the Navy
Telephone: 843-820-7326
Last EDR Contact: 02/18/2013
Next Scheduled EDR Contact: 06/03/2013
Data Release Frequency: Varies

Federal ERNS list

ERNS: Emergency Response Notification System

Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 12/31/2012
Date Data Arrived at EDR: 01/17/2013
Date Made Active in Reports: 02/15/2013
Number of Days to Update: 29

Source: National Response Center, United States Coast Guard
Telephone: 202-267-2180
Last EDR Contact: 04/02/2013
Next Scheduled EDR Contact: 07/15/2013
Data Release Frequency: Annually

State- and tribal - equivalent NPL

SHWS: Hazardous Sites Cleanup Act Site List

The Hazardous Sites Cleanup Act Site List includes sites listed on PA Priority List, sites delisted from PA Priority List, Interim Response Completed sites, and Sites Being Studied or Response Being Planned.

Date of Government Version: 01/08/2013
Date Data Arrived at EDR: 01/24/2013
Date Made Active in Reports: 02/19/2013
Number of Days to Update: 26

Source: Department Environmental Protection
Telephone: 717-783-7816
Last EDR Contact: 04/26/2013
Next Scheduled EDR Contact: 08/05/2013
Data Release Frequency: Semi-Annually

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

HSCA: HSCA Remedial Sites Listing

A list of remedial sites on the PA Priority List. This is the PA state equivalent of the federal NPL superfund list.

Date of Government Version: 12/31/2012
Date Data Arrived at EDR: 01/25/2013
Date Made Active in Reports: 02/19/2013
Number of Days to Update: 25

Source: Department of Environmental Protection
Telephone: 717-783-7816
Last EDR Contact: 04/24/2013
Next Scheduled EDR Contact: 08/05/2013
Data Release Frequency: Varies

State and tribal landfill and/or solid waste disposal site lists

SWF/LF: Operating Facilities

The listing includes Municipal Waste Landfills, Construction/Demolition Waste Landfills and Waste-to-Energy Facilities.

Date of Government Version: 02/26/2013
Date Data Arrived at EDR: 02/28/2013
Date Made Active in Reports: 04/17/2013
Number of Days to Update: 48

Source: Department of Environmental Protection
Telephone: 717-787-7564
Last EDR Contact: 02/26/2013
Next Scheduled EDR Contact: 06/10/2013
Data Release Frequency: Semi-Annually

State and tribal leaking storage tank lists

LUST: Storage Tank Release Sites

Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state.

Date of Government Version: 03/04/2013
Date Data Arrived at EDR: 03/20/2013
Date Made Active in Reports: 04/18/2013
Number of Days to Update: 29

Source: Department of Environmental Protection
Telephone: 717-783-7509
Last EDR Contact: 05/02/2013
Next Scheduled EDR Contact: 07/01/2013
Data Release Frequency: Semi-Annually

UNREG LTANKS: Unregulated Tank Cases

Leaking storage tank cases from unregulated storage tanks.

Date of Government Version: 04/12/2002
Date Data Arrived at EDR: 08/14/2003
Date Made Active in Reports: 08/29/2003
Number of Days to Update: 15

Source: Department of Environmental Protection
Telephone: 717-783-7509
Last EDR Contact: 08/14/2003
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

LAST: Storage Tank Release Sites

Leaking Aboveground Storage Tank Incident Reports.

Date of Government Version: 03/04/2013
Date Data Arrived at EDR: 03/20/2013
Date Made Active in Reports: 04/18/2013
Number of Days to Update: 29

Source: Department of Environmental Protection
Telephone: 717-783-7509
Last EDR Contact: 05/02/2013
Next Scheduled EDR Contact: 07/01/2013
Data Release Frequency: Semi-Annually

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land

LUSTs on Indian land in Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming.

Date of Government Version: 08/27/2012
Date Data Arrived at EDR: 08/28/2012
Date Made Active in Reports: 10/16/2012
Number of Days to Update: 49

Source: EPA Region 8
Telephone: 303-312-6271
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Quarterly

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Alaska, Idaho, Oregon and Washington.

Date of Government Version: 02/05/2013
Date Data Arrived at EDR: 02/06/2013
Date Made Active in Reports: 04/12/2013
Number of Days to Update: 65

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Quarterly

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 09/28/2012
Date Data Arrived at EDR: 11/01/2012
Date Made Active in Reports: 04/12/2013
Number of Days to Update: 162

Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 05/01/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Varies

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Iowa, Kansas, and Nebraska

Date of Government Version: 12/31/2012
Date Data Arrived at EDR: 02/28/2013
Date Made Active in Reports: 04/12/2013
Number of Days to Update: 43

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Varies

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in New Mexico and Oklahoma.

Date of Government Version: 09/12/2011
Date Data Arrived at EDR: 09/13/2011
Date Made Active in Reports: 11/11/2011
Number of Days to Update: 59

Source: EPA Region 6
Telephone: 214-665-6597
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Varies

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Florida, Mississippi and North Carolina.

Date of Government Version: 02/06/2013
Date Data Arrived at EDR: 02/08/2013
Date Made Active in Reports: 04/12/2013
Number of Days to Update: 63

Source: EPA Region 4
Telephone: 404-562-8677
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Semi-Annually

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Arizona, California, New Mexico and Nevada

Date of Government Version: 03/01/2013
Date Data Arrived at EDR: 03/01/2013
Date Made Active in Reports: 04/12/2013
Number of Days to Update: 42

Source: Environmental Protection Agency
Telephone: 415-972-3372
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Quarterly

State and tribal registered storage tank lists

UST: Listing of Pennsylvania Regulated Underground Storage Tanks
Registered Underground Storage Tanks. UST's are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with the state department responsible for administering the UST program. Available information varies by state program.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: 03/01/2013
Date Data Arrived at EDR: 03/21/2013
Date Made Active in Reports: 04/17/2013
Number of Days to Update: 27

Source: Department of Environmental Protection
Telephone: 717-772-5599
Last EDR Contact: 05/02/2013
Next Scheduled EDR Contact: 07/01/2013
Data Release Frequency: Varies

AST: Listing of Pennsylvania Regulated Aboveground Storage Tanks
Registered Aboveground Storage Tanks.

Date of Government Version: 03/01/2013
Date Data Arrived at EDR: 03/21/2013
Date Made Active in Reports: 04/17/2013
Number of Days to Update: 27

Source: Department of Environmental Protection
Telephone: 717-772-5599
Last EDR Contact: 05/02/2013
Next Scheduled EDR Contact: 07/01/2013
Data Release Frequency: Varies

INDIAN UST R4: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Tribal Nations)

Date of Government Version: 02/06/2013
Date Data Arrived at EDR: 02/08/2013
Date Made Active in Reports: 04/12/2013
Number of Days to Update: 63

Source: EPA Region 4
Telephone: 404-562-9424
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Semi-Annually

INDIAN UST R7: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 7 (Iowa, Kansas, Missouri, Nebraska, and 9 Tribal Nations).

Date of Government Version: 12/31/2012
Date Data Arrived at EDR: 02/28/2013
Date Made Active in Reports: 04/12/2013
Number of Days to Update: 43

Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Varies

INDIAN UST R5: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 5 (Michigan, Minnesota and Wisconsin and Tribal Nations).

Date of Government Version: 08/02/2012
Date Data Arrived at EDR: 08/03/2012
Date Made Active in Reports: 11/05/2012
Number of Days to Update: 94

Source: EPA Region 5
Telephone: 312-886-6136
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Varies

INDIAN UST R6: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 6 (Louisiana, Arkansas, Oklahoma, New Mexico, Texas and 65 Tribes).

Date of Government Version: 05/10/2011
Date Data Arrived at EDR: 05/11/2011
Date Made Active in Reports: 06/14/2011
Number of Days to Update: 34

Source: EPA Region 6
Telephone: 214-665-7591
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Semi-Annually

INDIAN UST R1: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont and ten Tribal Nations).

Date of Government Version: 09/28/2012
Date Data Arrived at EDR: 11/07/2012
Date Made Active in Reports: 04/12/2013
Number of Days to Update: 156

Source: EPA, Region 1
Telephone: 617-918-1313
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Varies

INDIAN UST R10: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 10 (Alaska, Idaho, Oregon, Washington, and Tribal Nations).

Date of Government Version: 02/05/2013
Date Data Arrived at EDR: 02/06/2013
Date Made Active in Reports: 04/12/2013
Number of Days to Update: 65

Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Quarterly

INDIAN UST R9: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 9 (Arizona, California, Hawaii, Nevada, the Pacific Islands, and Tribal Nations).

Date of Government Version: 02/21/2013
Date Data Arrived at EDR: 02/26/2013
Date Made Active in Reports: 04/12/2013
Number of Days to Update: 45

Source: EPA Region 9
Telephone: 415-972-3368
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Quarterly

INDIAN UST R8: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 27 Tribal Nations).

Date of Government Version: 08/27/2012
Date Data Arrived at EDR: 08/28/2012
Date Made Active in Reports: 10/16/2012
Number of Days to Update: 49

Source: EPA Region 8
Telephone: 303-312-6137
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Quarterly

FEMA UST: Underground Storage Tank Listing
A listing of all FEMA owned underground storage tanks.

Date of Government Version: 01/01/2010
Date Data Arrived at EDR: 02/16/2010
Date Made Active in Reports: 04/12/2010
Number of Days to Update: 55

Source: FEMA
Telephone: 202-646-5797
Last EDR Contact: 04/18/2013
Next Scheduled EDR Contact: 07/29/2013
Data Release Frequency: Varies

State and tribal institutional control / engineering control registries

ENG CONTROLS: Engineering Controls Site Listing
Under the Land Recycling Act (Act 2) persons who perform a site cleanup using the site-specific standard or the special industrial area standard may use engineering or institutional controls as part of the response action. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 05/15/2008
Date Data Arrived at EDR: 05/16/2008
Date Made Active in Reports: 06/12/2008
Number of Days to Update: 27

Source: Department of Environmental Protection
Telephone: 717-783-9470
Last EDR Contact: 04/24/2013
Next Scheduled EDR Contact: 08/05/2013
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

AUL: Environmental Covenants Listing
A listing of sites with environmental covenants.

Date of Government Version: 01/22/2013
Date Data Arrived at EDR: 01/24/2013
Date Made Active in Reports: 02/19/2013
Number of Days to Update: 26

Source: Department of Environmental Protection
Telephone: 717-783-7509
Last EDR Contact: 04/23/2013
Next Scheduled EDR Contact: 08/05/2013
Data Release Frequency: Varies

INST CONTROL: Institutional Controls Site Listing
Under the Land Recycling Act (Act 2) persons who perform a site cleanup using the site-specific standard or the special industrial area standard may use engineering or institutional controls as part of the response action. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 05/15/2008
Date Data Arrived at EDR: 05/16/2008
Date Made Active in Reports: 06/12/2008
Number of Days to Update: 27

Source: Department of Environmental Protection
Telephone: 717-783-9470
Last EDR Contact: 04/24/2013
Next Scheduled EDR Contact: 08/05/2013
Data Release Frequency: Varies

State and tribal voluntary cleanup sites

INDIAN VCP R7: Voluntary Cleanup Priority Lisitng
A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008
Date Data Arrived at EDR: 04/22/2008
Date Made Active in Reports: 05/19/2008
Number of Days to Update: 27

Source: EPA, Region 7
Telephone: 913-551-7365
Last EDR Contact: 04/20/2009
Next Scheduled EDR Contact: 07/20/2009
Data Release Frequency: Varies

INDIAN VCP R1: Voluntary Cleanup Priority Listing
A listing of voluntary cleanup priority sites located on Indian Land located in Region 1.

Date of Government Version: 09/28/2012
Date Data Arrived at EDR: 10/02/2012
Date Made Active in Reports: 10/16/2012
Number of Days to Update: 14

Source: EPA, Region 1
Telephone: 617-918-1102
Last EDR Contact: 04/05/2013
Next Scheduled EDR Contact: 07/15/2013
Data Release Frequency: Varies

VCP: Voluntary Cleanup Program Sites
The VCP listings included Completed Sites, Sites in Progress and Act 2 Non-Use Aquifer Determinations Sites. Formerly known as the Act 2, the Land Recycling Program encourages the voluntary cleanup and reuse of contaminated commercial and industrial sites.

Date of Government Version: 01/15/2013
Date Data Arrived at EDR: 01/16/2013
Date Made Active in Reports: 02/19/2013
Number of Days to Update: 34

Source: Department of Environmental Protection
Telephone: 717-783-2388
Last EDR Contact: 04/17/2013
Next Scheduled EDR Contact: 07/29/2013
Data Release Frequency: Semi-Annually

State and tribal Brownfields sites

BROWNFIELDS: Brownfields Sites
Brownfields are generally defined as abandoned or underused industrial or commercial properties where redevelopment is complicated by actual or perceived environmental contamination. Brownfields vary in size, location, age and past use. They can range from a small, abandoned corner gas station to a large, multi-acre former manufacturing plant that has been closed for years.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: 02/19/2013
Date Data Arrived at EDR: 02/21/2013
Date Made Active in Reports: 04/17/2013
Number of Days to Update: 55

Source: Department of Environmental Protection
Telephone: 717-783-1566
Last EDR Contact: 04/24/2013
Next Scheduled EDR Contact: 08/05/2013
Data Release Frequency: Varies

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS: A Listing of Brownfields Sites

Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. Assessment, Cleanup and Redevelopment Exchange System (ACRES) stores information reported by EPA Brownfields grant recipients on brownfields properties assessed or cleaned up with grant funding as well as information on Targeted Brownfields Assessments performed by EPA Regions. A listing of ACRES Brownfield sites is obtained from Cleanups in My Community. Cleanups in My Community provides information on Brownfields properties for which information is reported back to EPA, as well as areas served by Brownfields grant programs.

Date of Government Version: 12/10/2012
Date Data Arrived at EDR: 12/11/2012
Date Made Active in Reports: 12/20/2012
Number of Days to Update: 9

Source: Environmental Protection Agency
Telephone: 202-566-2777
Last EDR Contact: 03/26/2013
Next Scheduled EDR Contact: 07/08/2013
Data Release Frequency: Semi-Annually

Local Lists of Landfill / Solid Waste Disposal Sites

ODI: Open Dump Inventory

An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39

Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

DEBRIS REGION 9: Torres Martinez Reservation Illegal Dump Site Locations

A listing of illegal dump sites location on the Torres Martinez Indian Reservation located in eastern Riverside County and northern Imperial County, California.

Date of Government Version: 01/12/2009
Date Data Arrived at EDR: 05/07/2009
Date Made Active in Reports: 09/21/2009
Number of Days to Update: 137

Source: EPA, Region 9
Telephone: 415-947-4219
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: No Update Planned

HIST LF INACTIVE: Inactive Facilities List

A listing of inactive non-hazardous facilities (10000 & 300000 series). This listing is no longer updated or maintained by the Department of Environmental Protection. At the time the listing was available, the DEP?s name was the Department of Environmental Resources.

Date of Government Version: 12/20/1994
Date Data Arrived at EDR: 07/12/2005
Date Made Active in Reports: 08/11/2005
Number of Days to Update: 30

Source: Department of Environmental Protection
Telephone: 717-787-7381
Last EDR Contact: 06/21/2005
Next Scheduled EDR Contact: 12/19/2005
Data Release Frequency: No Update Planned

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

HIST LF INVENTORY: Facility Inventory

A listing of solid waste facilities. This listing is no longer updated or maintained by the Department of Environmental Protection. At the time the listing was available, the DEP?s name was the Department of Environmental Resources.

Date of Government Version: 06/02/1999
Date Data Arrived at EDR: 07/12/2005
Date Made Active in Reports: 08/11/2005
Number of Days to Update: 30

Source: Department of Environmental Protection
Telephone: 717-787-7381
Last EDR Contact: 09/19/2005
Next Scheduled EDR Contact: 12/19/2005
Data Release Frequency: No Update Planned

HIST LF ALI: Abandoned Landfill Inventory

The report provides facility information recorded in the Pennsylvania Department of Environmental Protection ALI database. Some of this information has been abstracted from old records and may not accurately reflect the current conditions and status at these facilities

Date of Government Version: 01/04/2005
Date Data Arrived at EDR: 01/04/2005
Date Made Active in Reports: 02/04/2005
Number of Days to Update: 31

Source: Department of Environmental Protection
Telephone: 717-787-7564
Last EDR Contact: 11/26/2012
Next Scheduled EDR Contact: 03/11/2013
Data Release Frequency: Varies

INDIAN ODI: Report on the Status of Open Dumps on Indian Lands

Location of open dumps on Indian land.

Date of Government Version: 12/31/1998
Date Data Arrived at EDR: 12/03/2007
Date Made Active in Reports: 01/24/2008
Number of Days to Update: 52

Source: Environmental Protection Agency
Telephone: 703-308-8245
Last EDR Contact: 05/03/2013
Next Scheduled EDR Contact: 08/19/2013
Data Release Frequency: Varies

Local Lists of Hazardous waste / Contaminated Sites

US CDL: Clandestine Drug Labs

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 11/14/2012
Date Data Arrived at EDR: 12/11/2012
Date Made Active in Reports: 02/15/2013
Number of Days to Update: 66

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 03/04/2013
Next Scheduled EDR Contact: 06/17/2013
Data Release Frequency: Quarterly

US HIST CDL: National Clandestine Laboratory Register

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 09/01/2007
Date Data Arrived at EDR: 11/19/2008
Date Made Active in Reports: 03/30/2009
Number of Days to Update: 131

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 03/23/2009
Next Scheduled EDR Contact: 06/22/2009
Data Release Frequency: No Update Planned

Local Lists of Registered Storage Tanks

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

ARCHIVE UST: Archived Underground Storage Tank Sites

The list includes tanks storing highly hazardous substances that were removed from the DEP's Storage Tank Information database because of the Department's policy on sensitive information. The list also may include tanks that are removed or permanently closed.

Date of Government Version: 03/01/2013
Date Data Arrived at EDR: 03/21/2013
Date Made Active in Reports: 04/18/2013
Number of Days to Update: 28

Source: Department of Environmental Protection
Telephone: 717-772-5599
Last EDR Contact: 05/02/2013
Next Scheduled EDR Contact: 07/01/2013
Data Release Frequency: Varies

ARCHIVE AST: Archived Aboveground Storage Tank Sites

The list includes aboveground tanks with a capacity greater than 21,000 gallons that were removed from the DEP's Storage Tank Information database because of the Department's policy on sensitive information. The list also may include tanks that are removed or permanently closed.

Date of Government Version: 03/01/2013
Date Data Arrived at EDR: 03/21/2013
Date Made Active in Reports: 04/18/2013
Number of Days to Update: 28

Source: Department of Environmental Protection
Telephone: 717-772-5599
Last EDR Contact: 05/02/2013
Next Scheduled EDR Contact: 07/01/2013
Data Release Frequency: Varies

Local Land Records

LIENS 2: CERCLA Lien Information

A Federal CERCLA ('Superfund') lien can exist by operation of law at any site or property at which EPA has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties.

Date of Government Version: 02/16/2012
Date Data Arrived at EDR: 03/26/2012
Date Made Active in Reports: 06/14/2012
Number of Days to Update: 80

Source: Environmental Protection Agency
Telephone: 202-564-6023
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Varies

ACT 2-DEED: Act 2-Deed Acknowledgment Sites

This listing pertains to sites where the Department has approved a cleanup requiring a deed acknowledgment under Act 2. This list includes sites remediated to a non-residential Statewide health standard (Section 303(g)); all sites demonstrating attainment of a Site-specific standard (Section 304(m)); and sites being remediated as a special industrial area (Section 305(g)). Persons who remediated a site to a standard that requires a deed acknowledgment shall comply with the requirements of the Solid Waste Management Act or the Hazardous Sites Cleanup Act, as referenced in Act 2. These statutes require a property description section in the deed concerning the hazardous substance disposal on the site. The location of disposed hazardous substances and a description of the type of hazardous substances disposed on the site shall be included in the deed acknowledgment. A deed acknowledgment is required at the time of conveyance of the property.

Date of Government Version: 04/23/2010
Date Data Arrived at EDR: 04/28/2010
Date Made Active in Reports: 04/30/2010
Number of Days to Update: 2

Source: Department of Environmental Protection
Telephone: 717-783-9470
Last EDR Contact: 07/22/2011
Next Scheduled EDR Contact: 11/07/2011
Data Release Frequency: Varies

Records of Emergency Release Reports

HMIRS: Hazardous Materials Information Reporting System

Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 12/31/2012
Date Data Arrived at EDR: 01/03/2013
Date Made Active in Reports: 02/27/2013
Number of Days to Update: 55

Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 04/02/2013
Next Scheduled EDR Contact: 07/15/2013
Data Release Frequency: Annually

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

SPILLS: State spills
A listing of hazardous material incidents.

Date of Government Version: 01/16/2013
Date Data Arrived at EDR: 01/24/2013
Date Made Active in Reports: 02/19/2013
Number of Days to Update: 26

Source: DEP, Emergency Response
Telephone: 717-787-5715
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 07/29/2013
Data Release Frequency: Varies

Other Ascertainable Records

RCRA NonGen / NLR: RCRA - Non Generators
RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

Date of Government Version: 02/12/2013
Date Data Arrived at EDR: 02/15/2013
Date Made Active in Reports: 02/27/2013
Number of Days to Update: 12

Source: Environmental Protection Agency
Telephone: 800-438-2474
Last EDR Contact: 05/02/2013
Next Scheduled EDR Contact: 07/15/2013
Data Release Frequency: Varies

DOT OPS: Incident and Accident Data
Department of Transporation, Office of Pipeline Safety Incident and Accident data.

Date of Government Version: 07/31/2012
Date Data Arrived at EDR: 08/07/2012
Date Made Active in Reports: 09/18/2012
Number of Days to Update: 42

Source: Department of Transporation, Office of Pipeline Safety
Telephone: 202-366-4595
Last EDR Contact: 05/07/2013
Next Scheduled EDR Contact: 08/19/2013
Data Release Frequency: Varies

DOD: Department of Defense Sites
This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 11/10/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 62

Source: USGS
Telephone: 888-275-8747
Last EDR Contact: 04/19/2013
Next Scheduled EDR Contact: 07/29/2013
Data Release Frequency: Semi-Annually

FUDS: Formerly Used Defense Sites
The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 02/26/2013
Date Made Active in Reports: 03/13/2013
Number of Days to Update: 15

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 03/11/2013
Next Scheduled EDR Contact: 06/24/2013
Data Release Frequency: Varies

CONSENT: Superfund (CERCLA) Consent Decrees
Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 01/15/2013
Date Made Active in Reports: 03/13/2013
Number of Days to Update: 57

Source: Department of Justice, Consent Decree Library
Telephone: Varies
Last EDR Contact: 04/01/2013
Next Scheduled EDR Contact: 07/15/2013
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

ROD: Records Of Decision

Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 12/18/2012
Date Data Arrived at EDR: 03/13/2013
Date Made Active in Reports: 04/12/2013
Number of Days to Update: 30

Source: EPA
Telephone: 703-416-0223
Last EDR Contact: 03/13/2013
Next Scheduled EDR Contact: 06/24/2013
Data Release Frequency: Annually

UMTRA: Uranium Mill Tailings Sites

Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

Date of Government Version: 09/14/2010
Date Data Arrived at EDR: 10/07/2011
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 146

Source: Department of Energy
Telephone: 505-845-0011
Last EDR Contact: 02/25/2013
Next Scheduled EDR Contact: 06/10/2013
Data Release Frequency: Varies

US MINES: Mines Master Index File

Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 08/18/2011
Date Data Arrived at EDR: 09/08/2011
Date Made Active in Reports: 09/29/2011
Number of Days to Update: 21

Source: Department of Labor, Mine Safety and Health Administration
Telephone: 303-231-5959
Last EDR Contact: 03/06/2013
Next Scheduled EDR Contact: 06/17/2013
Data Release Frequency: Semi-Annually

TRIS: Toxic Chemical Release Inventory System

Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 09/01/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 131

Source: EPA
Telephone: 202-566-0250
Last EDR Contact: 02/26/2013
Next Scheduled EDR Contact: 06/10/2013
Data Release Frequency: Annually

TSCA: Toxic Substances Control Act

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2006
Date Data Arrived at EDR: 09/29/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 64

Source: EPA
Telephone: 202-260-5521
Last EDR Contact: 03/28/2013
Next Scheduled EDR Contact: 07/08/2013
Data Release Frequency: Every 4 Years

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
Last EDR Contact: 02/25/2013
Next Scheduled EDR Contact: 06/10/2013
Data Release Frequency: Quarterly

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
A listing of FIFRA/TSCA Tracking System (FTTS) inspections and enforcements.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25

Source: EPA
Telephone: 202-566-1667
Last EDR Contact: 02/25/2013
Next Scheduled EDR Contact: 06/10/2013
Data Release Frequency: Quarterly

HIST FTTS: FIFRA/TSCA Tracking System Administrative Case Listing
A complete administrative case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2007
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

HIST FTTS INSP: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing
A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2008
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

SSTS: Section 7 Tracking Systems
Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 12/10/2010
Date Made Active in Reports: 02/25/2011
Number of Days to Update: 77

Source: EPA
Telephone: 202-564-4203
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System
The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 07/20/2011
Date Data Arrived at EDR: 11/10/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 61

Source: Environmental Protection Agency
Telephone: 202-564-5088
Last EDR Contact: 04/15/2013
Next Scheduled EDR Contact: 07/29/2013
Data Release Frequency: Quarterly

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

PADS: PCB Activity Database System

PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 11/01/2010
Date Data Arrived at EDR: 11/10/2010
Date Made Active in Reports: 02/16/2011
Number of Days to Update: 98

Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 04/19/2013
Next Scheduled EDR Contact: 07/29/2013
Data Release Frequency: Annually

MLTS: Material Licensing Tracking System

MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 06/21/2011
Date Data Arrived at EDR: 07/15/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 60

Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
Last EDR Contact: 03/11/2013
Next Scheduled EDR Contact: 06/24/2013
Data Release Frequency: Quarterly

RADINFO: Radiation Information Database

The Radiation Information Database (RADINFO) contains information about facilities that are regulated by U.S. Environmental Protection Agency (EPA) regulations for radiation and radioactivity.

Date of Government Version: 01/08/2013
Date Data Arrived at EDR: 01/09/2013
Date Made Active in Reports: 04/12/2013
Number of Days to Update: 93

Source: Environmental Protection Agency
Telephone: 202-343-9775
Last EDR Contact: 04/11/2013
Next Scheduled EDR Contact: 07/22/2013
Data Release Frequency: Quarterly

FINDS: Facility Index System/Facility Registry System

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 10/23/2011
Date Data Arrived at EDR: 12/13/2011
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 79

Source: EPA
Telephone: (215) 814-5000
Last EDR Contact: 03/12/2013
Next Scheduled EDR Contact: 06/24/2013
Data Release Frequency: Quarterly

RAATS: RCRA Administrative Action Tracking System

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995
Date Data Arrived at EDR: 07/03/1995
Date Made Active in Reports: 08/07/1995
Number of Days to Update: 35

Source: EPA
Telephone: 202-564-4104
Last EDR Contact: 06/02/2008
Next Scheduled EDR Contact: 09/01/2008
Data Release Frequency: No Update Planned

RMP: Risk Management Plans

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

When Congress passed the Clean Air Act Amendments of 1990, it required EPA to publish regulations and guidance for chemical accident prevention at facilities using extremely hazardous substances. The Risk Management Program Rule (RMP Rule) was written to implement Section 112(r) of these amendments. The rule, which built upon existing industry codes and standards, requires companies of all sizes that use certain flammable and toxic substances to develop a Risk Management Program, which includes a(n): Hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental releases; Prevention program that includes safety precautions and maintenance, monitoring, and employee training measures; and Emergency response program that spells out emergency health care, employee training measures and procedures for informing the public and response agencies (e.g the fire department) should an accident occur.

Date of Government Version: 05/08/2012
Date Data Arrived at EDR: 05/25/2012
Date Made Active in Reports: 07/10/2012
Number of Days to Update: 46

Source: Environmental Protection Agency
Telephone: 202-564-8600
Last EDR Contact: 04/29/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Varies

BRS: Biennial Reporting System

The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 02/26/2013
Date Made Active in Reports: 04/19/2013
Number of Days to Update: 52

Source: EPA/NTIS
Telephone: 800-424-9346
Last EDR Contact: 02/26/2013
Next Scheduled EDR Contact: 06/10/2013
Data Release Frequency: Biennially

UIC: Underground Injection Wells

A listing of underground injection well locations.

Date of Government Version: 03/26/2013
Date Data Arrived at EDR: 03/26/2013
Date Made Active in Reports: 04/18/2013
Number of Days to Update: 23

Source: Department of Environmental Protection
Telephone: 717-783-7209
Last EDR Contact: 03/26/2013
Next Scheduled EDR Contact: 07/08/2013
Data Release Frequency: Varies

NPDES: NPDES Permit Listing

A listing of facilities with an NPDES permit.

Date of Government Version: 12/26/2012
Date Data Arrived at EDR: 03/13/2013
Date Made Active in Reports: 04/18/2013
Number of Days to Update: 36

Source: Department of Environmental Protection
Telephone: 717-787-9642
Last EDR Contact: 03/13/2013
Next Scheduled EDR Contact: 06/24/2013
Data Release Frequency: Varies

PA MANIFEST: Manifest Information

Hazardous waste manifest information.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 07/23/2012
Date Made Active in Reports: 09/18/2012
Number of Days to Update: 57

Source: Department of Environmental Protection
Telephone: 717-783-8990
Last EDR Contact: 04/23/2013
Next Scheduled EDR Contact: 08/05/2013
Data Release Frequency: Annually

DRYCLEANERS: Drycleaner Facility Locations

A listing of drycleaner facility locations.

Date of Government Version: 03/25/2013
Date Data Arrived at EDR: 03/25/2013
Date Made Active in Reports: 04/18/2013
Number of Days to Update: 24

Source: Department of Environmental Protection
Telephone: 717-787-9702
Last EDR Contact: 03/25/2013
Next Scheduled EDR Contact: 07/08/2013
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

AIRS: Permit and Emissions Inventory Data
Permit and emissions inventory data.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 01/04/2013
Date Made Active in Reports: 02/15/2013
Number of Days to Update: 42

Source: Department of Environmental Protection
Telephone: 717-787-9702
Last EDR Contact: 04/01/2013
Next Scheduled EDR Contact: 07/15/2013
Data Release Frequency: Annually

INDIAN RESERV: Indian Reservations
This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 12/08/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 34

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 04/19/2013
Next Scheduled EDR Contact: 07/29/2013
Data Release Frequency: Semi-Annually

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners Listing
The State Coalition for Remediation of Drycleaners was established in 1998, with support from the U.S. EPA Office of Superfund Remediation and Technology Innovation. It is comprised of representatives of states with established drycleaner remediation programs. Currently the member states are Alabama, Connecticut, Florida, Illinois, Kansas, Minnesota, Missouri, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Wisconsin.

Date of Government Version: 03/07/2011
Date Data Arrived at EDR: 03/09/2011
Date Made Active in Reports: 05/02/2011
Number of Days to Update: 54

Source: Environmental Protection Agency
Telephone: 615-532-8599
Last EDR Contact: 05/06/2013
Next Scheduled EDR Contact: 08/05/2013
Data Release Frequency: Varies

PCB TRANSFORMER: PCB Transformer Registration Database
The database of PCB transformer registrations that includes all PCB registration submittals.

Date of Government Version: 02/01/2011
Date Data Arrived at EDR: 10/19/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 83

Source: Environmental Protection Agency
Telephone: 202-566-0517
Last EDR Contact: 05/03/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Varies

US FIN ASSUR: Financial Assurance Information
All owners and operators of facilities that treat, store, or dispose of hazardous waste are required to provide proof that they will have sufficient funds to pay for the clean up, closure, and post-closure care of their facilities.

Date of Government Version: 11/20/2012
Date Data Arrived at EDR: 11/30/2012
Date Made Active in Reports: 02/27/2013
Number of Days to Update: 89

Source: Environmental Protection Agency
Telephone: 202-566-1917
Last EDR Contact: 02/19/2013
Next Scheduled EDR Contact: 06/03/2013
Data Release Frequency: Quarterly

EPA WATCH LIST: EPA WATCH LIST
EPA maintains a "Watch List" to facilitate dialogue between EPA, state and local environmental agencies on enforcement matters relating to facilities with alleged violations identified as either significant or high priority. Being on the Watch List does not mean that the facility has actually violated the law only that an investigation by EPA or a state or local environmental agency has led those organizations to allege that an unproven violation has in fact occurred. Being on the Watch List does not represent a higher level of concern regarding the alleged violations that were detected, but instead indicates cases requiring additional dialogue between EPA, state and local agencies - primarily because of the length of time the alleged violation has gone unaddressed or unresolved.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: 07/31/2012
Date Data Arrived at EDR: 08/13/2012
Date Made Active in Reports: 09/18/2012
Number of Days to Update: 36

Source: Environmental Protection Agency
Telephone: 617-520-3000
Last EDR Contact: 02/12/2013
Next Scheduled EDR Contact: 05/27/2013
Data Release Frequency: Quarterly

US AIRS MINOR: Air Facility System Data
A listing of minor source facilities.

Date of Government Version: 11/15/2012
Date Data Arrived at EDR: 11/16/2012
Date Made Active in Reports: 02/15/2013
Number of Days to Update: 91

Source: EPA
Telephone: 202-564-5962
Last EDR Contact: 04/01/2013
Next Scheduled EDR Contact: 07/15/2013
Data Release Frequency: Annually

US AIRS (AFS): Aerometric Information Retrieval System Facility Subsystem (AFS)
The database is a sub-system of Aerometric Information Retrieval System (AIRS). AFS contains compliance data on air pollution point sources regulated by the U.S. EPA and/or state and local air regulatory agencies. This information comes from source reports by various stationary sources of air pollution, such as electric power plants, steel mills, factories, and universities, and provides information about the air pollutants they produce. Action, air program, air program pollutant, and general level plant data. It is used to track emissions and compliance data from industrial plants.

Date of Government Version: 11/15/2012
Date Data Arrived at EDR: 11/16/2012
Date Made Active in Reports: 02/15/2013
Number of Days to Update: 91

Source: EPA
Telephone: 202-564-5962
Last EDR Contact: 04/01/2013
Next Scheduled EDR Contact: 07/15/2013
Data Release Frequency: Annually

MINES: Abandoned Mine Land Inventory
This data set portrays the approximate location of Abandoned Mine Land Problem Areas containing public health, safety, and public welfare problems created by past coal mining.

Date of Government Version: 10/02/2012
Date Data Arrived at EDR: 01/30/2013
Date Made Active in Reports: 02/21/2013
Number of Days to Update: 22

Source: PASDA
Telephone: 814-863-0104
Last EDR Contact: 05/02/2013
Next Scheduled EDR Contact: 08/12/2013
Data Release Frequency: Semi-Annually

FEDLAND: Federal and Indian Lands
Federally and Indian administrated lands of the United States. Lands included are administrated by: Army Corps of Engineers, Bureau of Reclamation, National Wild and Scenic River, National Wildlife Refuge, Public Domain Land, Wilderness, Wilderness Study Area, Wildlife Management Area, Bureau of Indian Affairs, Bureau of Land Management, Department of Justice, Forest Service, Fish and Wildlife Service, National Park Service.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 02/06/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 339

Source: U.S. Geological Survey
Telephone: 888-275-8747
Last EDR Contact: 04/19/2013
Next Scheduled EDR Contact: 07/29/2013
Data Release Frequency: N/A

PRP: Potentially Responsible Parties
A listing of verified Potentially Responsible Parties

Date of Government Version: 12/02/2012
Date Data Arrived at EDR: 01/03/2013
Date Made Active in Reports: 03/13/2013
Number of Days to Update: 69

Source: EPA
Telephone: 202-564-6023
Last EDR Contact: 04/04/2013
Next Scheduled EDR Contact: 07/15/2013
Data Release Frequency: Quarterly

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

2020 COR ACTION: 2020 Corrective Action Program List

The EPA has set ambitious goals for the RCRA Corrective Action program by creating the 2020 Corrective Action Universe. This RCRA cleanup baseline includes facilities expected to need corrective action. The 2020 universe contains a wide variety of sites. Some properties are heavily contaminated while others were contaminated but have since been cleaned up. Still others have not been fully investigated yet, and may require little or no remediation. Inclusion in the 2020 Universe does not necessarily imply failure on the part of a facility to meet its RCRA obligations.

Date of Government Version: 11/11/2011
Date Data Arrived at EDR: 05/18/2012
Date Made Active in Reports: 05/25/2012
Number of Days to Update: 7

Source: Environmental Protection Agency
Telephone: 703-308-4044
Last EDR Contact: 02/15/2013
Next Scheduled EDR Contact: 05/27/2013
Data Release Frequency: Varies

LEAD SMELTER 2: Lead Smelter Sites

A list of several hundred sites in the U.S. where secondary lead smelting was done from 1931and 1964. These sites may pose a threat to public health through ingestion or inhalation of contaminated soil or dust

Date of Government Version: 04/05/2001
Date Data Arrived at EDR: 10/27/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 36

Source: American Journal of Public Health
Telephone: 703-305-6451
Last EDR Contact: 12/02/2009
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

LEAD SMELTER 1: Lead Smelter Sites

A listing of former lead smelter site locations.

Date of Government Version: 01/29/2013
Date Data Arrived at EDR: 02/14/2013
Date Made Active in Reports: 02/27/2013
Number of Days to Update: 13

Source: Environmental Protection Agency
Telephone: 703-603-8787
Last EDR Contact: 04/08/2013
Next Scheduled EDR Contact: 07/22/2013
Data Release Frequency: Varies

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List

A listing of coal combustion residues surface impoundments with high hazard potential ratings.

Date of Government Version: 08/17/2010
Date Data Arrived at EDR: 01/03/2011
Date Made Active in Reports: 03/21/2011
Number of Days to Update: 77

Source: Environmental Protection Agency
Telephone: N/A
Last EDR Contact: 03/15/2013
Next Scheduled EDR Contact: 06/24/2013
Data Release Frequency: Varies

COAL ASH DOE: Sleam-Electric Plan Operation Data

A listing of power plants that store ash in surface ponds.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 08/07/2009
Date Made Active in Reports: 10/22/2009
Number of Days to Update: 76

Source: Department of Energy
Telephone: 202-586-8719
Last EDR Contact: 04/18/2013
Next Scheduled EDR Contact: 07/29/2013
Data Release Frequency: Varies

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP: EDR Proprietary Manufactured Gas Plants

The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

EDR US Hist Auto Stat: EDR Exclusive Historic Gas Stations

EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR US Hist Cleaners: EDR Exclusive Historic Dry Cleaners

EDR has searched selected national collections of business directories and has collected listings of potential dry cleaner sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include dry cleaning establishments. The categories reviewed included, but were not limited to dry cleaners, cleaners, laundry, laundromat, cleaning/laundry, wash & dry etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR US Hist Cleaners: EDR Proprietary Historic Dry Cleaners - Cole

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: N/A
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR US Hist Auto Stat: EDR Proprietary Historic Gas Stations - Cole

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: N/A
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

CT MANIFEST: Hazardous Waste Manifest Data

Facility and manifest data. Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a tsd facility.

Date of Government Version: 02/18/2013
Date Data Arrived at EDR: 02/18/2013
Date Made Active in Reports: 03/21/2013
Number of Days to Update: 31

Source: Department of Energy & Environmental Protection
Telephone: 860-424-3375
Last EDR Contact: 02/18/2013
Next Scheduled EDR Contact: 06/03/2013
Data Release Frequency: Annually

NJ MANIFEST: Manifest Information

Hazardous waste manifest information.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 07/19/2012
Date Made Active in Reports: 08/28/2012
Number of Days to Update: 40

Source: Department of Environmental Protection
Telephone: N/A
Last EDR Contact: 04/19/2013
Next Scheduled EDR Contact: 07/29/2013
Data Release Frequency: Annually

NY MANIFEST: Facility and Manifest Data

Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a TSD facility.

Date of Government Version: 02/01/2013
Date Data Arrived at EDR: 02/07/2013
Date Made Active in Reports: 03/15/2013
Number of Days to Update: 36

Source: Department of Environmental Conservation
Telephone: 518-402-8651
Last EDR Contact: 05/09/2013
Next Scheduled EDR Contact: 08/19/2013
Data Release Frequency: Annually

RI MANIFEST: Manifest information

Hazardous waste manifest information

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 06/22/2012
Date Made Active in Reports: 07/31/2012
Number of Days to Update: 39

Source: Department of Environmental Management
Telephone: 401-222-2797
Last EDR Contact: 02/25/2013
Next Scheduled EDR Contact: 06/10/2013
Data Release Frequency: Annually

VT MANIFEST: Hazardous Waste Manifest Data

Hazardous waste manifest information.

Date of Government Version: 02/15/2013
Date Data Arrived at EDR: 02/21/2013
Date Made Active in Reports: 03/15/2013
Number of Days to Update: 22

Source: Department of Environmental Conservation
Telephone: 802-241-3443
Last EDR Contact: 01/21/2013
Next Scheduled EDR Contact: 05/06/2013
Data Release Frequency: Annually

WI MANIFEST: Manifest Information

Hazardous waste manifest information.

Date of Government Version: 12/31/2011
Date Data Arrived at EDR: 07/19/2012
Date Made Active in Reports: 09/27/2012
Number of Days to Update: 70

Source: Department of Natural Resources
Telephone: N/A
Last EDR Contact: 03/18/2013
Next Scheduled EDR Contact: 07/01/2013
Data Release Frequency: Annually

Oil/Gas Pipelines: This data was obtained by EDR from the USGS in 1994. It is referred to by USGS as GeoData Digital Line Graphs from 1:100,000-Scale Maps. It was extracted from the transportation category including some oil, but primarily gas pipelines.

Electric Power Transmission Line Data

Source: Rextag Strategies Corp.
Telephone: (281) 769-2247
U.S. Electric Transmission and Power Plants Systems Digital GIS Data

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:
Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing
Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.

Daycare Centers: Child Care Facility List
Source: Department of Public Welfare
Telephone: 717-783-3856

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 2003 & 2011 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002 and 2005 from the U.S. Fish and Wildlife Service.

Scanned Digital USGS 7.5' Topographic Map (DRG)
Source: United States Geologic Survey
A digital raster graphic (DRG) is a scanned image of a U.S. Geological Survey topographic map. The map images are made by scanning published paper maps on high-resolution scanners. The raster image is georeferenced and fit to the Universal Transverse Mercator (UTM) projection.

STREET AND ADDRESS INFORMATION

Appendix D
Supporting Information
Retrospective Case Study in Wise County, Texas

U.S. Environmental Protection Agency
Office of Research and Development
Washington, DC

May 2015
EPA/600/R-14/090

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Example Homeowner Letter from the Texas Commission on Environmental Quality is shown below

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

January 18, 2013

[redacted]

Dear [redacted]

Re: Confirmed groundwater contamination at GPS coordinates:
[redacted] Wise County, TX 76234

The Texas Commission on Environmental Quality (TCEQ) received information from the Railroad Commission of Texas that you own or rent property with a private well used for drinking water consumption or other household purposes. The purpose of this letter is to notify you that chloride was detected in a groundwater well within ½ mile of your property.

We understand that your private well(s) has been sampled and you have received the analytical results. This separate notification letter is being sent in accordance with the requirements of Section 26.408 of the Texas Water Code, which requires the TCEQ to provide notification to drinking water well owners who may be affected by groundwater contamination.

Please see the table below for a list showing the maximum detected value of chloride and its associated comparison levels.

Chemical	Maximum Detected Value (ppm)	Comparison Level[a] (ppm)	Comparison Level[b] (ppm)
Chloride	1620	300	250

[a] TCEQ Secondary Constituent Level .
[b] United States Environmental Protection Agency (USEPA) Secondary Maximum Contaminant Level (SMCL).
Chloride is not considered to present a risk to human health at the comparison values, but can affect the taste of the water. ppm = parts per million.

The TCEQ is uncertain of the source of the measured elevated concentrations of chloride in groundwater. Chloride occurs naturally in groundwater but elevated concentrations may be due to a number of human sources. Chloride in drinking water at levels above its comparison level is not a risk to human health but may cause the water to have a salty taste.

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[redacted]
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If you have any questions about this notification, please contact Heidi Bojes at the Texas Railroad Commission at 512-475-3089 or by email at Heidi.Bojes@rrc.state.tx.us. If you have questions for the TCEQ, please call me at 877-992-8370.

Sincerely,

Allison Jenkins

Allison Jenkins, MPH
Toxicologist
Texas Commission on Environmental Quality

cc: Heidi Bojes, Railroad Commission of Texas
Sid Slocum, Water Section Manager, TCEQ Region 4
Sam Barrett, Waste Section Manager, TCEQ Region 4
Keith Sheedy, TCEQ, Office of Air

Detailed Geological Description

Wise County is located in the Bend Arch-Fort Worth Basin, which was formed during the late paleozoic Ouachita Orogeny by the convergence of Laurussia and Gondwana in a narrow, restricted, inland seaway (Bruner and Smosna, 2011). The stratigraphy (Figure D1) of the Bend Arch-Fort Worth Basin is characterized by sedimentary sequence and includes limestones, sandstones, and shales. The Barnett shale is of Mississippian age (320 to 360 million years ago) and extends throughout the Bend Arch-Fort Worth Basin: south from the Muenster Arch, near the Oklahoma border, to the Llano Uplift in Burnet County and west from the Ouachita Thrust Front, near Dallas, to Taylor County (see Figure D2) (Bruner and Smosna, 2011). In the northeastern portion of the Fort Worth Basin, the Barnett Shale is divided by the Forestburg Limestone, but this formation tapers out towards the southern edge of Wise County (Bruner and Smosna, 2011). The Barnett Shale is bounded by the Chappel Limestone below it and the Marble Falls Limestone above it (Bruner and Smosna, 2011).

Stratigraphic units that supply fresh to slightly saline water to wells in the study region range in age from Paleozoic to recent. However, the most important water-bearing formations in north-central Texas are of Cretaceous age. The Cretaceous System is composed of two series, Gulf and Comanche, and each is divided into groups. The Gulf Series is divided into the following five groups: Navarro, Taylor, Austin, Eagle Ford, and Woodbine. The Comanche Series is divided into the following three groups: Washita, Fredericksburg, and Trinity. The Trinity Group is the principal water-bearing group of rocks in the study area and, based on the information obtained from the site visits, all the domestic wells included in this case study are screened in the groundwater-bearing formations of the Trinity Group. According to the Texas Railroad Commission (TRRC), the base of the Cretaceous formations in Wise County vary from 700 to 1, 050 feet below ground surface (bgs); the Barnett Shale, occurring in the Pennsylvanian system occurs between 7,000 to 8,000 feet bgs NETL, 2013).

The Trinity Group crops out through most of the Wise County study area, dips eastward and south eastward, and is underlain and confined by low-permeability rocks that range in age from Precambrian to Jurassic and, where it does not outcrop, is confined by the Walnut Formation (Renken, 1998). The aquifer dips to the south and southeast and has a large amount of vertical anisotropy (Renken, 1998).

The Trinity Group is divided into the following formations (youngest to oldest): Paluxy, Glen Rose, Antlers, and the Twin Mountains. In the southern part of the county, the Trinity Group is composed of the Paluxy, Glen Rose, and Twin Mountains formations (Nordstrom, 1982; Renken, 1998). In the northern portion of the county the Glen Rose formation pinches out and the Paluxy and Twin Mountains formations coalesce to form one unit, the Antlers formation (Nordstrom, 1982; Renken, 1998).

The Paluxy Formation is the upper member of the Trinity Group south of the Glen Rose pinch-out. It crops out in Hood, Parker, Tarrant, and Wise counties. The dip is easterly at an average rate of 30 feet per mile (5.7 meters per kilometer [m/km]) near the outcrop, increasing to 80 feet per mile (15.2 m/km) near the downdip limit of fresh to slightly saline water. The Paluxy is composed predominantly of fine- to coarse-grained, friable, homogeneous, white quartz sand interbedded with sandy, silty, calcareous, or waxy clay and shale. In general, coarse-grained sand is in the lower part. The Paluxy grades upward into fine-grained sand with variable amounts of shale and clay. The sands are usually well-sorted, poorly cemented, and crossbedded. Pyrite and iron nodules are often associated with the sands and contribute to the high iron concentrations in the groundwater (Nordstrom, 1982).

Thickness of the Paluxy varies considerably throughout the study region. From a maximum thickness nearing 400 feet (122 m) in the northern part of the study area, the Paluxy thins to the south and southeast to less than 100 feet (30 m) with a net sand thickness of less than 40 feet (12 m). The maximum thickness 122 meters (400 feet) is in the northern part of the formation and thins to less than 12 meters (40 feet) as you move south.

The Glen Rose formation consists of hard limestone strata alternating with marl or marly limestone (Nordstrom, 1982). The Glen Rose formation in Wise County consists of only three or four thin ledges of limestone interstratified with clays, sandy clays, and sands, and the total thickness is never more than 25 feet, with a reported thickness ranging from 22 to a thickness of 25 feet (Scott and Armstrong, 1932).

The Antlers formation crops out mainly in Cooke, Montague, and Wise counties. The Antlers dips to the southeast at an average rate of 20 feet per mile (3.8 m/km) near its outcrop to 70 feet per mile (13.3 m/km) near its southeastern limit. The Antlers consists of a basal conglomerate and gravel overlain by a fine white to gray, poorly consolidated sand in massive-crossbedded layers interbedded with layers of red, purple, or gray clay in discontinuous lenses scattered throughout the formation, with a middle section containing considerably more clay beds than the upper or lower sections (Nordstrom, 1982). Fine white to yellow pack sand with thin beds of multicolored clay resting on a basal layer of gravel characterize a section on the outcrop (Nordstrom, 1982). The thickness of the Antlers formation varies from about 122 meters (400 feet) near the outcrops to 274 meters (900 feet) near the pinch-out of the Glen Rose formation (Nordstrom, 1982).

The Twin Mountains formation crops out in the western part of the study region in Hood, Parker, and Wise counties. The Twin Mountains overlies Paleozoic rocks throughout the study region and is the lower member of the Trinity Group. The Twin Mountains underlies the Glen Rose formation where the Glen Rose is present. In Wise, Denton, Cooke, and Grayson counties, where the Glen Rose is absent, the Twin Mountains is equivalent to the lower unit of the Antlers formation. Originally the basal Cretaceous bed was named the Travis Peak formation, but the name was changed to the Twin Mountains formation in north-central Texas (Fisher and Rodda, 1966). The Travis Peak contains conglomerates of pebble-size and cobble-size limestone and dolomite, calcareous sands and silts, and impure limestones in central Texas. In contrast, the Twin Mountains sequence in north-central Texas consists mainly of medium- to coarse-grained sands, red and gray silty clays, and siliceous conglomerates of chert, quartzite, and quartz pebbles (Nordstrom, 1982).

The Twin Mountains consists of a basal conglomerate of chert and quartz, grading upward into coarse- to fine-grained sand interspersed with varicolored shale. The sand strata are more thickly bedded in the lower part of the formation than in the upper and middle, and it is in this lower massive sand that the majority of wells are completed. The upper part of the Twin Mountains also contains a considerable percentage of sand and sandstone strata but less than the lower part due to the increased interbedding of shale and clay. Few wells are developed in the upper part of the formation. The thickness varies from 61 meters (200 feet) near the outcrop to a maximum thickness of 305 meters (1,000 feet) downdip, which is a considerable distance away from Wise County (Nordstrom, 1982).

Detailed Hydrogeology

Historical water quality data have been reported (Nordstrom, 1982; Reutter and Dunn, 2000; TXWDB, 2013b; USGS, 2013a; USGS, 2013b). In general water quality data from both Nordstorm and Reutter and Dunn are consistent with each other. The historical data can be used as a reference point for water quality changes that may have taken place since 2000.

The Paluxy formation yields small to moderate amounts of fresh to slightly saline water. The primary source of recharge to the Paluxy is precipitation on the outcrop. Secondary sources include recharge from streams flowing across the outcrop and surface-water seepage from lakes, natural discharge through springs and evapotranspiration, and artificial discharge through pumping of wells (Nordstrom, 1982). Water in the outcrop area is under water table conditions, and water levels remain fairly constant with only normal seasonal fluctuations. In downdip areas, water is under artesian conditions and is confined under hydrostatic pressure by overlying formations; it discharges naturally through springs, evapotranspiration, and through pumping of wells (Nordstrom, 1982). The transmissibility ranges from 15,680 to 171,400 L/d m (1,263 to 13,806 gal/d ft); permeability ranges from 244 to 6,110 L/ d m^2 (6 to 150 gal/d ft^2); specific capacity ranges from 8.7 to 37 L/min m (0.7 to 3.0 gal/min ft); and yield 300 to 3,230 L/min (79 to 853 gal/min) (Nordstrom, 1982).

The Glen Rose formation yields small quantities of water to shallow wells in localized areas, and is of poor quality (Nordstrom, 1982).

The primary source of ground water in the Antlers formation is precipitation on the outcrop; streams on the outcrop are a source of recharge. The average annual precipitation on the outcrop is about 32 inches. Water in the outcrop area is unconfined and therefore under water table conditions. Downdip from the outcrop, the water is confined under hydrostatic pressure and is under artesian conditions. (Baker et al., 1990). The transmissibility ranges from 13,656 to 71,492 L/d m (1,100 to 5,800 gal/d ft); permeability ranges from 62 to 435 L/d m^2 (5 to 35 gal/d ft^2); specific capacity ranges from 7.4 to 52 L/min m (0.6 to 4.2 gal/min ft); and yield 416 to 2301 L/min (110 to 608 gal/min) (Nordstrom, 1982).

The Twin Mountains formation is the most important source of ground water for a large part of the northern Texas (Baker et al., 1990) and yields moderate to large quantities of fresh to slightly saline water to municipal and industrial wells. The primary source of recharge to the Twin Mountains formation is precipitation falling on the outcrop and other minor sources such as surface water seepage from ponds, lakes, and streams cutting the outcrop. Downdip, however, the ground water is confined by impermeable strata and discharges via springs, evapotranspiration, and pumping of wells (Nordstrom, 1982; Baker et al., 1990). Ground water in this formation usually occurs under water table conditions in or near the outcrop but can be artesian conditions downdip; the rate of flow is approximately 1 m/yr (2 ft/y) easterly down dip (Nordstrom 1982). The transmissibility ranges from 51,500 to 369,000 L/d m (4,150 to 29,724 gal/ft d); permeability ranges from 774 to 4073 L/d m (19 to 100 gal/d ft); specific capacity ranges from 21 to 140 L/min m (1.7 to 11.3 gal/min ft); and yields 606 to 7343 L/min (160 to 1,940 gal/min) (Nordstrom, 1982).

The average rate of movement of ground water in the Antlers, Twin Mountains, and Paluxy formations of the Trinity Group is about 1 to 2 feet per year (Nordstrom, 1982). Ground water moves generally in an east-southeast direction. However, as reported by the TXWDB in 1990, extensive cones of depression have developed in the piezometric surface of each of the region's principal aquifers, coinciding with areas of large ground water withdrawals. For example, from 1976 to 1989, water level declines of 25 feet (1.9 ft/yr) were common in the aquifers throughout the TXWBD' s northern Texas aquifer study area. Declines have been especially severe in the Antlers and Twin Mountains aquifers, where declines of 100 to 250 feet (7.6 to 19.2 ft/yr) occurred over extensive areas. Water-level declines in the Paluxy and the Woodbine aquifers (another regional aquifer overlying the Trinity, but not outcropping in Wise County) of up to 150 feet (11.5 ft/yr) were reported in some locations (Baker et al., 1990).

Results of pumping tests reported for Paluxy public supply wells showed that transmissibility values ranged from 1,263 to 13,808 gal/d ft., with an overall average of 3,700 gal/d ft., with coefficients of permeability ranging from 6 to 150 gal/d ft^2, with an overall average of 50 gal/d ft^2 (Nordstrom, 1982).

Gas Production

Since the 1950s, Wise County has been a focus of extensive oil and gas production as a result of being located in the north central portion of the Bend Arch-Fort Worth Basin. The comprehensive National Assessment of Oil and Gas Project completed by the USGS (Ball and Perry, 1996) in 1995 assessed the potential for undiscovered oil and natural gas resources of the onshore United States, identified the Bend Arch-Fort Worth Basin as a major petroleum-producing geological system, and was officially designated by the USGS as Province 045 and classified as the Barnett-Paleozoic total petroleum system (TPS). Oil and gas production in the TPS comes from carbonate and clastic rock reservoirs ranging in age from the Ordovician to the Permian (Figure D3). The first indications of hydrocarbons in the province were shows of oil and gas in wells drilled for water during the mid-nineteenth century. Sporadic exploration for petroleum began at the conclusion of the Civil War, and the first commercial oil accumulations were found in the early 1900s. The province reached a mature stage of exploration and development in the 1960s (Ball and Perry, 1996). In 2003, the USGS conducted a new assessment of the TPS and estimated a mean of 26.7 trillion cubic feet (tcf) of undiscovered natural gas, a mean of 98.5 million barrels (bbl) of undiscovered oil, and a mean of 1.1 billion bbls of undiscovered natural gas liquids, with more than 98%, or 26.2 tcf, of the undiscovered natural gas resource in the Mississippian-age Barnett Shale (USGS, 2004).

According to the USGS, there is extensive stratigraphic accumulation of natural gas in the numerous lenticular sandstone and conglomerate bodies of Early Pennsylvanian age in Jack, Parker, and Wise counties, Texas. These sandstone and conglomerate lenses, locally known as "Bend Conglomerates," deposited during the Atoka Stage of the Middle Pennsylvanian period, are characterized by extreme variability in lateral extent. Conglomerate bodies present in one well commonly are not present in the offset well. Some wells contain as many as eight separate lenses with a combined pay thickness of more than 100 feet. The Boonsville (Bend Conglomerate) gas field and the Toto (lower Bend Conglomerate) gas field cover an area of approximately 450 sq. mi in Jack, Parker, and Wise counties, and at one point in the 1950s it was the largest gas-producing area of North Texas. Reported depths for these Bend Conglomerates are from 5,000 to 7,000 feet below the ground. As of January 2011, the lower Atoka reservoirs, collectively, produced more than 3.2 tcf of natural gas and more than 36.3 million bbl of oil from more than 5,700 wells (Alhakeem, 2013).

The East Newark Field (i.e., the Barnett Shale) first became a TRRC-recognized field in early 1981 when Mitchell Energy Corp. made the first economic completion in the formation with its C.W. Slay #1, located 4 miles east of Newark, Texas. This truly could not be considered a “discovery” since the Barnett Shale was known to exist in the TPS for some time, as many wells had been drilled for years in the area to the shallower Boonsville Field or to deeper Viola Limestone intervals, while penetrating the Barnett Shale. However, Mitchell Energy Corp. achieved the first highly economic fracture completion of the Barnett Shale in 1998 by using slick-water fracturing (Miller et al, 2012). By 2005, the majority of new Barnett Shale wells drilled were horizontal; by 2008, 94% of the Barnett wells drilled were horizontal (Wang and Krupnick, 2013). According to the TRRC, as of January 2012, there were 16,530 gas wells in the Barnett Shale entered on TRRC records. In addition, there were 2,457 permitted locations. (These represent pending oil or gas wells, where either the operator has not yet filed completion paperwork with the TRRC or the completed well has not yet been set up with a TRCC identification number.) In June 2013, Powell Shale Digest reported the following well statistics for the Barnett Shale field:

- Total No. Wells: 18,920
- No. Horizontal Wells: 14,103
- No. Directional Wells: 528
- No. Vertical Wells: 4,289.

According to the TRRC the number of permits issued in the Barnett Shale peaked in 2008 with more than 4,000 permits being issued. In contrast, in 2012 approximately 1,182 permits were issued, no doubt a reflection of the low price of natural gas. Similarly, the number of drilling permits issued in Wise County peaked in the 2001 to 2002 period with more than 390 permits being issued, while in 2013, fewer than 70 permits had been issued by the TRRC. From January 2012 through November 2012 production in the Barnett shale accounted for 31% of Texas gas well gas production, with a cumulative production (2004 to 2012) of 11,715 billion cubic feet (bcf). There are approximately 492 oil and gas operators in Wise County, and approximately 11,410 wells, with a cumulative gas production of 2,808,866,540 cubic feet (http://www.oginfo.com/texas_production_data/TEXAS/WISE). As of February 2013, the TRRC reported a total of 4,362 regular gas-producing wells in Wise County. According to information presented by Powell Shale Digest in June 2013, gas production statistics for Wise County were as follows:

- No. of Horizontal Wells: 1,052
- Gas Peak Monthly Daily Average: 1,711 MCFPD
- Gas Total to April 1, 2013: 860,120 MCF

It was not until 1919 that the TRRC was given authority by the Texas legislature to regulate well plugging and enact general requirements designed to protect the loss of oil and gas to other strata, not to protect the environment. The TRRC continued to update plugging regulations by issuing specific cementing instructions in 1934 and then requiring the plugging of fresh water strata in 1957. In 1966, the TRRC promulgated Rule 14, which required setting cement plugs to protect fresh water sands to protect drinkable quality water from pollution and to isolate each productive horizon. In recent developments, the TRRC adopted regulations requiring the oil and gas industry to disclose the materials used in all hydraulic fracturing wells in Texas completed after February 1, 2012. Under these regulations the operator must disclose this information on the well completion report and complete the Chemical Disclosure Registry form and upload it to the FracFocus database. Additionally, on May 2013, the TRRC issued new regulations to strengthen the construction of oil and gas wells. The rule, known as the "well-integrity rule," will take effect next January 2014 and will update the commission's requirements for the process of drilling wells, installing pipe down the well and cementing the pipe in place.

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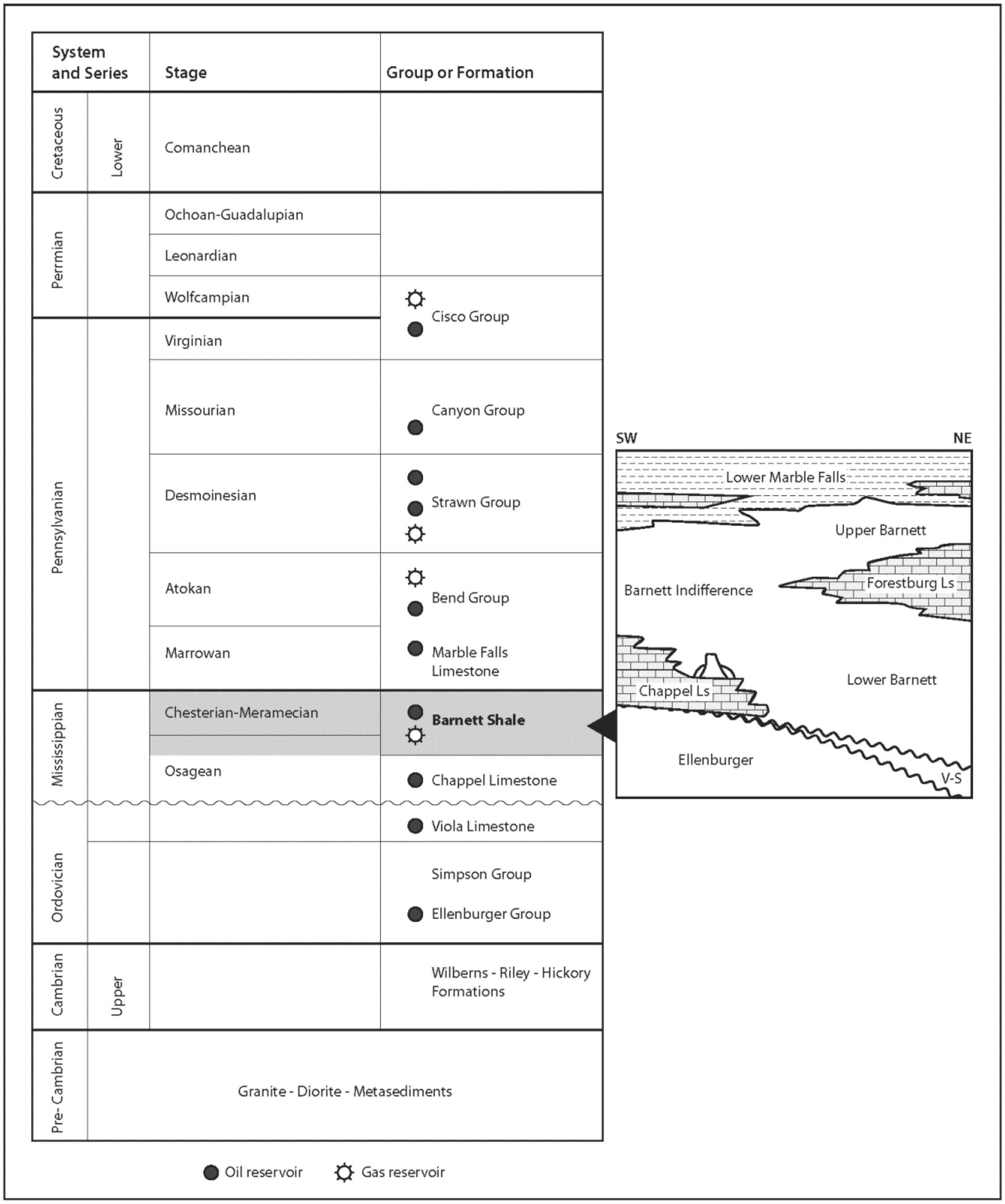
Appendix D Figures



Source: American Association of Petroleum Geologists

Figure D1 A generalized stratigraphy column for the Fort Worth Basin

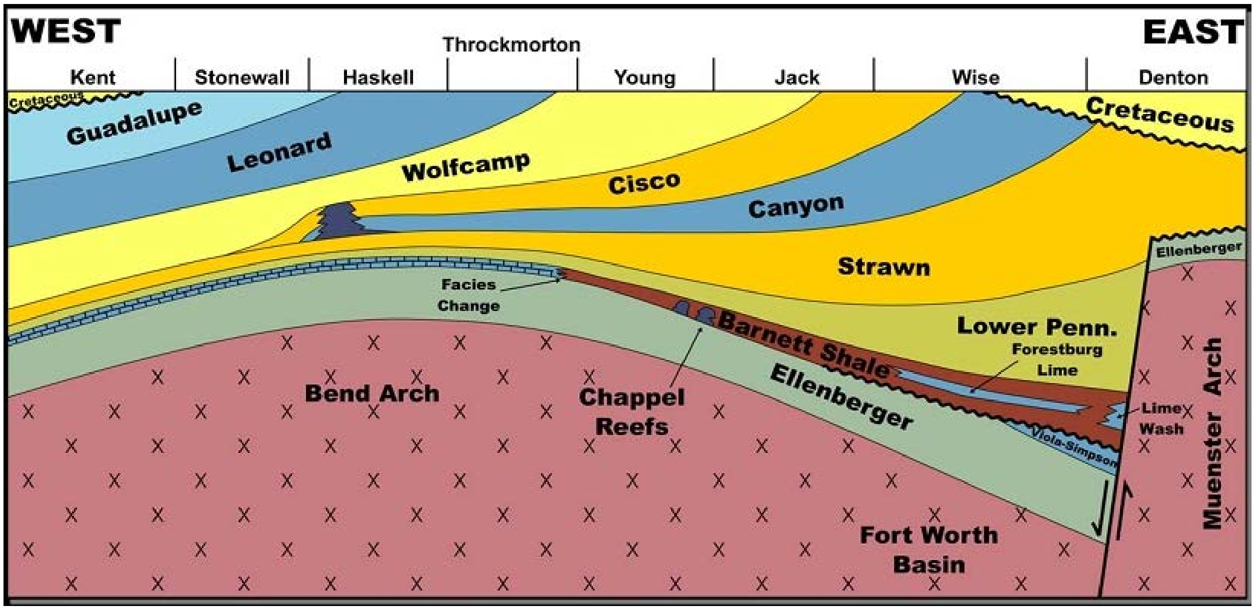


Figure D2 A generalized geologic cross section of the Bend Arch, Fort Worth Basin and Muenster Arch

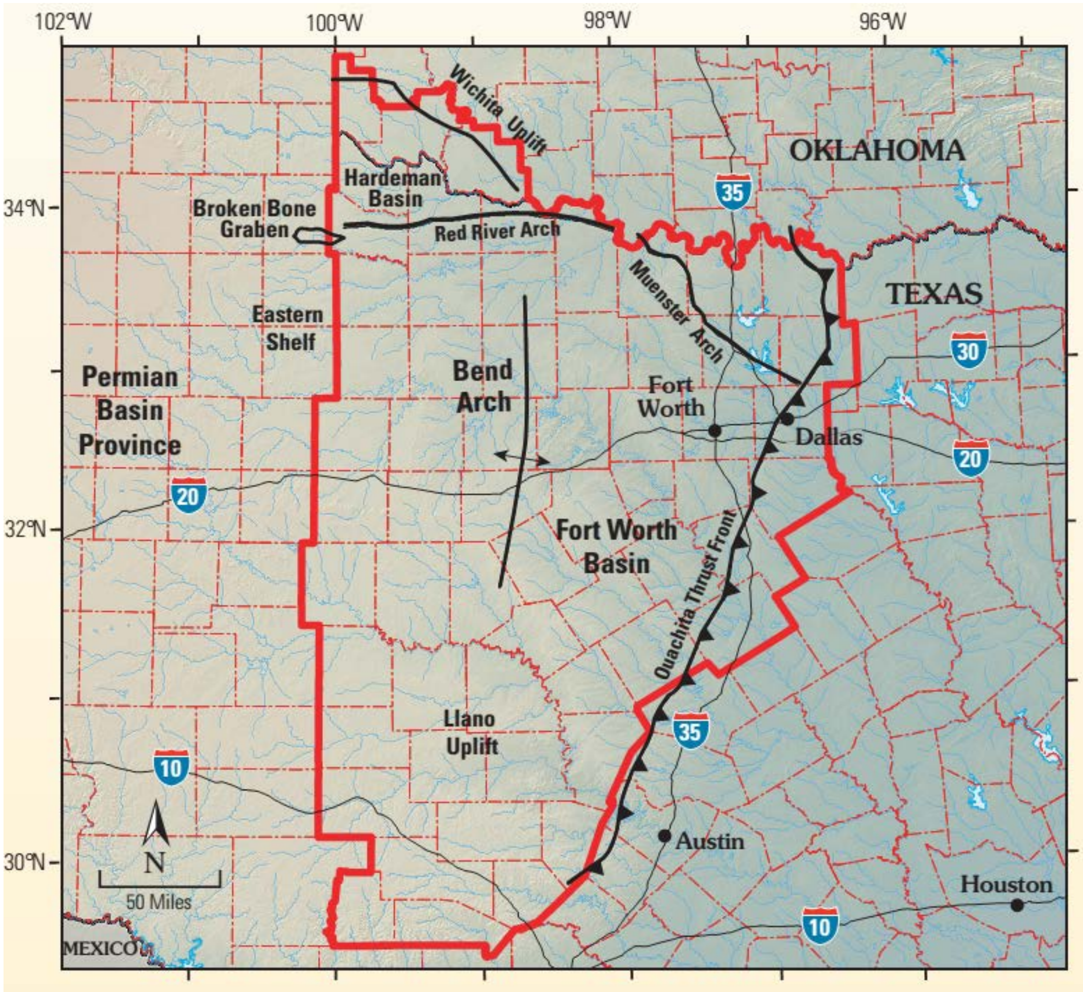


Figure D3 Bend Arch-Fort Worth Basin Province within the boundary outlined in red (after USGS)

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