Supplemental Assessment and Analysis of Brownfields Cleanup Alternatives (ABCA) Report

2401 Broadway Avenue
Northwood Anchor Site,
West Palm Beach, Florida

0002903100

Brownfields Site No. BF500302001

Prepared for
Treasure Coast Regional Planning Council

May 2014

Prepared for:

TREASURE COAST TCRPC REGIONAL PLANNING COUNCIL
"Bringing Communities Together" Est. 1976

CITY OF WEST PALM BEACH FLORIDA

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Shaping the Future

Executive Summary

From 2004 through 2008, Cardno TBE (on behalf of the Treasure Coast Regional Planning Council [TCRPC]), conducted environmental assessment activities, and developed a remedial action strategy for the 2401 N. Broadway Avenue site (Site) located in the Northwood Redevelopment Area, West Palm Beach, Palm Beach County, Florida. This site was a former retail gas facility, for which groundwater impacts were identified during Brownfields site assessment activities. Previously referred to as the "Northwood Anchor Site", a Combined Brownfields Site Assessment Report and Remedial Action Plan (BSAR/RAP) was submitted for the site in February 2009 and a Remedial Action Plan Approval Order was subsequently submitted by FDEP on April 12, 2011; after two requests for additional information.

The previously approved RAP included a proposal for in-situ bio-augmentation using concurrent injection of both a *pseudomonas* bacteria and nutrients mixture (Petrox®) and an oxygen release compound (ORC-A®). This combination was designed to facilitate rapid biological degradation of dissolved petroleum hydrocarbons (PHCs), with conversion to CO_2 and water.

For a number of reasons, no assessment or remedial actions were implemented at the site since August 2008. Based on the extensive amount of time that passed with no assessment data, Cardno TBE was retained in early 2014 to re-sample all existing monitor wells, to provide a supplemental Site Assessment Report for the site, and to re-evaluate the proposed remedial strategy in light of new data. Based on this assessment, dissolved petroleum contamination in the surficial aquifer was significantly higher in March 2014 than they were in 2008. Based on these results, a significant modification in the proposed remedial action approach is provided in this ABCA document. Specifically, Cardno TBE is submitting a comparison of four remedial alternatives for the site, along with a recommendation to a shift from bioremediation to air sparge/soil vapor extraction remediation.

Because assessment grant funding from the U.S. EPA was used to complete this work, the document title has been changed from Remedial Action Plan (RAP) to Analysis of Brownfields Cleanup Alternatives (ABCA), to meet the grant requirements. In addition to following EPA guidelines for ABCA preparation, the document is also designed to meet RAP requirements outlined in Chapter 62-780.700(3), Florida Administrative Code (F.A.C.).

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1 Introduction

Cardno TBE, on behalf of the Treasure Coast Regional Planning Council (TCRPC), previously conducted environmental assessment activities, and developed a remedial action plan for the 2401 N. Broadway Avenue site (Site) located in West Palm Beach, Palm Beach County, Florida (**Figure 1**). This site was a former retail gas facility and was investigated initially as part of a larger "Northwood Area" or "Northwood Anchor Site" Brownfields site investigation. Groundwater impacts were identified at the Site during historical Brownfields site assessment activities, and a Combined Brownfields Site Assessment Report and Remedial Action Plan (BSAR/RAP) was submitted for the site in February 2009. This combined document was approved (subsequent to two requests for additional information) in April 2011. A copy of the FDEP approval order is provided in **Appendix A**.

Subsequent to BSAR/RAP approval, the city of West Palm Beach (City) began demolition of several derelict buildings throughout the broader Northwood study area, including the demolition of the former 2401 Broadway Avenue gas station building (note – the former petroleum storage tanks were reportedly removed from the site in April 1990). Additionally, the cleared site was used by the City for an extended period as a staging area for building materials and equipment, in support of major buried utility upgrades throughout the Northwood area. Finally, financial arrangements and project lead responsibility for site remediation have remained under negotiation for this parcel between a group of stakeholders (TCRPC, the West Palm Beach Community Redevelopment Agency (CRA), and Palm Beach County). This negotiation has remained dynamic as a developer for this property has not been specifically identified and (as a result) the end development plans for the property have not been fully determined. Based on these factors, no additional site assessment or remediation work was performed at the site since RAP approval in April 2011.

Based on the amount of time that passed with no remedial actions, Cardno TBE was retained to re-sample all existing monitor wells and to provide a supplemental Site Assessment Report that summarized the current site conditions. Additionally, Cardno TBE was requested to refine the Analysis of Brownfield Cleanup Alternatives (ABCA)/RAP document, if required based on the assessment results from March 2014. This report provides the results of the March 2014 supplemental assessment, and includes a significant modification in the proposed remedial action approach due changes in water quality between 2008 and 2014. Also, because a number of remedial action strategies are compared within this document; historical information, regional hydrogeology information, and site hydrogeologic information is provided (again) for evaluation.

Finally, because U.S. EPA assessment grant funding was used to complete this work, the document title has been changed from Remedial Action Plan (RAP) to Analysis of Brownfields Cleanup Alternatives (ABCA), to meet the grant requirements. In addition to following EPA guidelines for ABCA preparation, the document has also been designed to meet the requirements for a RAP, pursuant to Chapter 62-780.700(3), Florida Administrative Code (F.A.C.).

1.1 Operational History

The 2401 Broadway Avenue site is listed within the FDEP LUST database (FDEP Facility ID No. 8514130), as having a documented release of petroleum hydrocarbons. Two 3,000 gallon underground storage tanks (one leaded gasoline and one unleaded gasoline) were reportedly removed from the closed facility in April 1990. Contaminated soils and groundwater were documented in Agency records, with no records of remediation activities in agency files (other than tank removal). The 1990 assessment indicated excessively contaminated soil within the site's south excavation area located between the former on-site structure and Northwood Road (in close proximity to the subject site's south property boundary). A subsequent Baseline Sampling Report (Nutting Environmental, August 2004) also documented groundwater contamination at the site.

A Phase 2 ESA performed by Cardno TBE (formerly TBE Group) in January 2005 also detected petroleum-impacted groundwater above state cleanup criteria along the property's southern property boundary. A subsequent geophysical survey conducted in November 2006 tentatively identified an underground storage tank in the western portion of this site. A groundwater monitor well was installed at this possible tank location during a Supplemental Brownfields Site Assessment program and no impacts were detected at this location (it does not appear that a tank is present at this location; however, this can be further evaluated during site remediation activities). Additional monitor wells were installed within this study area during the Supplemental Site Assessment program and these wells provided enhanced delineation of groundwater impacts. A detailed discussion of the Supplemental BSAR is provided in Section 3.0.

1.2 Previous Investigations

Cardno TBE has performed several investigations within the broader Northwood study area, beginning in 2004. The following reports have been prepared based on these investigations.

- Phase 1 Environmental Site Assessment (ESA) Report for the Northwood Redevelopment Area, TBE, September 2004, Prepared for Treasure Coast Regional Planning Council (TCRPC).

- Phase 2 ESA Report, Northwood Village Redevelopment Area, TBE, January 2005, Prepared for TCRPC.

- Phase 1 ESA Report, Northwood Anchor Site, TBE, December 2006, Prepared for TCRPC and the West Palm Beach Community Redevelopment Agency (WPB CRA).

- Phase 1 ESA Report for Northwood Redevelopment Area. TBE, January 2008, Prepared for TCRPC and WPB CRA.

- Preliminary Brownfields Site Assessment Report, Northwood Redevelopment Area, West of Broadway Avenue, TBE, May 2008, Prepared for TCRPC and WPB CRA.

- Supplemental Brownfields Site Assessment Report, Northwood Redevelopment Area West of Broadway Avenue, TBE, September 2008, Prepared for TCRPC and WPB CRA.

A detailed summary of the September 2008 findings is provided Section 3.0. This discussion also includes salient information from the prior documents that are listed above.

2 Regional Setting

2.1 Regional Physiographic Setting

West Palm Beach is located within the Eastern Valley physiographic province, less than a quarter mile west of Lake Worth, which is a saltwater body separating the mainland from a barrier island system further to the east. The eastern valley province is a low-lying, flat region that is typically at an elevation of less than 20-ft above mean sea level (MSL).

2.2 Regional Hydrogeology

The subsurface geology in the northeastern portion of Palm Beach County is comprised of between 100 and 200-ft of undifferentiated sediments, consisting primarily of sand, clay, silt, shell and limestone. These sediments are areally extensive and dip toward the southeast (Fernald and Patton, 1984). The Miocene Hawthorn Group underlies the undifferentiated Quaternary sediments and is comprised of relatively impermeable clays and marls. The Hawthorn Group can be as thick as 500-ft in the study area.

The undifferentiated surficial aquifer is the primary source of drinking water in the area and includes both water table aquifer and semi-confined aquifer systems (Fernald and Patton, 1984). The water table has very high hydraulic conductivity and can yield in excess of 10 million gallons per day in certain areas. The surficial aquifer becomes increasingly saline near the coast and is anticipated to be non-potable in the vicinity of West Palm Beach due to high salinity.

Site Hydrogeologic conditions are discussed in Section 5.0 of this document.

3 August 2008 Environmental Assessment Summary

Based on the passage of more than five (5) years since the previous environmental assessment of the 2401 Broadway property, a summary of the August 2008 assessment is provided in this section. The scope of that assessment included the following tasks:

- Soil samples were collected at four (4) boring locations, at depths of 1-ft bls and 3-ft bls (8 samples total). Samples were analyzed for VOCs and SVOCs.

- Three (3) shallow monitor wells were installed to the west, north and east of well MW-B4, respectively (wells TBE-3W, TBE-4W, and TBE-5W); and one (1) deep monitor well immediately adjacent to well MW-B4 (well TBE-6DW). Note – well MW-B4 was the most heavily-impacted monitor well at the site based on prior assessment activities.

- New monitor wells and existing monitor well MW-B4 were sampled for VOC and SVOC analysis.

A figure depicting the location of soil borings and monitor wells throughout much of the Northwood Study Area, which was provided in the BSAR/RAP document is provided on **Figure 2**. However, subsequent site inspection of the 2401 Broadway property brought into question some of the well locations as depicted on this figure (Note – well locations were placed on the map based on site landmarks that have subsequently been removed). As a result, Cardno TBE has conducted a specific purpose survey to ensure correct well placements on the map. Subsequent sections of this document will utilize the updated boundary survey map.

Soil borings were installed using direct push (Geoprobe) technology and soil samples were collected in 1-inch, clear, acetate core liners. The soil cores were opened and 1-ft sample composites were collected at 2-ft intervals and transferred into clear mason jars and covered with aluminum foil. The samples were then screened using a MicroFID organic vapor analyzer (OVA), both with an organic filter and without. The net OVA reading (unfiltered minus the filtered value) was then used to determine if organic vapors associated with petroleum hydrocarbons were present. While OVA readings provided additional assessment information, soil samples were collected at 1-ft and 3-ft depths at all boring locations to determine if shallow soil impacts were present and if soil remediation measures were warranted.

Monitor wells were installed using Direct Push (Geoprobe) technology (DPT). Ten (10) feet of 1-inch diameter, 0.01-inch slotted, pre-packed, schedule 40 PVC well screen was used for each well, with schedule 40 PVC risers completing the well to land surface. A fine sand and bentonite seal (approximately 2-ft thick) was placed immediately above the pre-packed screen and neat cement grout was used to fill the remainder of the well annulus. An approximately 2-ft by 2-ft concrete pad and 8-inch diameter, flush mount protective well cover was used to complete each well.

Once wells were completed, both soil and groundwater samples were collected in a manner consistent with FDEP Standard Operating Procedures (FDEP-SOP-001/01). Boring Logs and Well Construction and Development Logs from each of the three site assessment programs were provided in the February 2009 BSAR/RAP document.

3.1 Soil Screening Results

OVA readings were not elevated at any boring location above the water table, but were elevated below the water table at each of the four monitor well locations associated with the August 2008 investigation.

3.2 Soil Sampling Results

Soil samples were collected from depths of 1-ft and 3-ft bls at boring locationsTBE-3W, TBE-4W, TBE-5W, and TBE-6DW. These samples were collected to determine if shallow soil impacts were present that would result in potential direct exposure concerns. Deeper samples were collected for screening, but were not analyzed because the shallower samples were not impacted. Soil sample results are summarized in **Table 1**. As shown in **Table 1**, low levels of VOCs and SVOCs were encountered in several soil samples; however, no analytes were detected above Florida default soil CTLs. Based on this result, soils were not considered impacted at the study Site.

3.3 Groundwater Assessment Results

The results of the August 2008 analyses (as well as March 2014 analyses) are combined with April 2008 data in **Table 2**. As shown in **Table 2,** groundwater CTLs were exceeded for various COCs in four monitor wells at the 2401 Broadway property in August 2008. Specifically, the natural attenuation default criteria (NADC) levels were exceeded in samples from monitor well MW-B4 and the newly-installed northern offset monitor well (TBE-4W). Additionally, default GCTLs were exceeded for at least two COCs in the newly-installed western and eastern offset wells (TBE-3W and TBE-5W). However, no CTLs were exceeded in the deeper monitor well TBE-6DW that was installed to a depth of 29 ft bls, immediately adjacent to monitor well MW-B4, which is completed to a depth of 18 ft bls.

A total VOC isopleth map from August 2008 is provided on **Figure 2**. As shown on **Figure 2**, notable groundwater impacts to the shallow surficial aquifer were evident within the southern portion of the site. As a result, a combined BSAR/RAP document was submitted for FDEP consideration.

4 March 2014 Assessment Summary

4.1 Scope of Work

Existing on-site monitor wells, and select nearby monitor wells on adjacent properties were re-sampled in March 2014. Additionally, based on observations prior to initiating the sampling program, it was apparent that some of the existing monitor wells were not located accurately on the site map. As a result, Cardno TBE conducted two additional tasks: (1) contracting SurvTech, Inc. to provide an updated boundary survey with well locations and revised top-of-casing (TOC) elevations, and (2) installation of a new monitor well (TBE-7R) to replace monitor well TBE-7 during this sampling event. Well TBE-7R was located near the anticipated central portion of the VOC plume to provide additional information for determining reagent calculations for in-situ remedial action evaluations. Additionally, the modified TOC values were combined with groundwater elevation readings from March 2014, so that a determination of groundwater flow patterns could be made for the site.

A copy of the updated Specific Purpose Survey is provided in **Appendix B** and the Boring Log and Well Completion and Development Log for monitor well TBE-7R is provided in **Appendix C**. Groundwater sampling logs and equipment calibration logs from the March 2014 sampling event are provided in **Appendix D**.

4.2 Groundwater Flow

A summary of water level measurements and elevations based on the revised NAVD88 survey is provided in **Table 3**. A map depicting groundwater flow for March 25, 2014 is shown on **Figure 3**. As shown on this Figure, groundwater flow was from west to east, at a gradient of approximately 0.002 ft/ft.

4.3 Water Quality Summary

Laboratory analytical data from the March 2014 sampling event are included in **Appendix E** and the results are summarized in **Table 2** (along with April and August 2008 analytical data). As shown in **Table 2**, up to six (6) different volatile organic compounds (VOCs) were detected at concentrations exceeding the groundwater cleanup target levels (GCTLs) and/or the Natural Attenuation Default Criteria (NADCs) listed in Chapter 62-777, F.A.C. In addition to providing the analytical results for each of the six constituents of concern (COCs), an individual plume map is shown (on the revised site survey map) for each of the COCs on **Figure 4** (1,2,4-trimethylbenzene), **Figure 5** (1,3,5-trimethylbenzene), **Figure 6** (ethylbenzene), **Figure 7** (isopropylbenzene [cumene]), **Figure 8** (naphthalene), and **Figure 9** (total xylenes).

As noted in **Table 2**, COC concentrations in the two monitor wells with prior GCTL exceedances were significantly higher in March 2014 than during the previous sampling events. This notable increase in COC concentrations is likely due to the removal of the pavement at the site and the enhanced infiltration of water through the vadose zone. Additionally, concentrations in the new monitor well

(TBE-7R) were similar to those in the most impacted existing well (MW-B4). Concentrations of five of the six COCs exceeded NADC concentrations in wells TBE-4W and TBE-7R, and all six COCs exceeded NADC concentrations in well MW-B4.

In reviewing **Figures 4 through 9**, the VOC plume interpretation for each COC covers essentially the same aerial extent, covering approximately 0.05 acres. Additionally, because concentrations in the well TBE-6DW sample did not exceed any of the GCTLs, groundwater impacts appear to be limited to the upper portion of the surficial aquifer.

Based on the increased concentrations noted in March 2014, a re-evaluation of the previously proposed remedial action plan was warranted and is included in subsequent sections of this report.

5 Conceptual Model for Remedial System Design

5.1 Site Lithology

The surficial soils encountered throughout the study area consist of orange to white to tan, medium to fine-grained sand to a depth of approximately 30-ft bls. At approximately 30-ft bls, the soils transition to an olive gray color, and almost immediately to weathered limestone. The weathered limestone contains abundant shell fragments

5.2 Site Hydrogeology

5.2.1 Aquifer Testing Results

An aquifer test was not performed at the site; however, based on the lithology of the surficial aquifer and the yields obtained during well development, the surficial aquifer is highly transmissive (estimated at approximately 10^{-3} cm/sec or greater).

5.2.2 Groundwater Flow

Groundwater flow was discussed in Section 4.2. Flow in March 2014 was from west to east at a gradient of approximately 0.002 ft/ft.

5.3 Environmental Impacts

While no soil impacts were encountered during the previous site assessment activities (conducted in 2008), increases in the groundwater impacts subsequent to the removal of pavement and buildings from the site indicates that some level of vadose zone impacts (or smear zone impacts) exist (or existed) at the site. The highest total VOC concentration in groundwater in March 2014 (the sum of the six COCs exceeding GCTLs) was 5,756 µg/L in well MW-B4, compared to 1,895 µg/L in August 2008. Similar concentrations were detected in wells MW-B4 and new well TBE-7R in March 2014.

6 Analysis of Brownfields Cleanup Alternatives

6.1 Exposure Analysis

6.1.1 Risk Evaluation

Preparation of an ABCA requires an evaluation of possible corrective actions and their respective costs to remedy affected areas. Not all remedies are physical or chemical and may include other types of remedies such as institutional controls (e.g. restrictions to certain types of development or land use recorded on the deed). Excess public risk is defined by four factors, all of which must be present to produce excess risk from contaminants at a site. These are:

- A chemical with sufficient toxicity to do harm (whether acute or chronic),
- A sufficient quantity of the chemical to be toxic and do harm,
- A receptor on which to do harm, and
- A pathway by which a sufficient amount of the contaminant can actually reach a receptor and do harm.

Corrective actions to remedy affected areas rarely eliminate all COCs. It is generally the intent to remove, treat or immobilize the concentrations of COCs to levels producing an acceptable risk to human health and the environment. The degree of acceptable risk has to be determined by the public through legislative and regulatory processes. In Florida, this has been accomplished by the development of FDEP regulatory programs to implement State cleanup standards (Chapter 62-777, FAC, the Contaminant Cleanup Target Levels), which provide different cleanup target levels based on specific land use assumptions, as well as the ability to develop site-specific standards based on specific land use restrictions.

6.1.2 Potential Receptors and Exposure Pathways

In order for possible COCs to do harm to public health or the environment, they must occupy a point of exposure accessible to the population at risk. Compounds to which populations are not currently, or are not likely to be exposed via complete exposure pathways do not constitute a probable condition of elevated risk. The three potential receptor populations typically considered for soil exposures are:

- Construction worker – persons involved in the redevelopment of the property. FDEP typically dictates that this receptor generally is protected by OSHA guidelines

- Industrial/commercial worker – persons who occupy the property under conditions of full-time employment
- Residents – persons who reside on the property

For each of the potential receptors, the applicable exposure pathway of concern is direct contact with soil via incidental ingestion, dermal contact, and inhalation of particulates and/or volatile emissions. At this site, no vadose zone soil impacts have been detected; therefore, the COCs are not present at a point of exposure.

For groundwater, the applicable exposure pathway of concern is ingestion. Groundwater at the site flows to the east, toward Lake Worth. At this time, impacts to groundwater are limited to the shallow surficial aquifer within the southeast corner of the site, covering an area of approximately 0.05 acres.

6.2 Cleanup Objectives / Applicable Regulations

It is anticipated that the 2401 Broadway site will be redeveloped with a commercial or mixed use (commercial/residential) land use. The study site is part of a multi-block assemblage of properties that will be marketed as a single property or portion thereof. The surrounding area is undergoing notable redevelopment with restaurants, shops, and galleries.

Future groundwater assessment and/or remediation activities at this site will remain consistent with Chapter 62-780, F.A.C. (the Contaminated Site Cleanup Criteria). Per these criteria, additional actions must be taken if COC concentrations exceed the groundwater or soil cleanup target levels listed in Chapter 62-777, F.A.C. Therefore, the requirements of Chapters 62-780, F.A.C. and 62-777, F.A.C. are considered Applicable or Relevant and Appropriate Requirements (ARARs) with respect to documented groundwater impacts at this site. Actions required (by Chapter 62-780 F.A.C.) if the groundwater CTLs are exceeded generally include: additional assessment, development of alternative CTLs based on site specific conditions (e.g., a background study or risk assessment), implementation of remediation measures, and/or implementation of risk management options (RMOs) such as engineering and/or institutional controls.

Based on Brownfields assessment information obtained at this site, it is the intent of the Person Responsible for Brownfields Site Rehabilitation (PRFBSR) to remediate groundwater impacts to below the default groundwater CTLs listed in Chapter 62-777, F.A.C. However, if it proves impracticable to

remediate low level VOC impacts to the CTL levels, then alternative CTLs will be considered to support a conditional Site Rehabilitation Completion Order (SRCO) from the FDEP. The conditions for such a closure would include institutional controls to prevent future use of groundwater at the site.

7 Evaluation of Cleanup Alternatives

7.1 Soil Remediation Alternatives

Based on soil sampling conducted previously at the site, no soil impacts above SCTLs have been documented. As a result, remediation of vadose zone soils is not proposed. However, the air sparge / soil vapor extraction (AS/SVE) technology being considered for the site will remediate any residual or undocumented impacts within the vadose zone, and within the zone of influence of the SVE system,

7.2 Groundwater Remediation Alternatives

As a condition of grant funding for site remediation, the EPA requires an evaluation of multiple corrective measures alternatives based on an established set of criteria. The following five (5) remedial alternatives have been evaluated to address documented groundwater impacts at the 2401 Broadway Avenue Site in West Palm Beach, Palm Beach County, Florida

- No Action
- In-situ bio-augmentation
- Pump and Treat (P&T) combined with in-situ bio-augmentation
- Air Sparge with Soil Vapor Extraction (AS/SVE)
- De-watering and Excavation

Each of these alternatives has been evaluated with respect to effectiveness, implementability, and cost. A summary of each technology, including pros and cons of each, are included in **Table 4**. The following sections provide a synopsis of each technology and the final evaluation results.

7.2.1 No Action

Technology Description

The No Action alternative does not involve any technology. However, site closure without active remediation could involve the development of institutional and/or engineering controls at the site. Specifically, if the site met certain criteria outlined in Chapter 62-780, F.A.C., then an institutional control prohibiting use of groundwater at the site (for instance), could be implemented to support a conditional site closure finding from FDEP.

Effectiveness

Contaminant concentrations are well above the cleanup target levels prescribed by FDEP. As a result, the No Action alternative will not be sufficient to prevent potential exposure, or to obtain unconditional site closure. Additionally, based on the high concentrations of dissolved PHC contamination (i.e., concentrations above NADC concentrations), the site does not meet the criteria typically required by FDEP for conditional site closure with institutional controls. Finally, the lack of knowledge with respect to the final land use alternatives for the site, and the lack of control of adjacent properties with respect to potential well installation and groundwater withdrawals, make this alternative in-effective at the Northwood site.

Cost

The No Action alternative is by far the least expensive alternative, if suitable for the site. At this time, the site does not meet the requirements for the No Action alternative. However, if contaminant concentrations are reduced significantly (to below NADC concentrations), but remain slightly above groundwater CTL concentrations, a conditional SRCO may be feasible via the use of institutional controls (e.g., a restrictive covenant to the property deed) and/or engineering controls (e.g., a cap and cover system that controls infiltration and potential plume migration.

7.2.2 In-Situ Bio-Augmentation

Technology Description

Petroleum hydrocarbons (PHCs) are amenable to bio-degradation to innocuous end products (primarily CO_2 and H_2O), under the appropriate circumstances. Specifically, the appropriate microbes must be present, as well as sufficient nutrients and oxygen to facilitate rapid growth and replenishment of the microbial population. However, in order to reduce PHC concentrations to below cleanup target levels in a reasonable amount of time, sufficient microbes, nutrients, and oxygen must remain in the system throughout the degradation process.

Bio-augmentation involves the injection of appropriate microbes (typically *pseudomonas* bacteria), nutrients, and/or oxygen into the subsurface to facilitate microbial growth and accelerated biodegradation of PHCs. While microbe and nutrients are likely to enhance this process, dissolved oxygen is typically the limiting element in the biodegradation process. Therefore, it is critical to ensure sufficient dissolved oxygen in the subsurface, either via the direct injection of air (e.g., using bio-sparge well system), or by the injection of oxygen release compounds (ORC).

For this project, the bio-augmentation procedure under consideration is the injection in the subsurface of a microbial and nutrient complex (Petrox®), as well as a slow release oxygen release compound (ORC-A™). Injection would be via DPT injection points, from approximately 25 ft bls to just above the water table (approximately 8 ft bls). The injection points for Petrox and ORC-A will be offset from one another and would cover the entire area with documented PHC contamination.

Effectiveness

PHCs (particularly aromatic contaminants such as those present at the Northwood site) are readily degraded (mineralized) or co-metabolized in the presence of organisms (heterotrophs) which use the carbon in the PHC as a source of energy. The bioremediation process involves microbes seeking carbon sources such as petroleum for sustenance, with the hydrocarbons acting as an electron donor during the oxidation process. Dissolved oxygen acts as the electron acceptor in this process, with CO_2 and H_2O the final by-products of the reaction. The BTEX assimilative capacity of an aquifer can be estimated by the O_2 concentration ÷ 3.14 (e.g., 10 mg/L O_2 will degrade 3.18 mg/L BTEX) (Wiedemeier & Wilson 1995). Additionally, half-lives for BTEX compounds in the presence of sufficient oxygen have been estimated by ASTM (1995), as follows:

- Benzene 7.3 to 226 days
- Toluene 7.3 to 62 days
- Ethylbenzene 5.8 to 226 days
- Xylene 13.8 to 365 days

However, this is a rate limiting reaction; therefore, the reaction is anticipated to slow down as the concentrations are reduced. As a result, subsequent injections of reagent are frequently required.

Implementability

Except for the southern portion of the plume, the site is primarily clear and unpaved. Additionally, all contamination is present within unconsolidated sands. As a result, DPT injection of reagents into the subsurface is easily implemented.

Cost

The cost for implementing bio-augmentation is outlined in **Table 4**. As outlined in that table, the estimated cost to implement this technology is as follows: implementation is as follows:

- DPT injection program 140,000 - $150,000
- Two years of active remediation monitoring (ARM) 105,000-- $120,000

TOTAL COST ESTIMATE **$245,000 - $270,000**

7.2.3 Pump and Treat prior to Bio-Augmentation

Technology Description

Pump and treat (P&T) involves the recovery of impacted groundwater via recovery wells (typically) and pumps, and the on-site treatment (usually) of groundwater, prior to discharge via a storm sewer, sanitary sewer, subsurface injection, or some other mechanism. For on-site treatment, the contaminants must be amenable for treatment or discharge. In the case of PHCs, they are readily treatable via either air stripping or activated carbon filtration.

Effectiveness

P&T is one of the most effective remediation technologies for removing a significant mass of dissolved contamination in a short amount of time. However, P&T alone is typically ineffective in achieving the final remediation goals at a site because the rate of mass removal stagnates at concentrations considerably above target levels. This slowdown in contaminant capture is primarily due to the diffusion controlled aspects of contaminant migration in porous media. In addition to a slowdown in contaminant reductions, a certain level of contaminant rebound is also frequently associated with P&T remediation alone. However, because it is effective at removing initially high levels of contamination, P&T is a viable initial step for a site like Northwood, prior to a subsequent *in-situ* remediation alternatives (like bio-augmentation).

Implementability

The Northwood site is essentially clear and open, and the contamination occurs in unconsolidated sands that are permeable and amenable to recovery well installation. However, electrical power is typically required to effectively operate pumps and on-site treatment systems on a continual basis in a cost effective manner. As a result, Cardno TBE considers the best approach for P&T pre-remediation to include four episodic recovery events at the site using generator power and mobil pumps and treatment systems. While more labor intensive, this approach eliminates the requirement for having an electrical power drop at the site. In addition to the power issues, it is anticipated that an on-site air stripping tower (AST) would be used to remediate the captured groundwater prior to discharge. Because the site is small, discharge via a stormwater or sanitary sewer system is anticipated, along with the associated permitting.

Cost

As outlined in **Table 4**, the anticipated cost for P&T, coupled with in-situ bio-augmentation are as follows:

• Four months of episodic P&T	$75,000 - $85,000
• Reduced bio-augmentation cost (due to reduced mass)	$70,000 - $80,000
• One year ARM and one year PARM	$70,000 - $80,000
TOTAL COST ESTIMATE	**$215,000 - $245,000**

7.2.4 Air Sparge / Soil Vapor Extraction

Technology Description

Air Sparge / Soil Vapor Extraction (AS/SVE) involves the injection of air in the saturated portion of the aquifer to strip volatile organic compounds from groundwater (air sparging), coupled with the collection of soil vapors within the vadose zone (soil vapor extraction) prior to treatment or discharge into the atmosphere. The injected air moves upwards through the saturated media and the flux of air through the saturated and vadose zones disrupts the existing partition of contaminants among the void, soil moisture, and soil grain surface by promoting volatilization of the adsorbed and dissolved phase of contaminants. The AS/SVE system is typically comprised of an air compressor that is connected to a series of AS wells, and a vacuum blower that is connected to a series of SVE wells. The SVE radius of influence (ROI) generally has a larger footprint than the AS ROI so that organic vapors generated by the AS are captured for treatment or discharge. Once captured by the SVE system, the organic vapors are typically treated until the concentrations are lowered to levels that support discharge directly to the atmosphere. Vapor treatment is typically via carbon adsorption or thermal oxidation.

Effectiveness

AS/SVE is very effective at stripping volatile organic compounds from saturated media and removing vapors from the vadose zone. For petroleum hydrocarbons, the oxygen added by the AS system can also enhance biodegradation of contaminants. Given the limited extent but relatively high concentrations of dissolved volatile organic contamination at the site, as wells as the relatively high hydraulic conductivity of the subsurface, Cardno TBE believes AS/SVE is optimally suited to provide site remediation in the most timely and cost effective manner of any remedial technology.

Implementability

Optimal design of an air sparge system includes significant infiltration of air throughout the saturated zone. Because the zone of influence from air injection expands radially as it moves upward, air injection needs to occur as far beneath the impacted aquifer as is feasible. As a result, AS wells will

need to be installed relatively deep, or a higher number of shallow wells (vertical or horizontal) would be required throughout the impacted area.

Regarding the SVE portion of the AS/SVE system, SVE needs to occur in the vadose zone, above the mounded water table that typically occurs when an AS system is utilized. Additionally, the SVE system must be deep enough below land surface, or beneath sealed cover material, so that vapors are not being pulled from the atmosphere above, thereby short-circuiting the system. The depth to groundwater at the site is typically 9 to 10ft bls. As a result, vertical SVE wells screened from approximately 5 ft bls to 10 ft bls should be suitable for use at the Northwood site.

Power would be required to operate the compressor and blower equipment and off-gas treatment would be required during the initial weeks or months of operation. Despite these challenges, an AS/SVE system could be implemented at the Northwood site

Cost

As shown in **Table 4**, the anticipated cost to implement AS/SVE at the Northwood site are as follows:

• Design and startup costs	$12,000 - $15,000
• Well installation and system construction	$65,000 - $75,000
• One year O&M	$60,000 - $72,000
• One year ARM and one year PARM	$70,000 - $80,000
TOTAL ESTIMATED COST	**$207,000 - $242,000**

7.2.5 Excavation and Offsite Disposal

Technology Description

Excavation and offsite disposal is the removal of contaminated media and the transfer of the medial to an appropriate offsite treatment or disposal facility. This technology can be very cost effective and reliable at a site where the contaminants are readily accessible with the excavation equipement, and where the medial is above the water table. If located below the water table, then the site must be de-watered to allow access and backfilling of the excavation pit. For contaminated sites, the recovered groundwater must be treated prior to discharge.

Effectiveness

Excavation and removal of contaminated material is possibly the most effective remediation strategy available because the impacted medial is effectively removed from the site. Therefore, use of this technology is typically based on the implementability at a given site, and the cost associated with its implementation.

Implementability

Documented contamination at the Northwood site is within the surficial aquifer, which occurs from approximately 10 ft bls to 25 ft bls. Additionally, the impacts extend into the adjacent roadway right-of-way. Based on these conditions, an extensive de-watering and treatment system would be required to excavate from the target depths, and some form of sheetpiling or shoring would be required to minimize structural damage to the adjacent roadways. Finally, both overhead and buried utilities are present at the site, conditions which will limit the ability of utilizing the excavation equipment required to dig to approximately 25 ft bls. Based on an evaluation of site conditions and challenges, Cardno TBE does not believe that de-watering and excavation can be effectively implemented at the site.

Cost

As outlined in **Table 4**, the anticipated cost to implement excavation at the site would exceed **$350,000**.

8 Technology Selection

As outlined in Section 7, Cardno TBE has reviewed five remediation options for the 2401 Broadway site, including No Action, bio-augmentation, bio-augmentation with an initial phase of groundwater pump and treat (to reduce contaminant mass prior to bioremediation), air sparge/soil vapor extraction (AS/SVE), and de-watering and excavation.

A comparison of four technologies evaluated is summarized in **Table 4** (No Action is not included in the table). Based on the evaluation included in Section 78 of this document (as summarized in **Table 4**), and given the environmental impacts detected in 2014, AS/SVE appears to be the most cost effective technology, with the highest degree of reliability. As a result, Cardno TBE has summarized the evaluation of the AS/SVE technology based on the specific parameters outlined above, within the following Sections.

Short term / long term health or environmental effects

AS/SVE involves the injection of air within the impacted aquifer to facilitate volatilization of dissolved contaminants and a transfer of volatile contaminants into the vadose zone in a gaseous form. Once in the vadose zone, the soil vapors are captured via the soil vapor extraction system. Typically, the captured soil vapors are treated via granular activated carbon (GAC) to ensure that organic vapor emissions to the atmosphere do not exceed the 13.7 pounds/day (#/day) National Emission Standards for Hazardous Air Pollutants (NESHAP) limits established by the U.S. EPA. Use of GAC emission treatment is required by FDEP for a period of at least 30 days to ensure the NESHAP limits are met; this determination is made by frequent air emission testing during the initial start-up period. Additionally, the SVE recovery system design must be robust enough to ensure adequate capture of soil vapors.

The only significant environmental exposure concerns associated with the use of AS/SVE technology are the inhalation of contaminated vapors, and (if concentrations are high enough), potential for combustion of vapors in the atmosphere. Use of GAC treatment has proven effective in managing either of these conditions and concentrations are typically reduced to well below the NESHAP concentrations within weeks of system start-up. As a result, use of AS/SVE has minimum short term, and no long term health or environmental concerns associated with it.

Implementability

The Site is currently vacant and generally clear of obstructions that would limit optimal placement of deep air sparge wells and shallow soil vapor extraction recovery wells. The biggest challenge associated with well installation and connections to the required air line systems is that the plume extends slightly into the Northwood Road right-of-way, and across planters, sidewalks, etc. Cutting of trenches across some of these areas will be required during construction; however, the trenches will be covered immediately with concrete, asphalt, or other materials to match existing conditions.

Electrical power will be required to run the air compressor and vacuum blower systems. As a result, an electrical power drop will need to be made to the site to support system operation. Additionally, the equipment will typically be staged within a secured equipment compound to provide some level of security, and for aesthetic purposes.

Operation and maintenance (O&M) requirements

AS/SVE equipment typically requires a one week initial startup period where system adjustments are made to optimize system operation. Weekly O&M activities are usually required for at least three more weeks, including the weekly collection of air emission samples to ensure NESHAP compliance. Once the GAC is removed from the air emission source , O&M activities are typically reduced to a frequency of approximately one time per month during the remainder of the operating period. The O&M requirements can also be reduced in many cases if a programmable logic control (PLC) and/or remote monitoring system is included in the design.

In summary, AS/SVE includes mechanical equipment (air compressors, vacuum blowers, etc.) that require regular inspection and maintenance during system operation.

Reliability

While requiring a reasonable amount of inspection and maintenance, an appropriately designed AS/SVE system is extremely durable and reliable in reducing volatile organic compound contaminants in groundwater to below cleanup target levels. The system is also effective in reducing residual contaminant concentrations within the vadose zone; however, the SVE component of the system, must be designed in a way to prevent "short-circuiting" via the inordinate recovery of atmospheric vapors from above and groundwater from below. To prevent this, the SVE well depth and design is carefully selected and a plastic sheeting material is frequently used above the SVE recovery system. Finally, the air sparge system greatly increases oxygen concentrations in the subsurface at the site, which facilitates aerobic microbe growth; thereby enhancing biodegradation of contaminants and reducing potential rebound of contaminants after active remediation is completed.

Feasibility

The contaminants at the site are ideally suited for remediation via AS/SVE technology. Minor challenges are primarily associated with the construction of system piping and wells in the roadway and right-of-way areas, and the appropriate design of a vapor capture system that will not "short circuit" by pulling vapors downward from the atmosphere. A requirement to treat captured vapors is anticipated for less than 2 months, based on the concentrations encountered in the source zone monitor wells.

The treatment system is typically enclosed within a trailer system; however, it can typically still be heard for some distance away, and it could be subject to vandalism. A dedicated power drop will also be required to energize the treatment system.

Time for cleanup

Given the site conditions (e.g., shallow dissolved phase contaminants, VOC contamination, highly permeable soils, good site access), it is anticipated that an appropriately designed and constructed AS/SVE system can reduce COC concentrations in groundwater to below their respective GCTLs within 12 to 18 months, with minimal rebound concerns.

Cost-effectiveness of installation, O&M, etc.

Anticipated costs are provided in **Table 4**. Despite relatively higher costs to design and construct the system, and to rent the mechanical equipment, the general waste management costs are extremely low and the duration for site cleanup is anticipated to be quickest of any active remediation approach (other than excavation). Based on our comparison of all elements of the treatment system, we have concluded AS/SVE remediation is the most reliable and cost-effective technology available for this site (**Table 4**).

8.1 Conceptual Remedial System Design

This section provides an anticipated approach for AS/SVE system design, under the assumption that it is selected as the final remedial strategy for the site. The design elements remain conceptual at this stage of the project; more detailed design elements will be developed once the remedy is approved and authorization is provided to proceed.

Absent pilot testing, Cardno TBE recommends a robust AS/SVE system design to achieve remediation goals in the most cost-effective and timely manner possible. Based on an approximately 10 ft depth to groundwater and an effective aquifer thickness of approximately 15 ft bls, a combination of vertical AS and SVE wells are anticipated. A lateral spacing of 15 ft is also anticipated for both AS and SVE wells, resulting in considerable overlap of the anticipated zone of influence for each well. A conceptual layout of the AS/SVE well system is provided on **Figure 10**.

The AS wells will be constructed of one-inch (1") diameter schedule 40 PVC with a 2 ft long .01-inch slotted well screen from approximately 23 ft bls to 25 ft bls. The vertical SVE wells are to be constructed of 2-inch diameter PVC, 0.02-inch slotted well screens from approximately 5 ft to 10 ft bls. The SVE wells will be connected to common vacuum header lines that will be run back to the vacuum extraction blower system. For the AS wells, and to the degree possible, the individual lines will remain separated back to the air compressor system so that flow controls can be managed at a single location. Control valves will also be constructed at each well head to provide additional flow control, or to provide the primary flow control if the manifold design of the treatment system, or space constraints to not allow use of individual pressure lines.

Preliminary equipment (air compressor and vacuum blower) calculations for the air sparge and soil vapor extraction system are provided in **Appendix F**, based on this conceptual system design. As indicated by these calculations, it is anticipated that an air compressor capable of sustaining 60 cubic feet per minute (cfm) at a pressure of 46 pounds per square inch (psi) will be required to meet the remedial objectives. Similarly, the requirements for a vacuum blower will be 40 cfm at a vacuum of 42 inches of water (IOW).

8.2 Active and Post Active Remediation Monitoring

8.2.1 Cleanup Milestones

The remediation program objective is to obtain an unconditional No Further Action (NFA) order from FDEP. To meet this objective, COC concentrations will need to be below the GCTLs listed in Chapter 62-777, F.A.C. Based on the COC concentrations encountered in March 2014, Cardno TBE anticipates that GCTLs can be achieved within 12 to 18 months of AS/SVE operation, with minimal opportunity for contaminant rebound. To evaluate progress towards this goal, Cardno TBE recommends monthly sampling of air discharge from the SVE system, and quarterly groundwater monitoring to determine if the proposed schedule is being met, or if adjustments or system modifications are warranted. Assuming the system functions as anticipated, an unconditional NFA could be issued within 24 to 30 months after initiation of active site remediation.

8.2.2 Active and Post-Active Remediation Groundwater Monitoring

The following monitor wells will be sampled during the implementation of active and post active remediation monitoring:

MW-B3	MW-B4	TBE-3W	TBE-4W
TBE-5W	TBE-6DW	TBE-7R	TBE-8

Active remediation monitoring (ARM) will be conducted quarterly throughout the initial year of operation and will be adjusted after that, based on the rate of remediation being achieved. Once GCTL concentrations are realized in all monitor wells, the system will be shut down and PARM sampling will be initiated. PARM sampling will also be conducted on a quarterly basis, with quarterly ARM and PARM reports submitted to FDEP within 45 days of end of the monitoring month.

8.3 Declaration of Restrictive Covenant

As stated previously, the remedial objective of this project is to obtain an unconditional NFA for the site, for which an institutional control is not required. However, if GCTLs are not achieved in a timely manner, the PRFBSR may consider conditional site closure with an institutional control on groundwater use. If this occurs, such a petition will be submitted to FDEP within one of the critical ARM reports. In this situation, site remediation activities will continue until FDEP agrees that a conditional NFA is an acceptable closure alternative for the site.

8.4 Remediation Cost Estimate

Preliminary cost estimates for each of the four remedial alternatives considered within this ABCA are provided in **Table 4**. The cost estimates for AS/SVE are outlined as such within this table.

Task 1 – System Design, Permitting, Startup	$12,000 to $15,000
Task 2 - Well Installation and System Construction	$65,000-$75,000
Task 3 – O&M Costs/System Rental/Utilities (one year operation)	$60,000-$72,000
Task 4 – One year ARM and one year PARM monitoring	$70,000-$80,000
TOTAL COST ESTIMATE TO IMPLEMENT AS/SVE	**$207,000-$242,000**

9 Certification

This *Supplemental Assessment and Analysis of Brownfields Cleanup Alternatives Report* for the 2401 Broadway Avenue Site has been prepared pursuant to U.S. EPA guidance on ABCA preparation, and on paragraphs 62-780.450, 62-780.600(8), and 62-780.700(3), F.A.C. under the direction of a Professional Geologist registered in the State of Florida, in compliance with Chapter 492 of the Florida Statutes and Paragraph 62-730.220(8), F.A.C.

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TABLES

Table 1
Summary of Soil Analytical Data
Supplemental Brownfields Site Assessment Report
Northwood Redevelopment Area - West Palm Beach
Sample Data From August 2008

Parameter	Method	Units	SCTL			SB-1		TBE-1W		TBE-2W		TBE-3W		TBE-4W		TBE-5W		TBE-6DW	
			Res/Dir	Ind/Dir	Leach	1-ft	3-ft	1-ft	3-ft	1-ft	3-ft	1-ft	3-ft	1-ft	3-ft	1-ft	3-ft	1-ft	3-ft
VOCs																			
Acetone	8260B	µg/kg	11000000	68000000	25000	130	26	120	55	37	22	35	<15	26	17	59	<15	<15	74
Ethylbenzene	8260B	µg/kg	1500000	9200000	600	<0.4	<0.4	0.91	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
total xylenes	8260B	µg/kg	130000	700000	200	1.5	<1.2	3.4	1.3	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
Toluene	8260B	µg/kg	7500000	60000000	500	11	<0.4	19	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	1.1	<0.4
PAHs (low level)																			
Acenaphthene	8270	µg/kg	2400000	20000000	2100	<0.7	<0.7	<0.7	<0.7	4.2	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7
Acenaphthylene	8270	µg/kg	1800000	20000000	27000	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4
Anthracene	8270	µg/kg	21000000	30000000	2500000	5.4	<0.5	<0.5	<0.5	22	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)anthracene	8270	µg/kg	#	#	800	42	<1.1	<1.1	<1.1	65	<1.1	21	<1.1	19	<1.1	<1.1	<1.1	<1.1	<1.1
Benzo(a)pyrene	8270	µg/kg	100	700	8000	55	<1.2	<1.2	<1.2	77	<1.2	<1.2	<1.2	25	<1.2	<1.2	<1.2	<1.2	<1.2
Benzo(b)fluoranthene	8270	µg/kg	#	#	2400	100	<2.0	<2.0	<2.0	130	<2.0	<2.0	<2.0	44	<2.0	<2.0	<2.0	<2.0	<2.0
Benzo(g,h,i)perylene	8270	µg/kg	2500000	5200000	32000000	<3.7	<3.7	<3.7	<3.7	47	<3.7	<3.7	<3.7	<3.7	<3.7	<3.7	<3.7	<3.7	<3.7
Benzo(k)fluoranthene	8270	µg/kg	#	#	24000	40	<1.9	<1.9	<1.9	51	<1.9	<1.9	<1.9	24	<1.9	<1.9	<1.9	<1.9	<1.9
Chrysene	8270	µg/kg	#	#	77000	32	<1.0	<1.0	<1.0	72	<1.0	10	<1.0	9.9	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a,h)anthracene	8270	µg/kg	#	#	700	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8
Flouranthene	8270	µg/kg	3200000	5900000	1200000	80	<1.7	<1.7	<1.7	260	<1.7	33	<1.7	27	<1.7	<1.7	<1.7	<1.7	<1.7
Fluorene	8270	µg/kg	2600000	33000000	160000	<0.86	<0.85	<0.85	<0.85	9.7	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85
Indeno(1,2,3-c,d)Pyrene	8270	µg/kg	#	#	6600	<2.5	<2.4	<2.4	<2.4	48	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4
1-Methylnaphthalene	8270	µg/kg	200000	1800000	3100	<5.3	<5.2	<5.2	<5.2	<5.2	<5.2	<5.2	<5.2	<5.2	<5.2	<5.2	<5.2	<5.2	<5.2
2-Methylnaphthalene	8270	µg/kg	210000	2100000	8500	<3.7	<3.7	<3.7	<3.7	<3.7	<3.7	<3.7	<3.7	<3.7	<3.7	<3.7	<3.7	<3.7	<3.7
Naphthalene	8270	µg/kg	55000	300000	1200	<0.4	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39	<0.39
Phenanthrene	8270	µg/kg	2200000	36000000	250000	31	<0.79	<0.79	<0.79	170	<0.79	16	<0.79	7.4	<0.79	<0.79	<0.79	<0.79	<0.79
Pyrene	8270	µg/kg	2400000	45000000	880000	76	<4.3	<4.3	<4.3	250	<4.3	33	<4.3	24	<4.3	<4.3	<4.3	<4.3	<4.3

Benzo(a)Pyrene Equivalents			SB-1		TBE-1W		TBE-2W		TBE-3W		TBE-4W		TBE-5W		TBE-6DW	
PAH		TEF	1-ft	3-ft	1-ft	3-ft	1-ft	3-ft	1-ft	3-ft	1-ft	3-ft	1-ft	3-ft	1-ft	3-ft
benzo(a)pyrene		1	55	0	0	0	77	0	0	0	25	0	0	0	0	0
benzo(a)anthracene		0.1	4.2	0	0	0	6.5	0	2.1	0	1.9	0	0	0	0	0
benzo(b)fluoranthene		0.1	10	0	0	0	13	0	0	0	4.4	0	0	0	0	0
Benzo(k)flouranthene		0.1	4	0	0	0	5.1	0	0	0	2.4	0	0	0	0	0
chrysene		0.001	0.032	0	0	0	0.072	0	0.01	0	0.0099	0	0	0	0	0
dibenz(a,h)anthracene		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
indeno(1,2,3-cd)pyrene		0.1	0	0	0	0	4.8	0	0	0	0	0	0	0	0	0
Total PAH (BaP equivalents)			73	0	0	0	106	0	2	0	34	0	0	0	0	0

NA = Not Analyzed
# Value converted to benzo(a)pyrene equivalents and added prior to comparison to benzo(a)pyrene SCTL.
* Contaminant is not a health concern for this exposure scenario
*** Leachability values derived from SPLP or TCLP analyses

Table 2
Groundwater Analytical Data Summary
(detected compounds only)
2401 Broadway Avenue
Northwood Anchor Site, West Palm Beach Florida
2008 through 2014

Parameter	Units	FL CTL (Chptr 62-777, FAC)	NADC Criteria	MW-B3	MW-B4			TBE-3W		TBE-4W		TBE-5W		TBE-6DW		TBE-7	TBE-7R	TBE-8		TBE-9	TBE-10		TBE-11
VOCs (Method 8260)				*Mar-14*	*Apr-08*	*Aug-08*	*Mar-14*	*Aug-08*	*Mar-14*	*Aug-08*	*Mar-14*	*Aug-08*	*Mar-14*	*Aug-08*	*Mar-14*	*Apr-08*	*Mar-14*	*Apr-08*	*Mar-14*	*Apr-08*	*Apr-08*	*Mar-14*	*Apr-08*
1,2,4-trimethylbenzene	µg/L	10	100	<0.37	450 L	490 L	1500	31	<0.37	<0.32	730	7.6	<0.37	10	<0.37	<0.32	1200	<0.32	0.54 I	<0.32	<0.32	0.42 I	<0.32
1,3,5-trimethylbenzene	µg/L	10	100	<0.24	120 L	210 L	490	12	<0.24	<0.25	29	3.8	<0.24	2.8	<0.24	<0.25	380	<0.25	1.2	<0.25	<0.25	<0.24	<0.25
4-Isopropyltoluene	µg/L	NS	NS	NA	<0.33	5.9	NA	1.6	NA	6.7	NA	<0.33	NA	<0.33	NA	<0.33	NA	<0.33	NA	<0.33	<0.33	NA	<0.33
Acetone	µg/L	6300	63000	<6.9	<20	23 I	63	<20	<6.9	<20	89	<20	20	<20	8.7 I	<20	41	<20	<6.9	<20	<20	600	<20
Carbon disulfide	µg/L	700	7000	<0.35	<0.37	<0.37	<0.35	<0.37	<0.35	<0.37	<0.35	2.3	<0.35	2.2	<0.35	<0.37	<0.35	<0.37	<0.35	<0.37	<0.37	<0.35	<0.37
Chloroform	µg/L	70	700	<0.19	<0.17	<0.17	<0.19	<0.17	<0.19	<0.17	<0.19	<0.17	<0.19	<0.17	<0.19	<0.17	<0.19	<0.17	<0.19	<0.17	1.9	<0.19	<0.17
Ethylbenzene	µg/L	30	300	<0.20	160 L	170 L	640	<0.23	<0.20	400 L	1000	22	<0.20	1.3	<0.20	<0.23	300	<0.23	1.4	<0.23	<0.23	<0.20	<0.23
Isopropylbenzene (cumene)	µg/L	0.8	8	<0.20	24	45	120	2.4	0.41 I	58	74	4.6	0.47 I	0.4 I	<0.26	<0.28	40	<0.28	0.37 I	<0.28	<0.28	<0.26	<0.28
n-Butylbenzene	µg/L	NS	NS	NA	9.9	22	NA	12	NA	33	NA	1.8	NA	<0.28	NA	<0.28	NA	<0.28	NA	<0.28	<0.28	NA	<0.28
N-Propylbenzene	µg/L	NS	NS	NA	60	130 L	NA	11	NA	170 L	NA	12	NA	1.4	NA	<0.36	NA	<0.36	NA	<0.36	<0.36	NA	<0.36
Naphthalene	µg/L	14	140	1.6	180 L	290 L	900	<2.5	<0.23	500 L	960	33	<0.23	6.9	6.1	<2.5	500	<2.5	<0.23	<2.5	<2.5	4.0	<2.5
Xylenes (total)	µg/L	20	200	<0.22	447 L	509 L	2100	<0.47	<0.22	529 L	800	2.5	<0.22	6	<0.22	<0.47	2100	<0.47	<0.22	<0.47	<0.47	<0.22	<0.47
sec-Butylbenzene	µg/L	NS	NS	NA	2.3	<0.31	NA	3.8	NA	<0.31	NA	1.1	NA	<0.31	NA	<0.31	NA	<0.31	NA	<0.31	<0.31	NA	<0.31
Tetrachloroethene	µg/L	3	300	<0.36	<0.23	<0.23	<0.36	<0.23	<0.36	<0.23	<0.36	<0.23	<0.36	<0.23	<0.36	<0.23	<0.36	<0.23	<0.36	<0.23	<0.23	<0.36	<0.23
Toluene	µg/L	40	400	<0.20	<0.46	<0.46	<0.20	<0.46	<0.20	15	8.9	<0.46	<0.20	<0.46	<0.20	<0.46	93	<0.46	<0.20	<0.46	<0.46	<0.20	<0.46
SVOCs (Method 8270C)																							
1-Methylnaphthalene	µg/L	28	280	NA	17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.17	NA	<0.17	NA	<0.17	<0.17	NA	<0.17
2-Methylnaphthalene	µg/L	28	280	NA	28 L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.19	NA	<0.19	NA	<0.19	<0.19	NA	<0.19
Acenaphthene	µg/L	20	200	NA	<0.16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.16	NA	<0.16	NA	<0.16	<0.16	NA	<0.16
Fluorene	µg/L	280	2800	NA	<0.19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.19	NA	<0.19	NA	<0.19	<0.19	NA	<0.19
Naphthalene	µg/L	14	140	NA	64 L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.16	NA	<0.16	NA	<0.16	<0.16	NA	<0.16
TRPH	µg/L	5000	50000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	µg/L	15	150	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solides	mg/L	500	5000	170	NA	NA	260	NA	110	NA	200	NA	340	NA	230	NA	190	NA	220	NA	NA	230	NA

µg/L = micrograms per liter
NS = No Standard is developed for this compound
L = Value is off-scale high, actual value is know to be less than the value reported
NA = Parameter not analyzed

TABLE 3: GROUNDWATER ELEVATION SUMMARY

Facility Name: Northwood Anchor Site
Facility Address: Northwood Section of West Palm Beach
Facility ID#: BF #96488107-0

WELL NO.	MW-B3			MW-B4			TBE-3W			TBE-4W			TBE-5W			TBE-6DW		
DIAMETER (inches)	1			1			1			1			1			1		
WELL DEPTH	13.2			18.0			16.0			15.6			16.5			29.0		
SCREEN INTERVAL	3.2-13.2			8-18			6-16			5.6-15.6			6.5-16.5			19-29		
TOC ELEVATION	14.74			14.77			14.59			14.71			14.51			14.61		
DATE	ELEV	DTW	DTNAPL	ELEV	DTW	DTNAPL	ELEV	DTW	DTNAPL	ELEV	DTW	DTNAPL	ELEV	DTW	DTNAPL	ELEV	DTW	DTNAPL
4/2/2008	4.84	9.90	NA	4.82	9.95	NA	4.93	9.66	NA	4.87	9.84	NA	4.86	9.65	NA	4.89	9.72	NA
3/25/2014	4.81	9.93	NA		NM		4.78	9.81	NA	4.74	9.97	NA	4.63	9.88	NA	4.71	9.90	NA

WELL NO.	TBE-7			TBE-7R			TBE-8			TBE-10			TBE-11					
DIAMETER (inches)	1			1			1			1			1					
WELL DEPTH	18.0			15.6			28.3			17.9			18.0					
SCREEN INTERVAL	8-18			5.6-15.6			18.3-28.3			7.9-17.9			8-18					
TOC ELEVATION	15.43			14.96			14.74			15.00			15.30					
DATE	ELEV	DTW	DTNAPL	ELEV	DTW	DTNAPL	ELEV	DTW	DTNAPL	ELEV	DTW	DTNAPL	ELEV	DTW	DTNAPL			
4/2/2008	4.94	10.49	NA	4.88	10.08	NA	4.66	10.08	NA	4.96	10.04	NA	4.82	10.48	NA			
3/25/2014	4.88	10.55	NA	4.73	10.23	NA	4.63	10.11	NA	4.89	10.11	NA	4.79	10.51	NA			

TOC Elevations surveyed 3/24/14 by SurvTech Solutions, Inc.
All Measurements = Feet
DTNAPL= Depth to non-aqueous phase liquids
DTW = Depth to water
ELEV = Relative Water Table Elevation

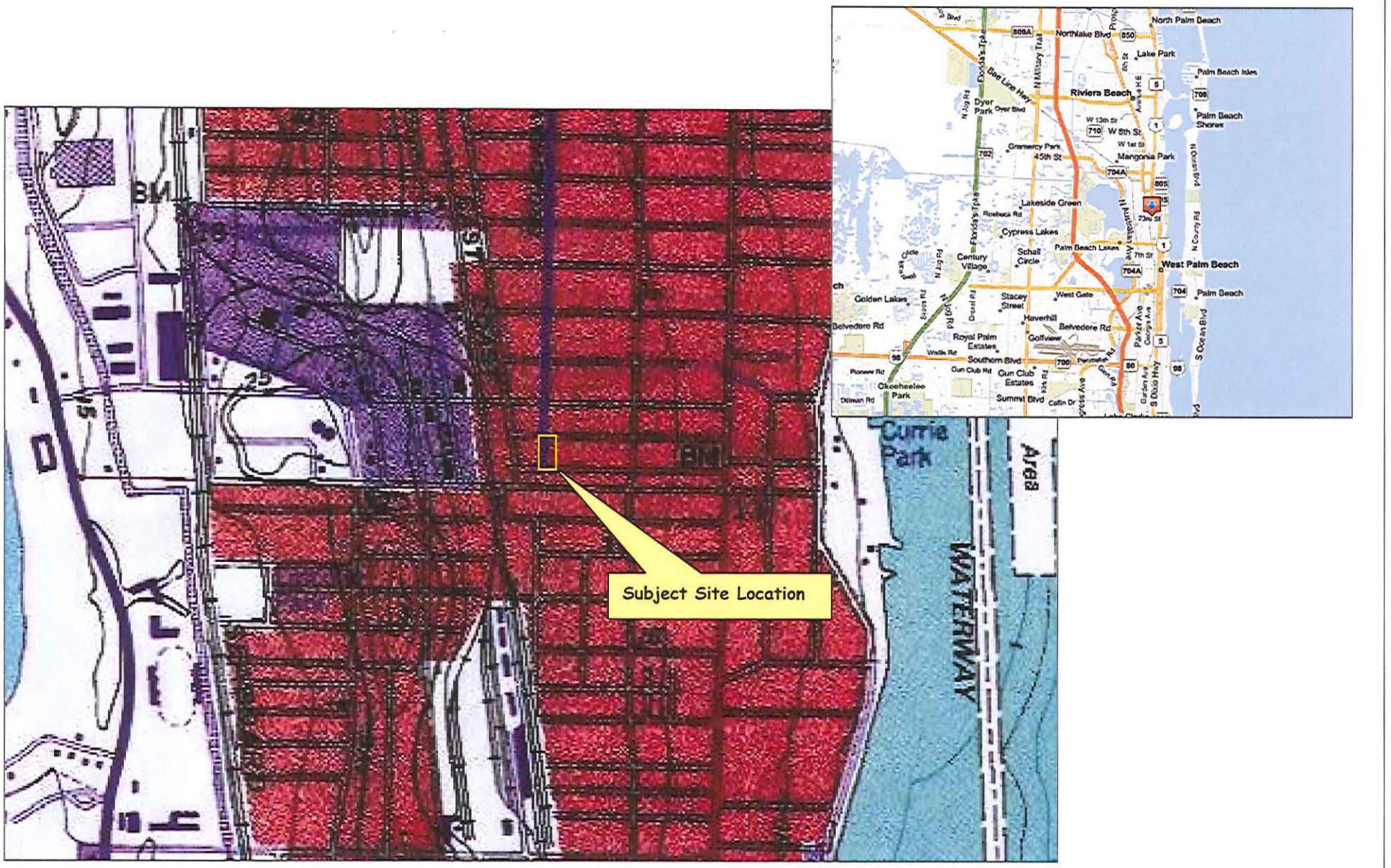
NA= Not Applicable
NM = Not Measured

Table 4
Remedial Alternatives Comparison Table
2401 Broadway Property, Northwood Anchor Site

Remedial Technology	General Description	Implementability, Reliability, O&M Requirements		Estimated Cost to Implement[1/]	Estimated Time to Remediate	Comments/Recommendations
		Pros	Cons			
In-Situ Bio-Augmentation	A combination of Petrox® and Oxygen Release Compound (ORC-A®) injected into the subsurface to facilitate in-situ biodegradation of petroleum contamination in groundwater. Accomplished via DPT injection within the saturated zone. Preliminary estimate of 60 individual injection points with alternating injection of Petrox (microbes and nutrients) and ORC-A. As with all remediation technologies discussed in this table, one year of post-active remediation monitoring will be required after target levels are achieved to ensure rebound of COCs does not occur.	1 - No system Fabrication or Power Requirements, 2 - Brief period of in-situ injections (estimate <2 weeks for 3 different events), 3 - No equipment, piping, etc. left on site while remediation process is underway, 4 - No ongoing operation & maintenance (O&M)	1 - Ability to fully meet cleanup objectives difficult to predict given current contaminant concentrations, 2 - Anticipate >2 years to achieve remediation goals, 3 - Will require ongoing monitoring and reporting throughout remediation period to determine rate of degradation. 4 - Potential to require follow-up (polishing) injection program(s) 5 - Does no remediate vadose zone or smaller pore spaces portions of aquifer; therefore, more subject to contaminant rebound during PARM sampling period.	**$140,000 to $150,000** Injection program only (DPT activities and reagent purchase). Assumes three quarterly injection programs with one follow-up injection. Longer duration to reach remedial goals will require more extensive monitoring and reporting costs. Adding three years of ARM/PARM sampling and reporting at $35,000-$40,000/year ($105,000-$120,000 total); total estimated cost is between ***$245,000 and $270,000***.	2 to 3 years (not including PARM sampling)	Capital and infrastructure costs are lowest of any alternative, making it an attractive alternative. However, the success is less predictable than physical remediation alternatives (e.g., excavation or AS/SVE). Highest potential for contaminant rebound.
In-Situ Bio-Augmentation with Initial Phase of Pump & Treat prior to Bio.	Same *In-Situ* Bio-Augmentation process as described above, with the addition of a temporary and episodic groundwater recovery and treatment (Pump & Treat [P&T]) phase to quickly reduce dissolved contamination concentrations. Episodic remediation would entail system operation for several one-week(±) periods and then removal for 3-4 weeks, repeating on 3 or four occasions over the course of 4 to 6 months. This approach is designed to quickly remove majority of dissolved contaminant; thereby enhancing chances of success of bio-agumentation approach. Approach should significantly reduce time associated with reaching the cleanup objective, compared to bio-augmentation alone.	1 - P&T is highly effective in quickly removing contaminant mass, but not in reaching low concentration cleanup target levels, 2 - P&T addition enhances chances of reaching cleanup targets via bio-augmentation, 3 - Removing initial mass of contaminants will reduce the quantity of reagents required and will decrease the time period required to meet site remediation goals (compared to bio-augmentation alone)	1 - Requires installation of groundwater recovery wells and header piping system, which will stay in-place for several months, 2 - requires rental of pumps & treatment system during periods of operation, 3 - requires either electrical power drop or use of generator systems during the (one-week?) operating periods, 4 - Requires use of air stripping tower to remediate recovered groundwater (including power to operate system), 5 - requires permit to discharge treated water.	Dependent on time and duration of P&T operation. Approximate $20,000 initial construction & operation, plus approximately $16,000 each subsequent one-week operating period. Estimate *$75,000 to $85,000* for P&T portion (4 month episodic operation). Added to a reduced bio-augmentation cost estimate (*$70,000-$80,000*), plus 1 years active remediation monitoring and 1 year PARM (*$70,000 to $80,000*)...total cost approximately **$215,000 to $245,000**.	2+ years (not including PARM sampling)	Notable increase in initial capital costs to implement, with long-term cost savings anticipated. Use of P&T prior to bio-augumentation enhances likely effectiveness of the latter and shortens time to meet cleanup goals. Rapid initial mass removal reduced potential rebound effects and helps support conditional closure, if this is a viable objective.
Air Sparge / Soil Vapor Extraction (AS/SVE)	Injection of pressurized air near the base of the contaminated aquifer, and collection of vapors from the vadose zone, above the water table. Air strips volatile organic compounds from groundwater for capture by the SVE system and enhances aerobic biodegradation *in-situ*. Recovered vapors are typically treated for a limited period, and then are exhausted into the atmosphere.	1 - Likely the most effective technology for rapid remediation of volatile organic compounds given the Northwood site conditions, short of excavation. 2 - remediates saturated and unsaturated portion of subsurface, 3 - relatively rapid (anticipate between 1 and 2 y ears to meet remediation goals). 4 - No specific permits required for effluent emissions.	1 - Design, fabrication, construction and/or rental of AS/SVE equipment required., 2 - electrical power drop and account setup required, 3 - Higher capital costs at beginning of project, 4 - equipment compound construction required, 5 - operation and maintenace required througout operational duration.	Design and Startup costs between *$12,000 and $15,000*. Well installation and system construction costs estimated between *$65,000 and $75,000*; Monthly O&M costs (including power and equipment rental), estimated at approximately $5,000 and $6,000; or *$60,00 to $72,000/year*. One year of active monitoring & reporting, and 1 year PARM (*$70.000-$80,000).* Total estimated cost **$207,000 to $242,000**.	1 to 2 years	Site conditions and contaminants well suited for this technology. Considered higher reliability than most reagent-based remediation methods. Shortest time period anticipated to reach remedial objectives. Higher capital costs for construction and operation, with time savings for shortened project duration. ***Recommended Technology***.
Excavation and Offsite Disposal	Excavation of contaminated media, with transportation to a permitted treatment or disposal facility. Depth to groundwater and thickness of surficial aquifer would require de-watering and deep excavation (25± feet below land surface). Utilities, roadways, etc. will make it difficult to excavate much of documented impacted area(s).	1 - Excavation essentially eliminates potential rebound of contaminants, as well as future liability concerns, 2 - Most of the affected area is cleared of any buildings or obstructions, other than roadways and utilities to the south.	1 - 10-ft depth to water table requires shoring or sloping to extend excavation well below the water table (estimated depth requirement of 25± ft bls). 2 - Extensive de-watering required; water treatment, and discharge required to support excavation below the water table. 3 - Proximity to roadways will require shoring walls to prevent damage or collapse.	Cost of groundwater de-watering system and operation will be similar to or slightly higher than discusssed under P&T prior to bio-augmentation, with de-watering system required to operate for 4 to 6 weeks (*$75,000 to $80,000* for dewatering and treatment). Apprixmately $180,000 to $190,000 for excavation, trasnportation, disposal and backfill of excavation, plus $50,000 for roadway shoring and repair. Adding one year PARM ($35,000 to $40,000): total estimated cost will exceed **$350,000**.	<1 year	Not well suited for site conditions. Cost prohibitive.

[1/]Estimated costs are budgetary estimates only. Costs are subject to change once system designs are complete and contractor bids are obtained.

FIGURES



Cardno TBE
Shaping the Future

2401 Broadway/Northwood Anchor Site
West Palm Beach, Palm Beach County, Florida
Section 9, Township 43, Range 43 E

Figure 1
USGS / Site Vicinity Map

ADAMS VOLKSWAGENS

AVENUE

24TH STREET

RAILROAD

MW-A3

08/08
ND
NA

TBE-1W

SB-1

MW-A4

04/08 08/08
21 ND
ND NA

TBE-1

TBE-5

04/08 08/08
4.5 11.0
10.5 NA

VEHICLE STAORAGE

TBE-6

04/08
1.9
ND

TBE-2W

08/08
ND
NA

SHOP KWIK

04/08
ND
ND

MW-B3

CLOSED GAS STATION

40'

04/08
ND
ND

CAR PARTS STORAGE

TBE-7

08/08
31
NA

08/08
1712
NA

CLOSED GAS STATION

TBE-4W

04/08 08/08
ND 91
ND NA

TBE-6DW

TBE-5W

TBE-3W

MW-B4

TBE-8

04/08
ND
ND

CARBURETOR REPAIR SHOP

08/08
74
NA

MW-A5

CLOSED GAS STATION

VEHICLE LIFT

04/08 08/08
1453.2 1895
109 NA

NORTHWOOD ROAD

TBE-10

04/08
1.9
ND

TBE-11

04/08
ND
ND

SHOPS

TBE-12

04/08
ND
.6

TBE-9

04/08
ND
ND

23RD STREET

LEGEND

EXCEEDS GCTL

TOTAL VOC's (ug/L)

TOTAL SVOC's (ug/L)

(Source: TBE Group, Feb 2009)

NO.	DESCRIPTION	BY	DATE

TREASURE COAST REGIONAL PLANNING COUNCIL

NORTHWOOD ANCHOR SITE WEST PALM BEACH, FL

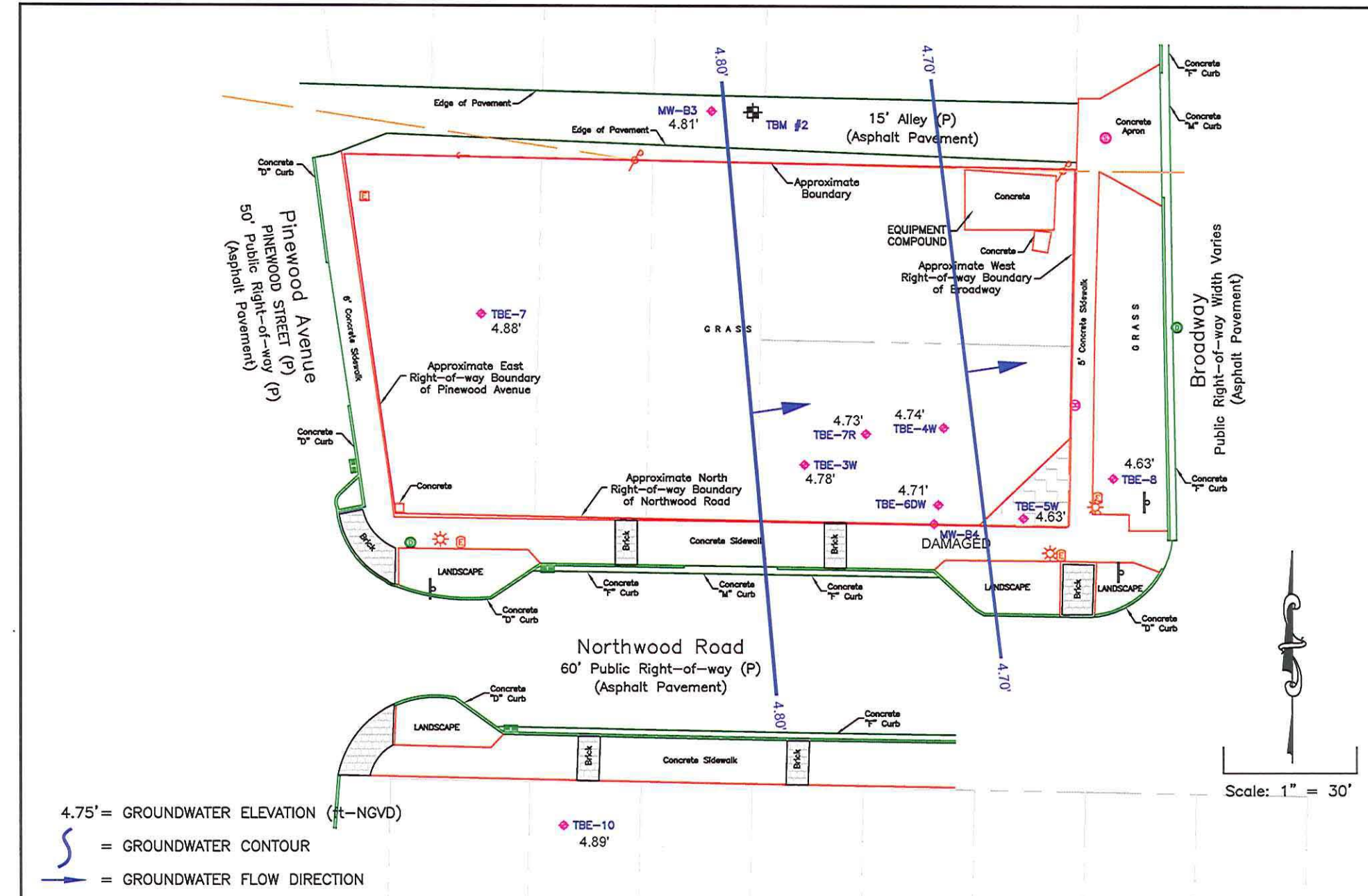
TBE GROUP
Civil Engineering · Transportation
Environmental · Planning
380 Pork Place Boulevard, Suite 300
Clearwater, Florida, 33759
www.tbegroup.com – 800.861.8314
License No. 3843

Greg A. Schultz, PE DATE
LIC. NO.: 57586

DESIGNED TWG
DRAWN DWK
Q.C.
APPROVED

FIGURE 2
VOC\SVOC CONCENTRATIONS IN GROUNDWATER AUGUST, 2008

PROJECT NO: 00029-015-00
DATE: 05-08-08
SHEET NO: OF



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NORTHWOOD REDEVELOPMENT AREA
WEST PALM BEACH, FL

FIGURE 3
GROUNDWATER FLOW IN THE SURFICIAL AQUIFER
MARCH 25, 2014

Drawing Name: J:\00029\00029031.00\ACAD\dwg\Northwood Anchor Site Survey 5-2014.dwg May 23, 2014 - 12:02pm

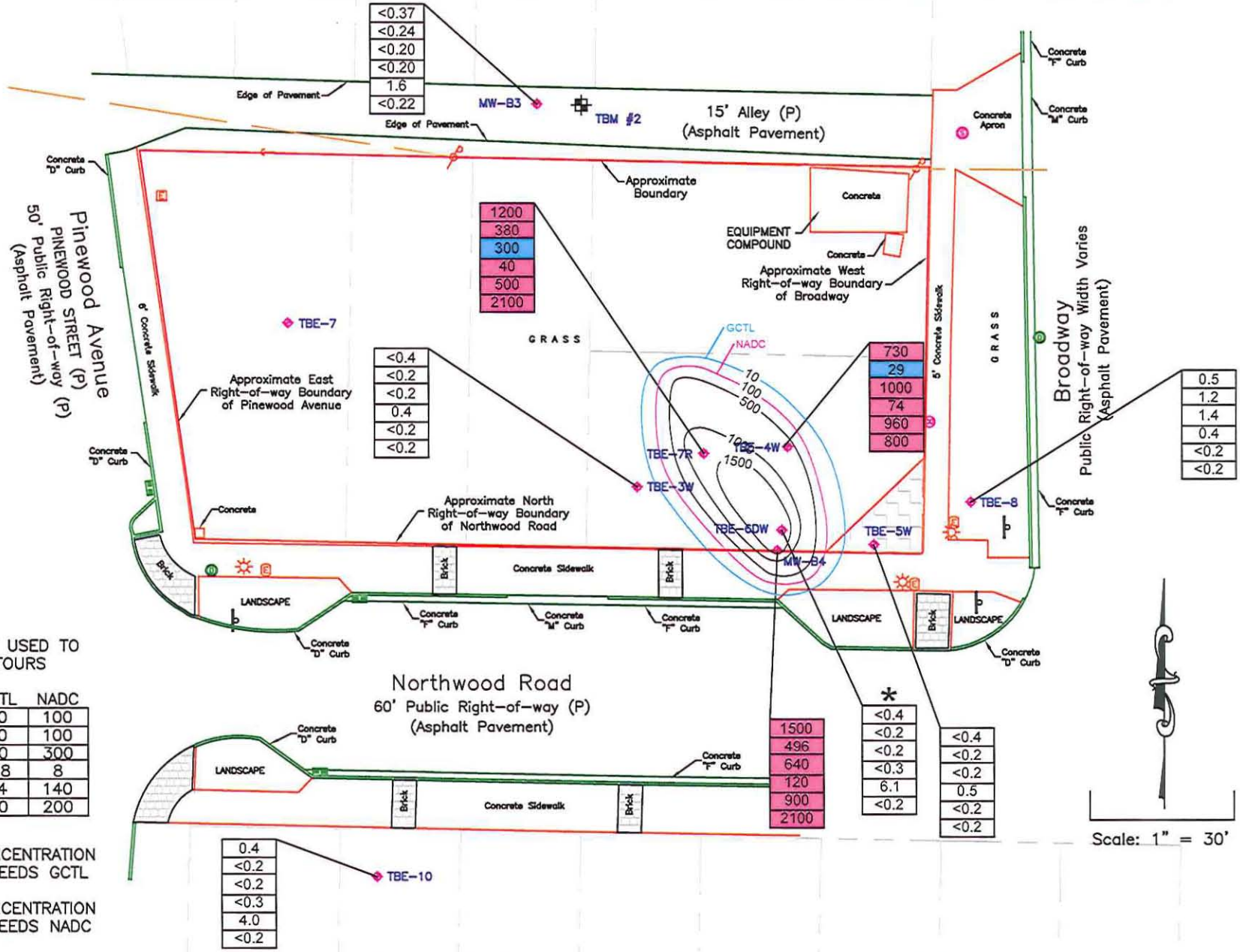

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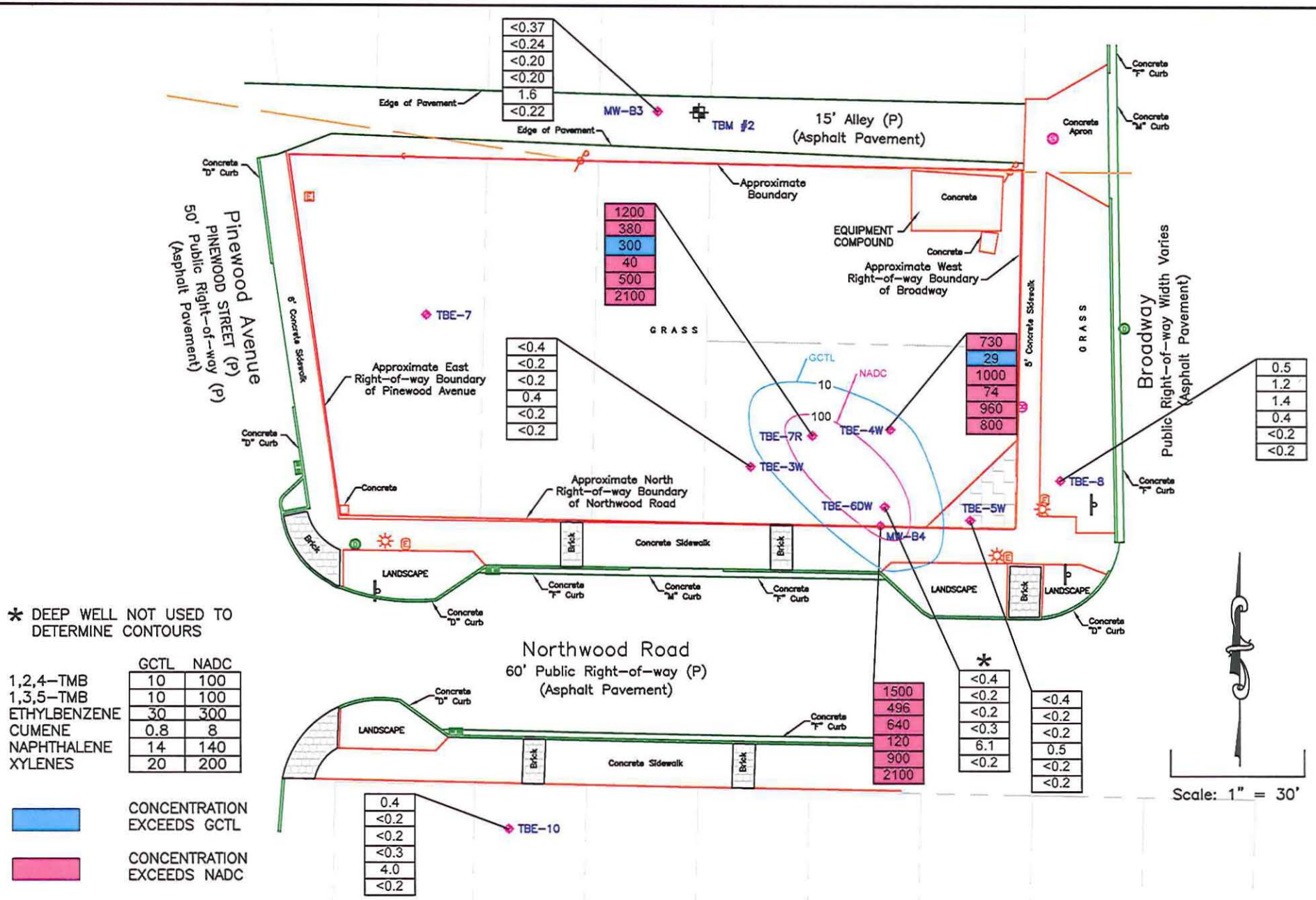
FIGURE 4
1,2,4-TRIMETHYLBENZENE CONCENTRATION IN GROUNDWATER MARCH 2014

Drawing Name: J:\00029\00029031.00\VCAD\dwg\Northwood Anchor Site Survey 5-2014.dwg May 23, 2014 - 12:01pm



* DEEP WELL NOT USED TO DETERMINE CONTOURS

	GCTL	NADC
1,2,4-TMB	10	100
1,3,5-TMB	10	100
ETHYLBENZENE	30	300
CUMENE	0.8	8
NAPHTHALENE	14	140
XYLENES	20	200

CONCENTRATION EXCEEDS GCTL

CONCENTRATION EXCEEDS NADC

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FIGURE 5
1,3,5-TRIMETHYLBENZENE CONCENTRATION IN GROUNDWATER MARCH 2014

Drawing Name: J:\00029\00029031.00\ACAD\dwg\Northwood Anchor Site Survey 5-2014.dwg May 23, 2014 - 12:01pm

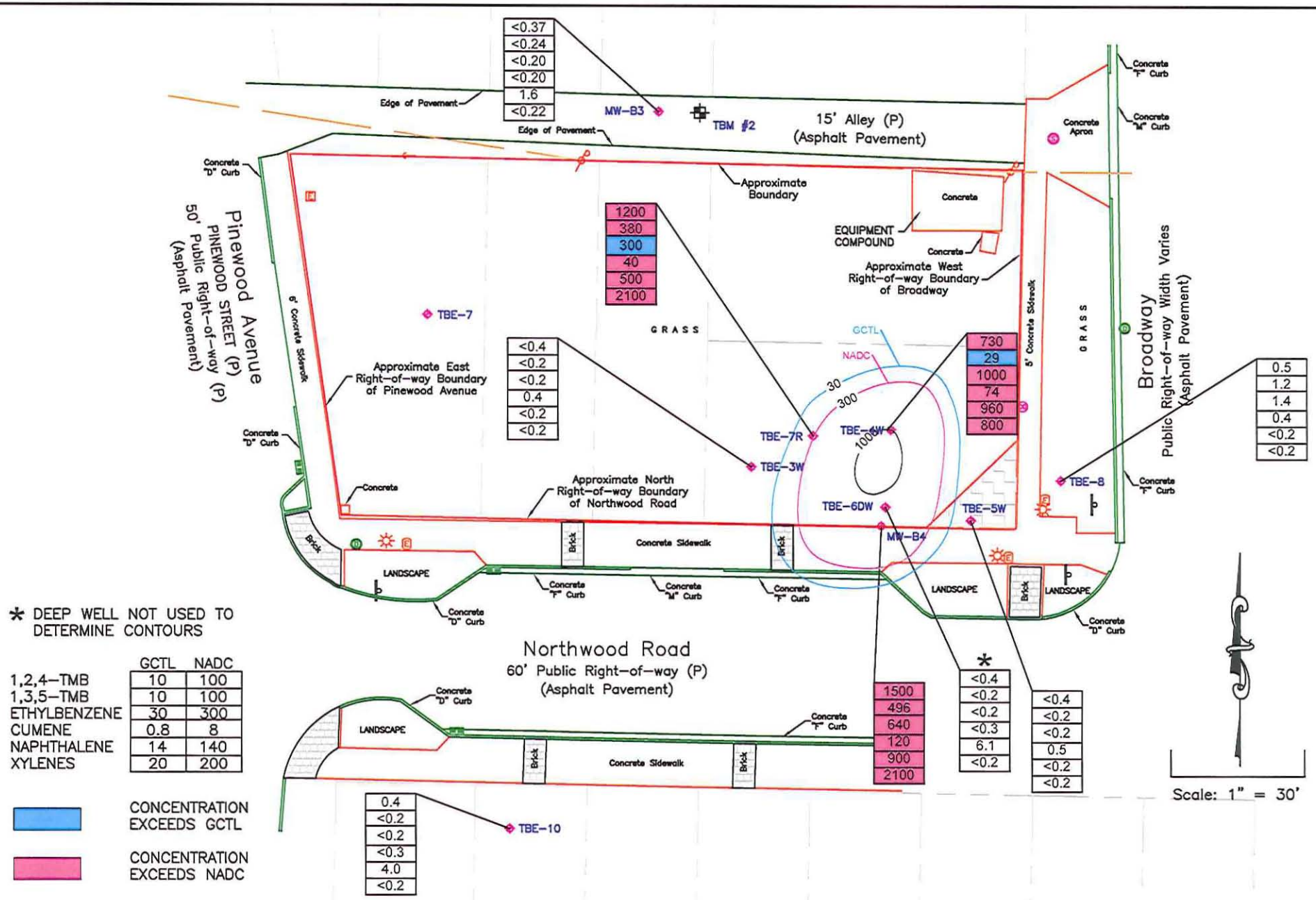

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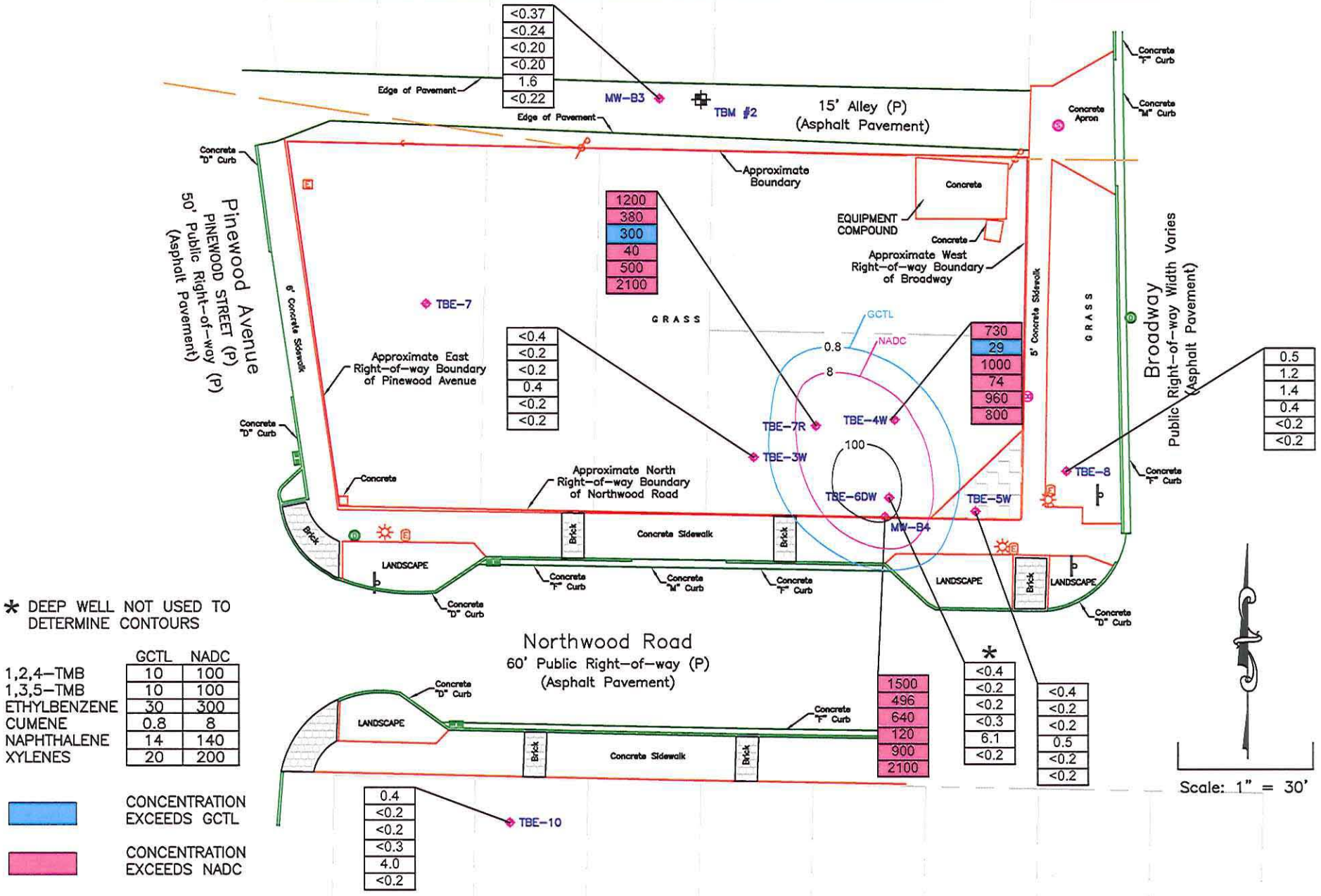
FIGURE 6 ETHYLBENZENE CONCENTRATION IN GROUNDWATER MARCH 2014

Drawing Name: J:\00029\00029031.00\ACAD\dwg\Northwood Anchor Site Survey 5-2014.dwg May 23, 2014 - 12:01pm



* DEEP WELL NOT USED TO DETERMINE CONTOURS

	GCTL	NADC
1,2,4-TMB	10	100
1,3,5-TMB	10	100
ETHYLBENZENE	30	300
CUMENE	0.8	8
NAPHTHALENE	14	140
XYLENES	20	200

CONCENTRATION EXCEEDS GCTL

CONCENTRATION EXCEEDS NADC

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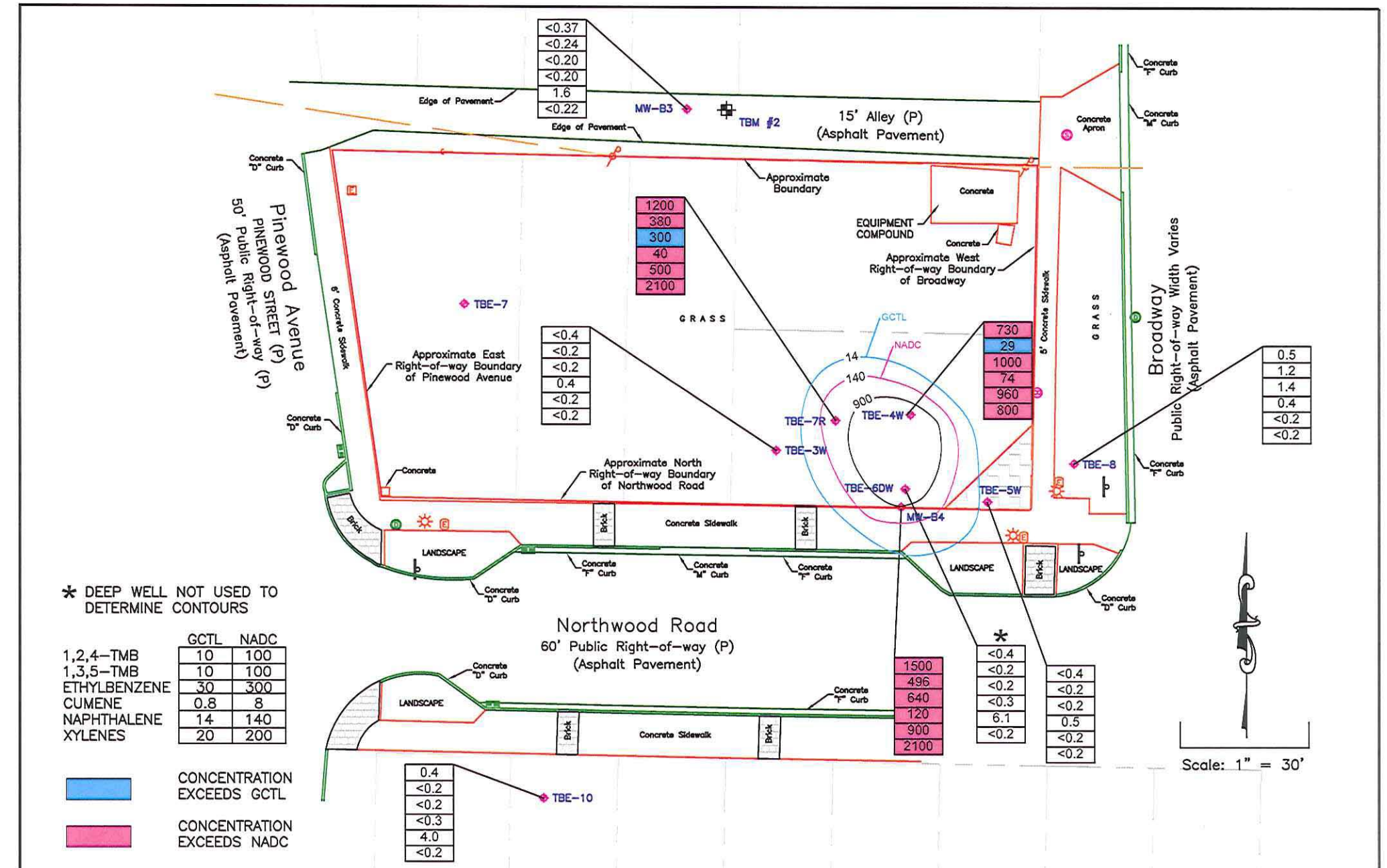
FIGURE 7 CUMENE CONCENTRATION IN GROUNDWATER MARCH 2014

Drawing Name: J:\00029\00029031.00\ACAD\dwg\Northwood Anchor Site Survey 5-2014.dwg May 23, 2014 - 12:01pm



* DEEP WELL NOT USED TO DETERMINE CONTOURS

	GCTL	NADC
1,2,4-TMB	10	100
1,3,5-TMB	10	100
ETHYLBENZENE	30	300
CUMENE	0.8	8
NAPHTHALENE	14	140
XYLENES	20	200

CONCENTRATION EXCEEDS GCTL

CONCENTRATION EXCEEDS NADC

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FIGURE 8 NAPHTHALENE CONCENTRATION IN GROUNDWATER MARCH 2014

Drawing Name: J:\00029\00029031.00\ACAD\dwg\Northwood Anchor Site Survey 5-2014.dwg May 23, 2014 - 12:02pm

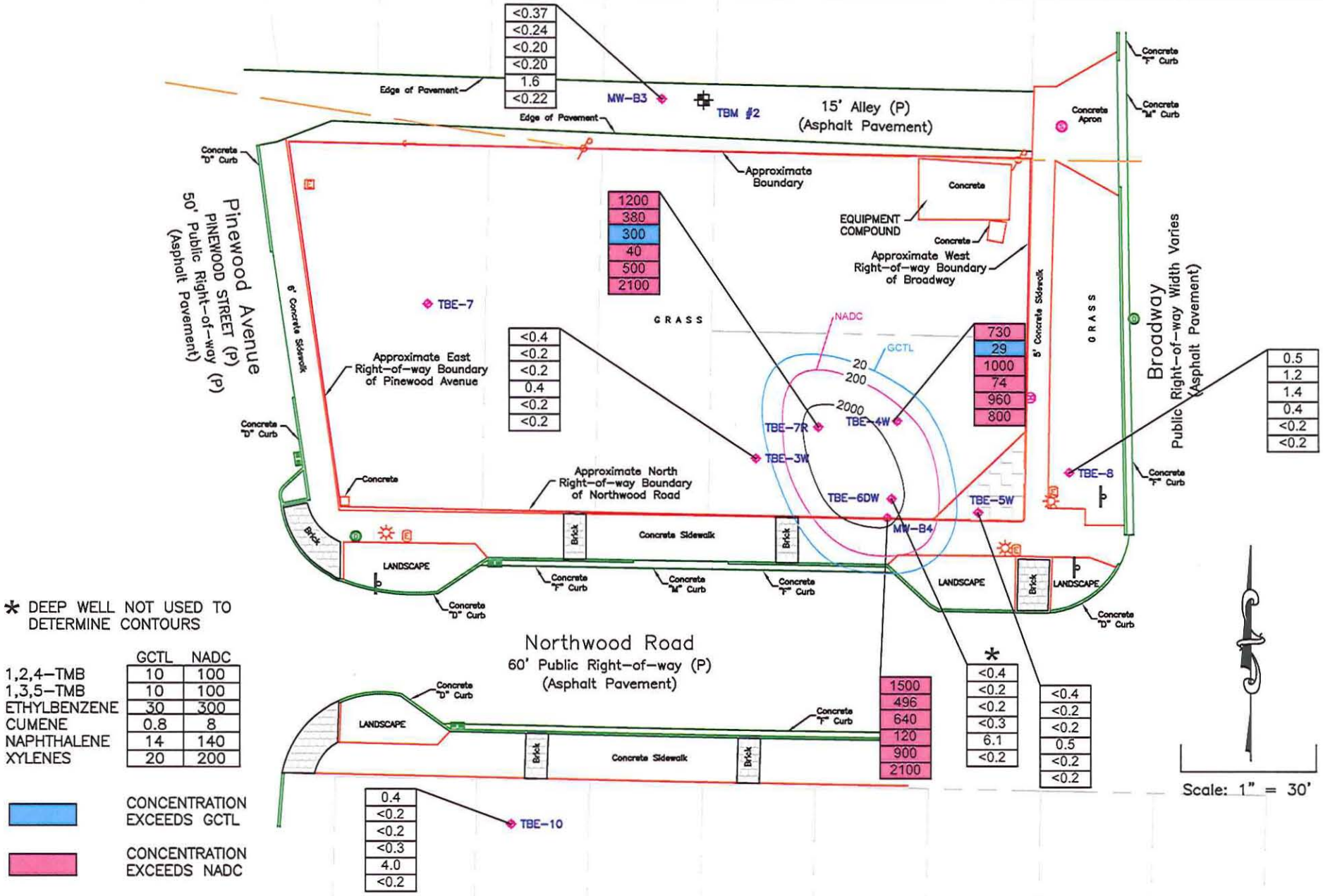

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FIGURE 9 TOTAL XYLENES CONCENTRATION IN GROUNDWATER MARCH 2014

Drawing Name: J:\00029\00029031.00\CAD\dwg\Northwood Anchor Site Survey 5-2014.dwg May 23, 2014 - 12:02pm

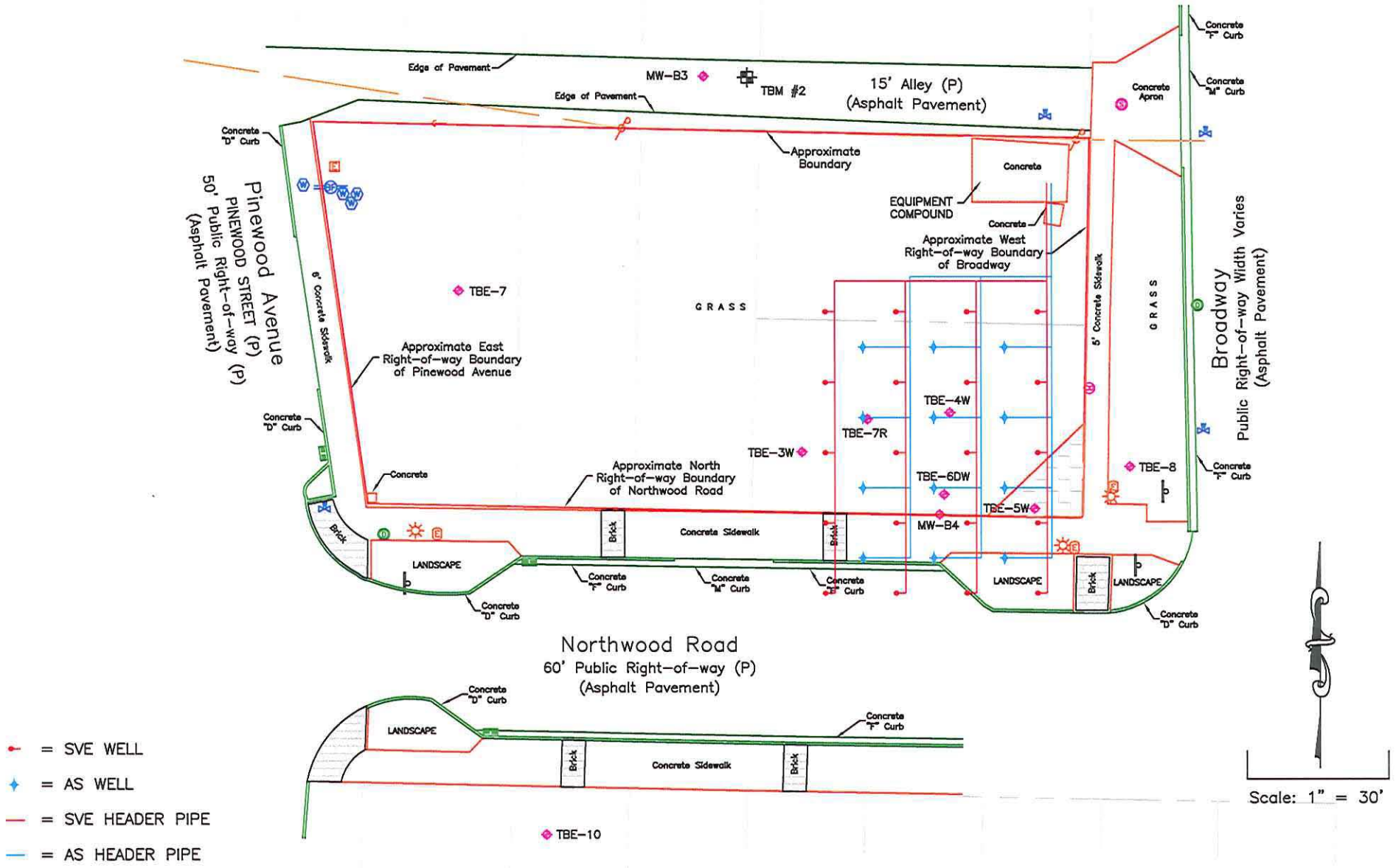

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FIGURE 10
CONCEPTUAL AIR SPARGE / SOIL VAPOR EXTRACTION SYSTEM LAYOUT

Drawing Name: J:\00029\00029031.00\ACAD\dwg\Northwood Anchor Site Survey 5-2014.dwg May 21, 2014 - 9:05am

APPENDIX A
REMEDIAL ACTION PLAN APPROVAL ORDER
FDEP, April 2011

Florida Department of Environmental Protection

Southeast District Office
400 N. Congress Avenue, Suite 200
West Palm Beach, FL 33401

561-681-6600

Rick Scott
Governor

Jennifer Carroll
Lt. Governor

Herschel T. Vinyard Jr.
Secretary

APR 1 2 2011

VIA ELECTRONIC MAIL
blazarus@wpb.org

Barry S. Lazarus, CRA Real Estate Administrator
West Palm Beach Community Redevelopment Agency
401 Clematis Street 2nd Floor
West Palm Beach, FL 34401-5319

Brownfields
City of West Palm Beach
Palm Beach County
BF 500302001

Re: Remedial Action Plan Approval Order, Northwood Anchor Site, West Palm Beach, Palm Beach County, Site ID: # COM_297626

Dear Mr. Lazarus:

Staff of the District's Waste Cleanup Section has reviewed the Combined Brownfields Site Assessment Report (SAR) & Remedial Action Plan (RAP) Report, dated February 19, 2009, (received February 23, 2009) and additional SAR/RAP information dated September 10, 2009 (received September 16, 2009), April 9, 2010 (received April 12, 2010), January 28, 2011 (received January 31, 2011) all submitted by Cardno TBE for the contamination at the above referenced site. Maps depicting the area are attached herein as Exhibits 2 and 3. We found all the documents submitted to date to be adequate to meet the requirements of Rule 62-785.700, Florida Administrative Code (F.A.C.). The Department has determined that the actions proposed in this RAP inclusive of the supplemental information dated through January 31, 2011, represent a reasonable strategy toward accomplishing the site-specific cleanup objectives of Chapter 62-785, F.A.C

Additional analytical field sampling must also be done to verify that no new contamination has occurred due to a segment of the Brownfield site currently utilized as a Florida Department of Transportation (FDOT) construction staging area. Within 60 days after FDOT has de-mobilized from the staging area, groundwater monitoring wells destroyed by the FDOT contractors must be replaced and, prior to implementation of the RAP, a baseline groundwater monitoring sampling event must take place. This pre-RAP implementation baseline groundwater monitoring sampling event should be as follows:

Monitoring Wells	Contaminants of Concern	Frequency
MW-B3, TBE-8 TBE-10, TBE-7, TBE-6DW, TBE-3W, TBE-4W, TBE-5W, MW-B4 MW-B4, TBE-3W, TBE-4W	pH, TDS (EPA method 160.1) Nitrate & nitrite (EPA method 300) BTEX/MTBE (EPA method 8260B) PAHs (EPA method 8270) Total/dissolved iron (EPA method 6020) Sulfate (EPA method 300.0)	Pre injection sampling event

Subsequent to the baseline sampling event underground injections into groundwater will proceed with ORC Advanced™ and Petrox™ (both products accepted by the Department). ORC will be injected into the plume via 23 Direct Push (25 ft. depth) injection points to supply oxygen. A map depicting the injection points is attached herein as Exhibit 1. The secondary drinking water parameters pH and TDS must be sampled from TBE-7, TBE10, and TBE-8 for the Temporary Zone of Discharge. Petrox™ will be injected into the plume via 15 Direct Push injection points to enhance biological oxidation of petroleum hydrocarbons. The injections are approved for a one-time event. No additional Bioremediation products are to be injected into the subsurface without a RAP addendum approval Order from the Department. Pursuant to Subsection 62-785.690(8), F.A.C., you are required to complete the monitoring program outlined below. The first sampling event must be performed within 30 days after completing injection(s). Water level measurements must be made immediately prior to each sampling event. The analytical results (laboratory report), chain of custody record form, cumulative summary tables as required by Subparagraph 62-785.600(8)(a)25, F.A.C. (updated as applicable), site map(s) that illustrate the most recent analytical results, and the water level elevation information (cumulative summary table and most recent flow interpretation map), must be submitted to the Southeast District within 60 days of sample collection.

The monitoring wells to be sampled, the sampling parameters, and the sampling frequency after the injections are as follows:

Monitoring Wells	Contaminants of Concern	Frequency
MW-B4, TBE-3W TBE-4W, TBE-5W, TBE-8	pH, TDS (EPA method 160.1) Nitrate & nitrite (EPA method 300) BTEX/MTBE (EPA method 8260B) PAHs (EPA method 8270) Total/dissolved iron, (EPA method 6020) Sulfate (EPA method 300.0)	Monthly

Pursuant to Paragraph 62-785.700(8)(a), F.A.C. the Department approves the RAP as described in this RAP Approval Order (Order). However, if it appears during RAP implementation that the remedial strategy is not effective, concentrations are migrating offsite or to previously uncontaminated or less contaminated areas, a request for modification of this Order, pursuant to Subsection 62-785.700(15), F.A.C., may be submitted to the Department, or the Department may require the preparation and submittal of a RAP Modification to enhance the active remediation. Depending on the nature of the system modification, the Department may revoke this Order. The operation of the active remediation system must be initiated within **120 days** as required by Subsections 62-785.700(11),(12), F.A.C. A Post-Active Remediation Monitoring Report must be submitted to the Department 60 days after the second monthly sampling event at which time the proposed quarterly groundwater monitoring will be reviewed.

You are also required to submit to the Southeast District record drawings (as-built drawings) of the treatment system within 120 days of initiating operation of the active remediation system(s). These drawings must be certified by a professional engineer. NA

Legal Issues

The Department's Order shall become final unless a timely petition for an administrative hearing is filed under Sections 120.569 and 120.57, Florida Statutes (F.S.), within 21 days of receipt of this Order. The procedures for petitioning for an administrative hearing are set forth below.

Persons affected by this Order have the following options:

(A) If you choose to accept the Department's decision regarding the RAP you do not have to do anything. This Order is final and effective as of the date on the top of the first page of this Order.

(B) If you choose to challenge the decision, you may do the following:

(1) File a request for an extension of time to file a petition for an administrative hearing with the Department's Agency Clerk in the Office of General Counsel within 21 days of receipt of this Order; such a request should be made if you wish to meet with the Department in an attempt to informally resolve any disputes without first filing a petition for an administrative hearing; or

(2) File a petition for an administrative hearing with the Department's Agency Clerk in the Office of General Counsel within 21 days of receipt of this Order.

Please be advised that mediation of this decision pursuant to Section 120.573, F.S., is not available.

How to Request an Extension of Time to File a Petition for an Administrative Hearing

For good cause shown, pursuant to Subsection 62-110.106 (4), F.A.C., the Department may grant a request for an extension of time to file a petition for an administrative hearing. Such a request must be filed (received) by the Department's Agency Clerk in the Office of General Counsel at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida, 32399-3000, within 21 days of receipt of this Order. Petitioner, if different from the City of West Palm Beach Community Redevelopment Agency (CRA), Attn: Barry S. Lazarus, 401 Clematis Street 2nd Floor, West Palm Beach Florida, 34401-5319 shall mail a copy of the request to City of West Palm Beach CRA, Attn: Barry S. Lazarus, 401 Clematis Street 2nd Floor West Palm Beach Florida, 34401-5319, at the time of filing. Timely filing a request for an extension of time tolls the time period within which a petition for an administrative hearing must be made.

How to File a Petition for an Administrative Hearing

A person whose substantial interests are affected by this Order may petition for an administrative hearing under Sections 120.569 and 120.57, F.S. The petition must contain the information set forth below and must be filed (received) by the Department's Agency Clerk in the Office of General Counsel at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida, 32399-3000, within 21 days of receipt of this Order. Petitioner, if different from the City of West Palm Beach CRA, Attn: Barry S. Lazarus, 401 Clematis Street 2nd Floor West Palm Beach Florida, 34401-5319 shall mail a copy of the petition to City of West Palm Beach CRA, Attn: Barry S. Lazarus, 401 Clematis Street 2nd Floor West Palm Beach Florida, 34401-5319, at the time of filing. Failure to file a petition within this time period shall waive the right of anyone who may request an administrative hearing under Sections 120.569 and 120.57, F.S.

Pursuant to Subsection 120.569(2), F.S. and Rule 28-106.201, F.A.C., a petition for an administrative hearing shall contain the following information:

(a) The name, address, and telephone number of each petitioner; the name, address, and telephone number of the petitioner's representative, if any; the facility owner's name and address, if different from the petitioner; the FDEP facility number, and the name and address of the facility;
(b) A statement of when and how each petitioner received notice of the Department's action or proposed action;
(c) An explanation of how each petitioner's substantial interests are or will be affected by the Department's action or proposed action;
(d) A statement of the disputed issues of material fact, or a statement that there are no disputed facts;
(e) A statement of the ultimate facts alleged, including a statement of the specific facts the petitioner contends warrant reversal or modification of the Department's action or proposed action;
(f) A statement of the specific rules or statutes the petitioner contends require reversal or modification of the Department's action or proposed action; and

(g) A statement of the relief sought by the petitioner, stating precisely the action petitioner wishes the Department to take with respect to the Department's action or proposed action.

This Order is final and effective as of the date on the top of the first page of this Order. Timely filing a petition for an administrative hearing postpones the date this Order takes effect Until the Department issues either a final order pursuant to an administrative hearing or an Order Responding to Supplemental Information provided to the Department pursuant to meetings with the Department.

Judicial Review

Any party to this Order has the right to seek judicial review of it under Section 120.68, F.S., by filing a notice of appeal under Rule 9.110 of the Florida Rules of Appellate Procedure with the Department's Agency Clerk in the Office of General Counsel at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida, 32399-3000, and by filing a copy of the notice of appeal accompanied by the applicable filing fees with the appropriate district court of appeal. The notice of appeal must be filed within 30 days after this Order is filed with the Department's clerk (see below).

Questions

Any questions regarding the Department's review of your Combined Brownfields Site Assessment and Remedial Action Plan should be directed to Mr. Art Torvela, P.E., at (561) 681-6676. Questions regarding legal issues should be referred to the Department's Office of General Counsel at (850) 245-2242. Contact with any of the above does not constitute a petition for administrative hearing or request for an extension of time to file a petition for administrative hearing.

Sincerely,

04/12/11
Kevin Claridge — Date
Assistant District Director
Southeast District

FILING AND ACKNOWLEDGMENT
FILED, on this date, pursuant to
§120.52 Florida Statutes, with the
designated Department Clerk, receipt
of which is hereby acknowledged.

Clerk

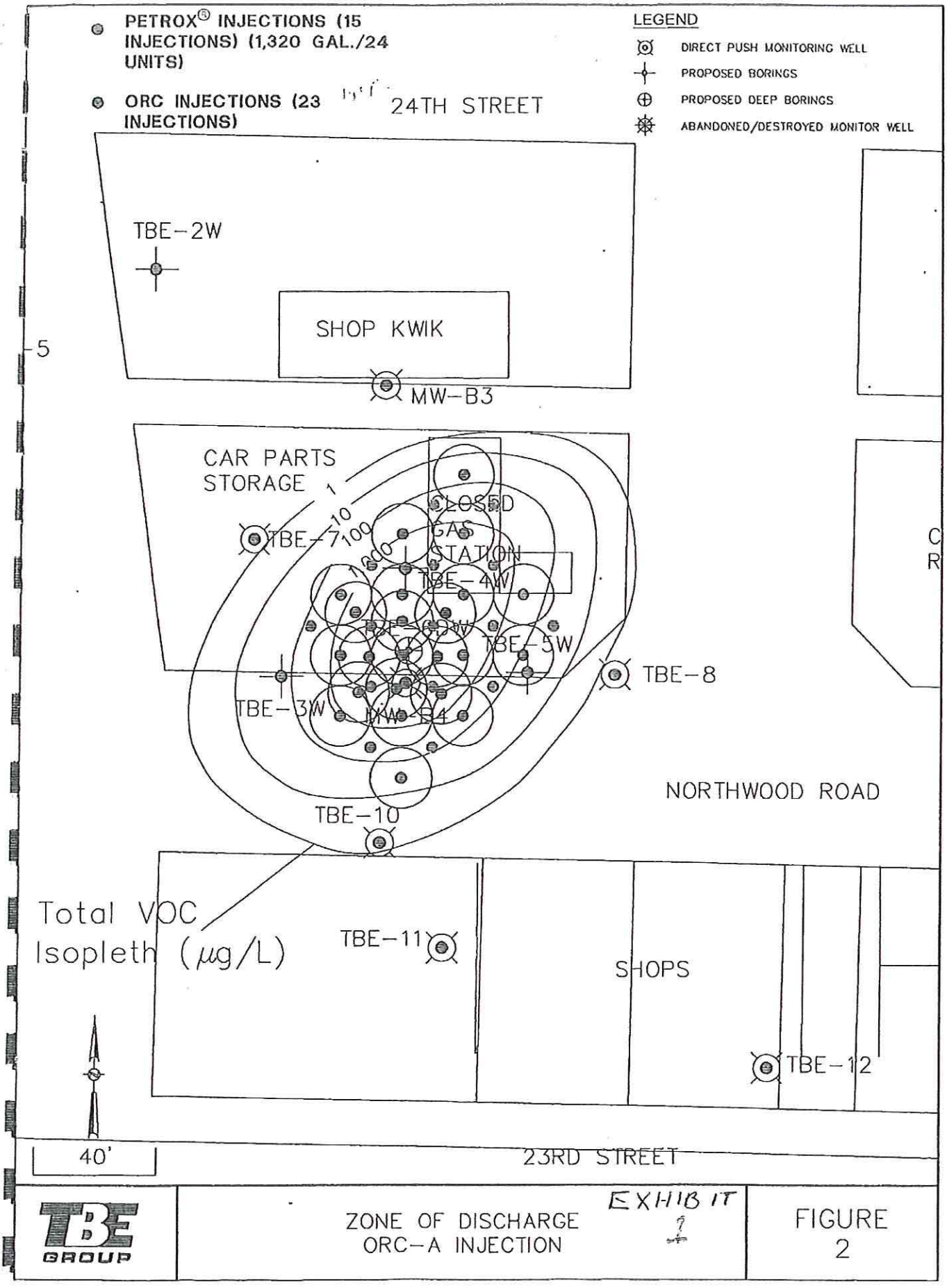
4-12-2011
Date

KC/JWL/ paw/aet

Attachments: Exhibit 1 (Figure 2), Exhibit 2 (Figure 7A), Exhibit 3, (Figure 7B)

cc: Greg Vaday (via email: gvaday@tcrpc.org)
Kim Walker, (via email: kim.walker@dep.state.fl.us)
Brian Dougherty, Bureau of Waste Cleanup, FDEP (Brian.Dougherty@dep.state.fl.us)
Larry Morgan, Esq., OGC, FDEP (Larry.Morgan@dep.state.fl.us)
Ronni Moore, Esq., OGC, FDEP (ronni.moore@dep.state.fl.us)
John O'Malley, P.G., P.B.C. Health Department (john_o'malley@doh.state.fl.us)
Dave Gibson, P.G., PBC ERM (dgibson@co.palm-beach.fl.us)
Miles Ballogg (mballogg@tbegroup.com
Terry Griffin, P.G. (tgriffin@tbegroup.com)
Mayor Jeri Muoio (jmuoio@wpb.org)
Kim Briesemeister: Redevelopment Manager, kbriesemeister@wpb.org

#090213,090870,100291,100721,110098,


PETROX® INJECTIONS (15 INJECTIONS) (1,320 GAL./24 UNITS)
ORC INJECTIONS (23 INJECTIONS)
LEGEND
DIRECT PUSH MONITORING WELL
PROPOSED BORINGS
PROPOSED DEEP BORINGS
ABANDONED/DESTROYED MONITOR WELL
24TH STREET
TBE-2W
SHOP KWIK
MW-B3
CAR PARTS STORAGE
CLOSED GAS STATION
TBE-7
TBE-4W
TBE-5W
TBE-8
TBE-3W
MW-B4
TBE-10
NORTHWOOD ROAD
Total VOC Isopleth (µg/L)
TBE-11
SHOPS
TBE-12
40'
23RD STREET
TBE GROUP
ZONE OF DISCHARGE ORC-A INJECTION
EXHIBIT 1
FIGURE 2

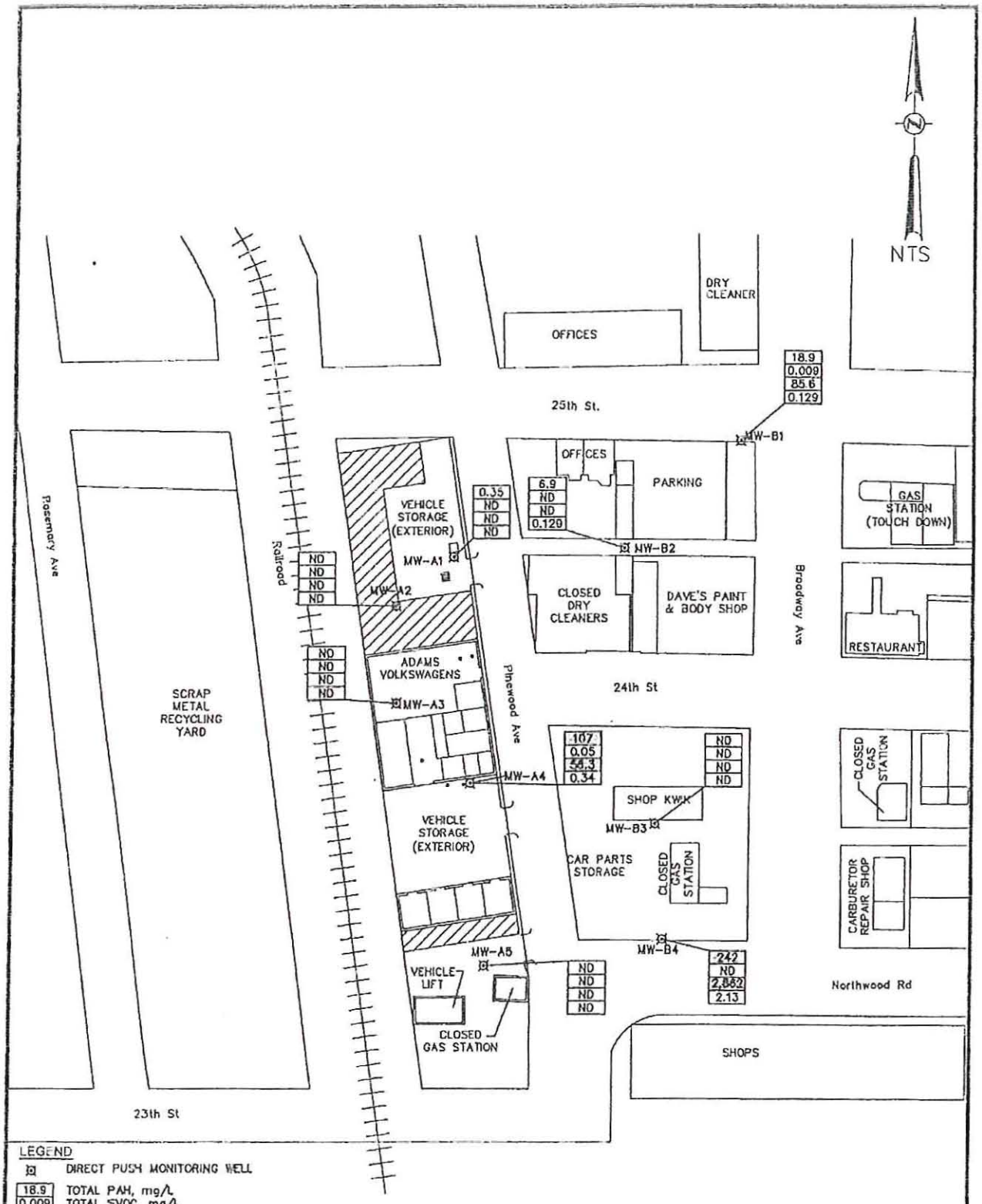


EXHIBIT 2

TBE GROUP	Total Parameter Group/Concenctration in Groundwater January 2005 Northwood Study Area West Palm Beach, Florida	FIGURE 7A

J:\0062910002\CAD\dwg\Site.dwg, 1/27/2005 2:56:37 PM, jjh1, Letter, 1:2.8

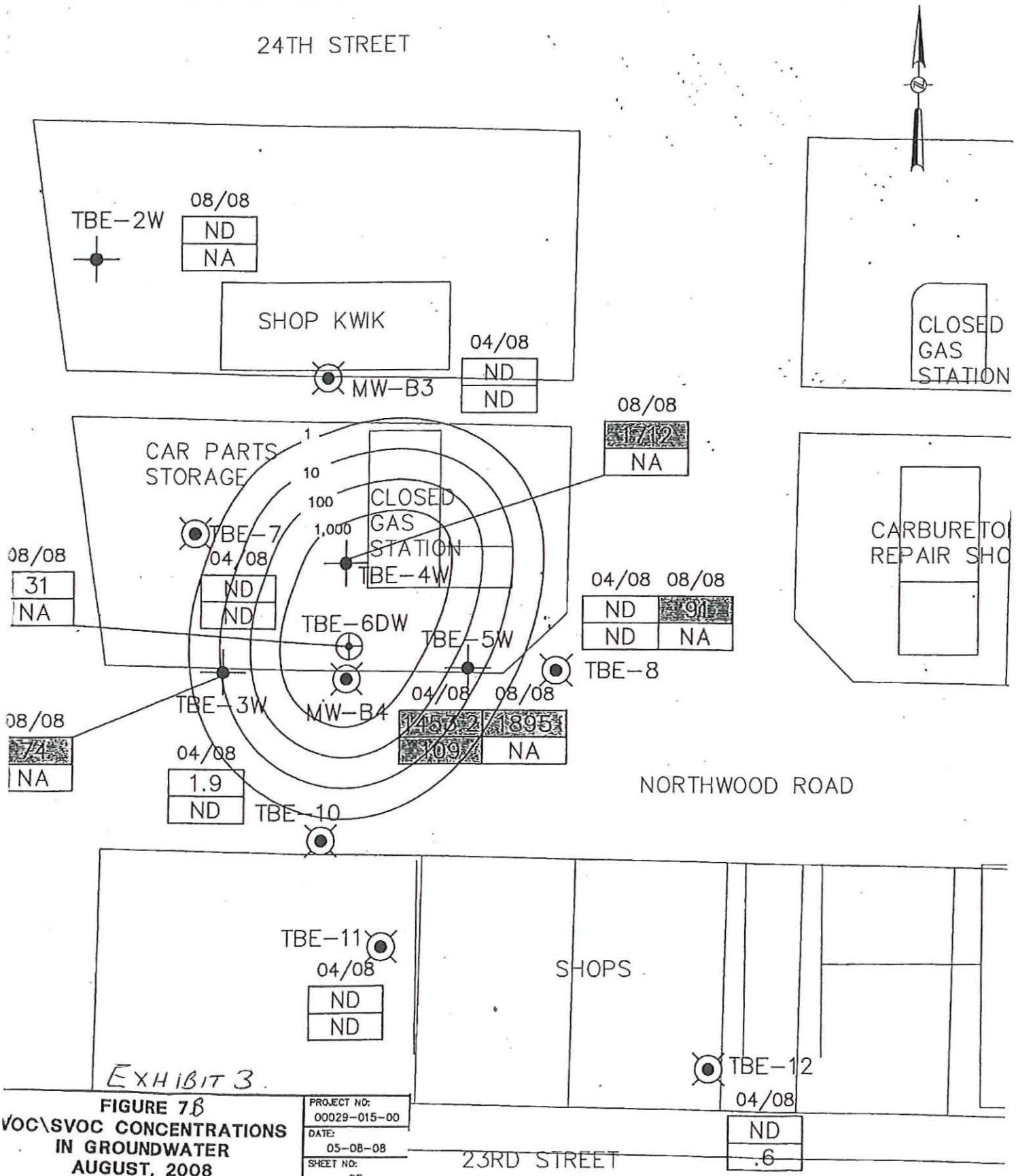


EXHIBIT 3

FIGURE 7B
VOC\SVOC CONCENTRATIONS IN GROUNDWATER AUGUST, 2008

PROJECT NO: 00029-015-00
DATE: 05-08-08
SHEET NO: OF

NORTHWOOD REDEVELOPMENT AREA WEST PALM BEACH, FL

TBE GROUP
Civil Engineering • Transportation Environmental • Planning
380 Park Place Boulevard, Suite 300
Clearwater, Florida, 33759
www.tbegroup.com – 800.861.8314
License No. 3843

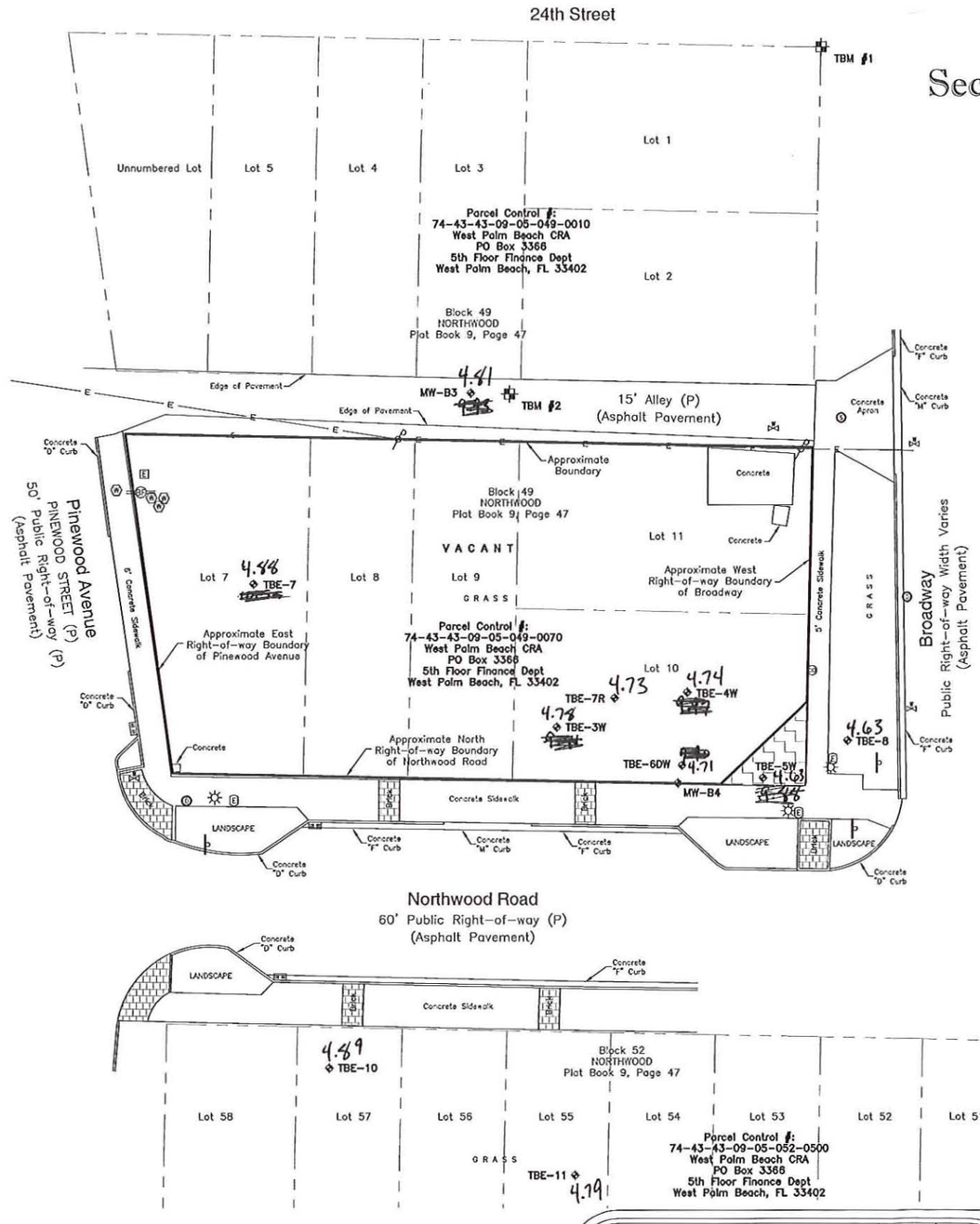
Greg A. Schultz, PE DATE
LIC. NO.: 57586

DESIGNED TWG
DRAWN DWK
Q.C.
APPROVED

FIGUI VOC\SVOC CO IN GROUN AUGUST

APPENDIX B
SPECIFIC PURPOSE SURVEY
NORTHWOOD ANCHOR SITE

Specific Purpose Survey
Northwood Anchor Site
Section 9, Township 43 South, Range 43 East
Palm Beach County, Florida



0' 20' 40' 60'

Scale: 1" = 20'

Legend of Symbols & Abbreviations

P.S.M.	Professional Surveyor and Mapper		Water Meter
	Temporary Benchmark		Water Valve
TBM	Temporary Benchmark		Backflow Preventer
	Monitoring Well		Power Pole
	Sign		Guy Wire
	Cleanout		Light Pole
	Sanitary Manhole		Electric Sensor
	Storm Manhole		Electric Vault
	Catch Basin		Overhead Utility Lines
	Storm Manhole		Right-of-way Take per Florida Department of Transportation Map Section #: 93020-2549
	Plat Lot Line		
(P)	Plat Reference		

Surveyor's Notes

1.) Not valid without the signature and original raised seal of a Florida Licensed Surveyor and Mapper.
2.) The horizontal datum utilized for this project is NAD 1983 Florida East Zone, U.S. Survey Feet.
3.) The vertical datum utilized for this project is NAVD 1988, U.S. Survey Feet. The benchmark utilized was Palm Beach County Benchmark "OMAHA" with an elevation of 9.416 feet.
4.) All utilities depicted hereon are from visible evidence only. Surveyor did not contact subsurface utility locator service.
5.) No underground foundations or footers were excavated or located for this survey.
6.) THIS IS NOT A BOUNDARY SURVEY.

Monitoring Well Information:

Designation	Northing Florida East NAD 1983 US Survey Feet	Easting Florida East NAD 1983 US Survey Feet	Ground Elevation NAVD 88 US Survey Feet	Rim Elevation NAVD 88 US Survey Feet
MW-B3	874123.4	963877.3	15.0	14.74
MW-B4	874030.1	963927.2	14.9	14.77
TBE-3W	874043.4	963898.1	14.8	14.59
TBE-4W	874051.8	963929.4	15.0	14.71
TBE-5W	874031.3	963947.4	14.8	14.51
TBE-6DW	874034.4	963928.2	14.9	14.61
TBE-7	874077.7	963825.5	15.6	15.43
TBE-7R	874050.4	963911.9	15.2	14.96
TBE-8	874040.3	963967.6	15.1	14.74
TBE-10	873961.9	963843.9	15.3	15.00
TBE-11	873936.2	963902.7	15.6	15.30

Benchmark Information: NAVD 1988

TBM #1
Elevation = 14.98'
Found p.k. nail & disk "P.S.M. #5734" near the southwest corner of the intersection of 24th Street & Broadway (See Survey).

TBM #2
Elevation = 14.98'
Set p.k. nail & disk "SurvTech Trav Pt" in asphalt alley; 9'± east of MW-B3; 64'± westerly of a water valve (See Survey).

Description: OR Book 18381, Page 788
Lots 7,8,9,10 and 11, Block 49, NORTHWOOD, according to the map or plat thereof, as recorded in Plat Book 9, Page 47, of the Public Records of Palm Beach County, Florida.

Stacy Brown P.S.M. No. 6516
SurvTech Solutions, Inc. L.B. No. 7340

REVISION	DATE	INITIALS

Project Name: Northwood Anchor Site — *Project No.: 20140051*
Address: 2401 Broadway — *City: West Palm Beach* — *State: Florida*

SURVEYING TODAY WITH TOMORROWS TECHNOLOGY

Drafted By: B. Stinson
Date Drafted: 3/26/14
Approved By: S. Brown
Date Approved: 3/31/14
Phase: 1
Drawing Name: 20140051_1S
Field Date: 3/24/14
Field Book/Page: 14-05/32-34

SURVTECH SOLUTIONS, INC.
10220 U.S. Highway 92 East
Tampa, FL 33610
phone: (813)-621-4929
fax: (813)-621-7194
Licensed Business #7340
email: sbrown@survtechsolutions.com
http://www.survtechsolutions.com

APPENDIX C
BORING LOG AND WELL COMPLETION REPORT
WELL TBE-7R

Florida Department of Environmental Protection - Division of Waste Management - Bureau of Petroleum Storage Systems

BORING LOG

Page 1 of 1

Boring/Well Number:	Permit Number:	FDEP Facility Identification Number:
TBE-7R		

Site Name:	Borehole Start Date: 3.24.14	Borehole Start Time: 1310 ☐ AM ☐ PM
Northwood Anchor	End Date: 3.24.14	End Time: 1450 ☐ AM ☐ PM

Environmental Contractor:	Geologist's Name:	Environmental Technician's Name:
Cardno	James Wilson	—

Drilling Company:	Pavement Thickness (inches):	Borehole Diameter (inches):	Borehole Depth (feet):
Preferred	Grass	3 1/4	16

Drilling Method:	Apparent Borehole DTW (in feet from soil moisture content):	Measured Well DTW (in feet after water recharges in well):	OVA (list model and check type):
HA/DPT	10		MiniRae 3000 ☐ FID ☒ PID

Disposition of Drill Cuttings [check method(s)]: ☐ Drum ☐ Spread ☐ Backfill ☐ Stockpile ☐ Other

(describe if other or multiple items are checked):

Borehole Completion (check one): ☒ Well ☐ Grout ☐ Bentonite ☐ Backfill ☐ Other (describe)

Sample Type	Sample Depth Interval (feet)	Sample Recovery (inches)	SPT Blows (per six inches)	Unfiltered OVA	Filtered OVA	Net OVA	Depth (feet)	Sample Description (include grain size based on USCS, odors, staining, and other remarks)	USCS Symbol	Moisture Content	Lab Soil and Groundwater Samples (list sample number and depth or temporary screen interval)
HA						5.1	1	Sand, medium, gray -Piece of cinder block and shells		D	
							2	Sand, medium, beige/gray			
						1.6	3				
							4				
							5				
						0.0	6				
DPT							7	Sand, medium, white		M	
						0.0	8				
							9	Sand, medium, rusty orange/brown		W S	
						0.1	10				
						0.1	12	Strong petro odor and staining 13-15'			
							16				

Sample Type Codes: PH = Post Hole; HA = Hand Auger; SS = Split Spoon; ST = Shelby Tube; DP = Direct Push; SC = Sonic Core; DC = Drill Cuttings

Moisture Content Codes: D = Dry; M = Moist; W = Wet; S = Saturated

Florida Department of Environmental Protection - Division of Waste Management - Bureau of Petroleum Storage Systems

WELL CONSTRUCTION AND DEVELOPMENT LOG

WELL CONSTRUCTION DATA

Well Number:	Site Name:	FDEP Facility I.D. Number:	Well Install Date(s):
TBE-7R	Northwood Anchor		3.24.14

Well Location and Type (check appropriate boxes):
☐ On-Site ☐ Right-of-Way
☐ Off-Site Private Property
☐ Above Grade (AG) ☒ Flush-to-Grade
If AG, list feet of riser above land surface:

Well Purpose:
☐ Perched Monitoring
☒ Shallow (Water-Table) Monitoring
☐ Intermediate or Deep Monitoring
☐ Remediation or Other (describe)

Well Install Method: DPT

Surface Casing Install Method: N/A

Borehole Depth (feet):	Well Depth (feet):	Borehole Diameter (inches):	Manhole Diameter (inches):	Well Pad Size:
16	15.6	3 1/4	8"	2 feet by 2 feet

Riser Diameter and Material:	Riser/Screen Connections:	Riser Length:
1" PVC	☒ Flush-Threaded ☐ Other (describe)	6 feet from 6 feet to 0 feet

Screen Diameter and Material:	Screen Slot Size:	Screen Length:
1" PVC	0.01	10 feet from 16 feet to 6 feet

1st Surface Casing Material: also check: ☐ Permanent ☐ Temporary	1st Surface Casing I.D. (inches):	1st Surface Casing Length: feet from 0 feet to feet
2nd Surface Casing Material: also check: ☐ Permanent ☐ Temporary	2nd Surface Casing I.D. (inches):	2nd Surface Casing Length: feet from 0 feet to feet
3rd Surface Casing Material: also check: ☐ Permanent ☐ Temporary	3rd Surface Casing I.D. (inches):	3rd Surface Casing Length: feet from 0 feet to feet

Filter Pack Material and Size:	Prepacked Filter Around Screen (check one):	Filter Pack Length:
Sand 20/30	☒ Yes ☐ No	11 feet from 5 feet to 16 feet

Filter Pack Seal Material and Size:	Filter Pack Seal Length:
Sand 30/65	1 feet from 4 feet to 5 feet

Surface Seal Material:	Surface Seal Length:
Grout	4 feet from 0 feet to 4 feet

WELL DEVELOPMENT DATA

Well Development Date:	Well Development Method (check one):
3.24.14	☒ Surge/Pump ☐ Pump ☐ Compressed Air ☐ Other (describe)

Development Pump Type (check):	Depth to Groundwater (before developing in feet):
☐ Centrifugal ☒ Peristaltic ☐ Submersible ☐ Other (describe)	10.30

Pumping Rate (gallons per minute):	Maximum Drawdown of Groundwater During Development (feet):	Well Purged Dry (check one):
0.22	0.3	☐ Yes ☒ No

Pumping Condition (check one):	Total Development Water Removed (gallons):	Development Duration (minutes):	Development Water Drummed (check one):
☒ Continuous ☐ Intermittent	5	23	☐ Yes ☒ No

Water Appearance (color and odor) At Start of Development:	Water Appearance (color and odor) At End of Development:
Brown Cloudy Petro odor	Clear Petro odor

WELL CONSTRUCTION OR DEVELOPMENT REMARKS

Begin Dev at 1450
end 1513

APPENDIX D
GROUNDWATER SAMPLING LOGS AND EQUIPMENT CALIBRATION LOGS

Form FD 9000-24

GROUNDWATER SAMPLING LOG

BF#: 96488107-0

SITE NAME: Northwood Redevelopment Area	SITE LOCATION: West Palm Beach, FL	
WELL NO: MW-B3	SAMPLE ID: MW-B3	DATE: 3.24.14

PURGING DATA

WELL DIAMETER (inches): 1	TUBING DIAMETER (inches): 1/8	WELL SCREEN INTERVAL DEPTH: 3.2 feet to 13.2 feet	STATIC DEPTH TO WATER (feet): 9.97	PURGE PUMP TYPE OR BAILER: PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable) 0.13 = (13.2 feet – 9.97 feet) X 0.04 gallons/foot = 0.13 gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 11	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 11	PURGING INITIATED AT: 1033	PURGING ENDED AT: 1040	TOTAL VOLUME PURGED (gallons): 1.1

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) ~~µmhos/cm~~ or (µS/cm)	DISSOLVED OXYGEN (circle units) (mg/L) or ~~% saturation~~	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
1034	0.15	0.15	0.15	10.02	6.53	25.34	397.0	0.95	0.99	Clear	None
1037	0.45	0.60	0.15	10.02	6.57	25.46	399.0	0.91	0.71	"	"
1040	0.45	1.05	0.15	10.02	6.54	25.35	400.0	0.91	0.73	"	"

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Sames Wilson/Cardno	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT: 1040	SAMPLING ENDED AT: 1048
PUMP OR TUBING DEPTH IN WELL (feet):	TUBING MATERIAL CODE: PE	FIELD-FILTERED: Y (N) Filtration Equipment Type:	FILTER SIZE: ____ µm
FIELD DECONTAMINATION: PUMP Y (N)	TUBING Y ~~N~~ (replaced)	DUPLICATE: Y (N)	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH			
MW-B3	3	CG	40mL	HCl+Ice	—	—	VOC8260+Naph	RFPP	50
MW-B3	1	PE	250mL	Ice	—	—	TDS	APP	500

REMARKS:

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. **The above do not constitute all of the information required by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: February 12, 2009

Form FD 9000-24

GROUNDWATER SAMPLING LOG

BF#: 96488107-0

SITE NAME: Northwood Redevelopment Area	SITE LOCATION: West Palm Beach, FL	
WELL NO: MW-B4	SAMPLE ID: MW-B4	DATE: 3.25.14

PURGING DATA

WELL DIAMETER (inches): 3/4	TUBING DIAMETER (inches): 1/8	WELL SCREEN INTERVAL DEPTH: 8 feet to 18 feet	STATIC DEPTH TO WATER (feet): 9.50	PURGE PUMP TYPE OR BAILER: PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
0.17 = (18 feet – 9.50 feet) X 0.02 gallons/foot = 0.17 gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 10	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 10	PURGING INITIATED AT: 1628	PURGING ENDED AT: 1644	TOTAL VOLUME PURGED (gallons): 0.8

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) ~~µmhos/cm~~ or (µS/cm)	DISSOLVED OXYGEN (circle units) (mg/L) or ~~% saturation~~	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
1632	0.20	0.20	0.05	9.67	6.11	24.77	422.0	1.10	54.3	Slight white cloudy	Petro
1635	0.15	0.35	0.05	9.67	6.11	24.68	427.0	0.75	30.1	Clear	" "
1638	0.15	0.50	0.05	9.67	6.14	24.70	431.0	0.63	19.8	" "	" "
1641	0.15	0.65	0.05	9.67	6.15	24.78	434.0	0.58	17.1	" "	" "
1644	0.15	0.80	0.05	9.67	6.15	24.67	438.0	0.55	13.7	" "	" "

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: James Wilson / Cardno	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT: 1644	SAMPLING ENDED AT: 1654
PUMP OR TUBING DEPTH IN WELL (feet): 10	TUBING MATERIAL CODE: PE	FIELD-FILTERED: Y (N) Filtration Equipment Type:	FILTER SIZE: ____ µm
FIELD DECONTAMINATION: PUMP Y (N)	TUBING Y ~~N~~ (replaced)	DUPLICATE: Y (N)	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
MW-B4	3	CG	40mL	HCl+Ice	—	—	VOC 8260 + Naph	RFPP	50
MW-B4	1	PE	250mL	Ice	—	—	TDS	APP	200

REMARKS:
5 well volumes = 0.85 Gal.

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. **The above do not constitute all of the information required by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: February 12, 2009

Form FD 9000-24

GROUNDWATER SAMPLING LOG

BF#: 96488107-0

SITE NAME: Northwood Redevelopment Area	SITE LOCATION: West Palm Beach, FL	
WELL NO: TBE-3W	SAMPLE ID: TBE-3W	DATE: 3.24.14

PURGING DATA

WELL DIAMETER (inches): 1	TUBING DIAMETER (inches): 1/8	WELL SCREEN INTERVAL DEPTH: 6 feet to 16 feet	STATIC DEPTH TO WATER (feet): 9.85	PURGE PUMP TYPE OR BAILER: PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable) 0.25 = (16 feet – 9.85 feet) X 0.04 gallons/foot = 0.25 gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 11	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 11	PURGING INITIATED AT: 1000	PURGING ENDED AT: 1011	TOTAL VOLUME PURGED (gallons): 1.7

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) ~~µmhos/cm~~ or (µS/cm)	DISSOLVED OXYGEN (circle units) (mg/L) or ~~% saturation~~	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
1002	0.30	0.30	0.15	9.92	6.40	23.97	294.0	0.97	1.67	Clear	None
1005	0.45	0.75	0.15	9.92	6.10	24.07	288.0	0.85	1.42	"	"
1008	0.45	1.20	0.15	9.92	6.10	24.11	285.0	0.77	1.27	"	"
1011	0.45	1.65	0.15	9.92	6.10	24.01	284.0	0.74	1.07	"	"

Petro odor

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: James Wilson / cardno	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT: 1011	SAMPLING ENDED AT: 1020
PUMP OR TUBING DEPTH IN WELL (feet): 11	TUBING MATERIAL CODE: PE	FIELD-FILTERED: Y (N) Filtration Equipment Type:	FILTER SIZE: ____ µm
FIELD DECONTAMINATION: PUMP Y (N)	TUBING Y ~~N~~ (replaced)	DUPLICATE: Y (N)	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
TBE-3W	3	CG	40mL	HCl+Ice	—	—	VOC 8260+Naph	RFPP	50
TBE-3W	1	PE	250mL	Ice	—	—	TDS	APP	500

REMARKS:
Noted Petro odor when filling TDS bottle.

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: February 12, 2009

Form FD 9000-24

GROUNDWATER SAMPLING LOG

BF#: 96488107-0

SITE NAME: Northwood Redevelopment Area	SITE LOCATION: West Palm Beach, FL	
WELL NO: TBE-4W	SAMPLE ID: TBE-4W	DATE: 3.25.14

PURGING DATA

WELL DIAMETER (inches): 1	TUBING DIAMETER (inches): 1/8	WELL SCREEN INTERVAL DEPTH: 5.6 feet to 15.6 feet	STATIC DEPTH TO WATER (feet): 9.97	PURGE PUMP TYPE OR BAILER: PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH − STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
0.23 = (15.6 feet − 9.97 feet) X 0.04 gallons/foot = 0.23 gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 10.5	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 10.5	PURGING INITIATED AT: 1038	PURGING ENDED AT: 1053	TOTAL VOLUME PURGED (gallons): 1.5

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) ~~µmhos/cm~~ or (µS/cm)	DISSOLVED OXYGEN (circle units) (mg/L) or ~~% saturation~~	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
1041	0.30	0.30	0.10	10.21	6.50	23.66	443.0	0.55	37.4	clear	Petro
1044	0.30	0.60	0.10	10.21	6.49	24.14	445.0	0.47	16.2	"	"
1047	0.30	0.90	0.10	10.21	6.50	24.57	452.0	0.43	7.22	"	"
1050	0.30	1.20	0.10	10.21	6.51	24.65	457.0	0.40	5.94	"	"
1053	0.30	1.50	0.10	10.21	6.49	24.54	460.0	0.39	4.87	"	"

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Sameer Wilson / Cardno	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT: 1053	SAMPLING ENDED AT: 1105
PUMP OR TUBING DEPTH IN WELL (feet): 10.5	TUBING MATERIAL CODE: PE	FIELD-FILTERED: Y (N) Filtration Equipment Type:	FILTER SIZE: ____ µm
FIELD DECONTAMINATION: PUMP Y (N)	TUBING Y ~~N~~ (replaced)	DUPLICATE: (Y) N	(DUP-1)

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
TBE-4W	3	CG	40mL	HCl+Ice	—	—	VOC8260+Naph	RFPP	50
TBE-4W	1	PE	250mL	Ice	—	—	TDS	APP	500
DUP-1	3	CG	40mL	HCl+Ice	—	—	VOC8260+Naph	RFPP	50
DUP-1	1	PE	250mL	Ice	—	—	TDS	APP	500

REMARKS:

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: February 12, 2009

Form FD 9000-24

GROUNDWATER SAMPLING LOG

BF#: 96488107-0

SITE NAME: Northwood Redevelopment Area	SITE LOCATION: West Palm Beach, FL	
WELL NO: TBE-5W	SAMPLE ID: TBE-5W	DATE: 3.24.14

PURGING DATA

WELL DIAMETER (inches): 1	TUBING DIAMETER (inches): 1/8	WELL SCREEN INTERVAL DEPTH: 6.5 feet to 16.5 feet	STATIC DEPTH TO WATER (feet): 9.80	PURGE PUMP TYPE OR BAILER: PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable) 0.27 = (16.5 feet – 9.80 feet) X 0.04 gallons/foot = 0.27 gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 10	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 10	PURGING INITIATED AT: ~~1053~~ 1253	PURGING ENDED AT: 1302	TOTAL VOLUME PURGED (gallons): 0.9

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) ~~µmhos/cm~~ or (µS/cm)	DISSOLVED OXYGEN (circle units) (mg/L) or ~~% saturation~~	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
1256 ~~1056~~	0.30	0.30	0.10	9.91	6.39	24.88	647.0	0.88	0.87	Clear	None
1259 ~~1059~~	0.30	0.60	0.10	9.91	6.39	24.79	649.0	0.77	0.74	"	"
1302 ~~1102~~	0.30	0.90	0.10	9.91	6.42	24.67	649.0	0.84	1.06	"	"

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./FL): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: James Wilson / Cardno	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT: 1302	SAMPLING ENDED AT: 1310
PUMP OR TUBING DEPTH IN WELL (feet): 10	TUBING MATERIAL CODE: PE	FIELD-FILTERED: Y (N) Filtration Equipment Type:	FILTER SIZE: ____ µm
FIELD DECONTAMINATION: PUMP Y (N)	TUBING Y ~~N~~ (replaced)	DUPLICATE: Y (N)	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
TBE-5W	3	CG	40mL	HCl+Ice	—	—	VOC8260+Naph	RFPP	50
TBE-5W	1	PE	250mL	Ice	—	—	TDS	APP	500

REMARKS:
Tubing won't insert past 10' bls. Set tubing there and lower flowrate

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. **The above do not constitute all of the information required by Chapter 62-160, F.A.C.**

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: February 12, 2009

Form FD 9000-24

GROUNDWATER SAMPLING LOG

BF#: 96488107-0

SITE NAME: Northwood Redevelopment Area	SITE LOCATION: West Palm Beach, FL	
WELL NO: TBE-6DW	SAMPLE ID: TBE-6DW	DATE: 3.25.14

PURGING DATA

WELL DIAMETER (inches): 1	TUBING DIAMETER (inches): 1/8	WELL SCREEN INTERVAL DEPTH: 19 feet to 29 feet	STATIC DEPTH TO WATER (feet): 9.91	PURGE PUMP TYPE OR BAILER: PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (feet – feet) X gallons/foot = gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
0.16 = 0.0006 gallons + (0.0006 gallons/foot X 35 feet) + 0.15 gallons = 0.16 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 24	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 24	PURGING INITIATED AT: 0958	PURGING ENDED AT: 1009	TOTAL VOLUME PURGED (gallons): 1.7

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) ~~µmhos/cm~~ or (µS/cm)	DISSOLVED OXYGEN (circle units) (mg/L) or ~~% saturation~~	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
1000	0.30	0.30	0.15	9.91	7.25	25.48	487.0	0.55	40.8	Clear	None
1003	0.45	0.75	0.15	9.91	7.18	25.49	482.0	0.54	19.5	"	"
1006	0.45	1.20	0.15	9.91	7.14	25.51	478.0	0.50	7.97	"	"
1009	0.45	1.65	0.15	9.91	7.09	25.45	478.0	0.50	5.28		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: James Wilson / Cardno	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT: 1009	SAMPLING ENDED AT: 1017
PUMP OR TUBING DEPTH IN WELL (feet): 24	TUBING MATERIAL CODE: PE	FIELD-FILTERED: Y (N) Filtration Equipment Type:	FILTER SIZE: ____ µm
FIELD DECONTAMINATION: PUMP Y (N)	TUBING Y ~~N~~ (replaced)	DUPLICATE: Y (N)	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
TBE-6DW	3	CG	40mL	HCl+Ice	—	—	VOC8260+Naph	RFPP	50
TBE-6DW	1	PE	250mL	Ice	—	—	TDS	APP	500

REMARKS:
High turbidity from tiny red floaters.

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: February 12, 2009

Form FD 9000-24

GROUNDWATER SAMPLING LOG

BF#: 96488107-0

SITE NAME: Northwood Redevelopment Area	SITE LOCATION: West Palm Beach, FL	
WELL NO: TBE-7R	SAMPLE ID: TBE-7R	DATE: 3-25-14

PURGING DATA

WELL DIAMETER (inches): 1	TUBING DIAMETER (inches): 1/8	WELL SCREEN INTERVAL DEPTH: 5.6 feet to 15.6 feet	STATIC DEPTH TO WATER (feet): 10.22	PURGE PUMP TYPE OR BAILER: PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
0.22 = (15.6 feet – 10.22 feet) X 0.04 gallons/foot = 0.22 gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 12	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 12	PURGING INITIATED AT: 1707	PURGING ENDED AT: 1722	TOTAL VOLUME PURGED (gallons): 1.1

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) ~~µmhos/cm~~ or (µS/cm)	DISSOLVED OXYGEN (circle units) (mg/L) or ~~% saturation~~	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
1710	0.30	0.30	0.10	10.25	6.52	24.20	392.0	0.51	216	white cloudy	None
1713	0.30	0.60	0.10	10.25	6.53	24.23	394.0	0.51	56.2	clear	None
1716	0.15	0.75	0.05	10.23	6.55	24.22	391.0	0.54	18.3	clear	None
1719	0.15	0.90	0.05	10.23	6.54	24.15	394.0	0.53	11.6	"	"
1722	0.15	1.05	0.05	10.23	6.55	24.07	391.0	0.50	6.81	"	"

lower flowrate to not exceed 5 well volumes

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Sameswilson/Cardno	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT: ~~1722~~ 1722	SAMPLING ENDED AT: 1732
PUMP OR TUBING DEPTH IN WELL (feet): 12	TUBING MATERIAL CODE: PE	FIELD-FILTERED: Y (N) Filtration Equipment Type:	FILTER SIZE: ____ µm
FIELD DECONTAMINATION: PUMP Y (N)	TUBING Y ~~N~~ (replaced)	DUPLICATE: Y (N)	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
TBE-7R	3	CG	40mL	HCl+Ice	—	—	VOC8260+Naph	RFPP	50
TBE-7R	1	PE	250mL	Ice	—	—	TDS	APP	200

REMARKS:
5 well volumes = 1.1 Gal.

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: February 12, 2009

Form FD 9000-24

GROUNDWATER SAMPLING LOG

BF#: 96488107-0

SITE NAME: Northwood Redevelopment Area	SITE LOCATION: West Palm Beach, FL	
WELL NO: TBE-8	SAMPLE ID: TBE-8	DATE: 3.24.14

PURGING DATA

WELL DIAMETER (inches): 1	TUBING DIAMETER (inches): 1/8	WELL SCREEN INTERVAL DEPTH: 14.3 feet to 24.3 feet	STATIC DEPTH TO WATER (feet): 10.15	PURGE PUMP TYPE OR BAILER: PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)
= (feet – feet) X gallons/foot = gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
0.16 = 0.0006 gallons + (0.0006 gallons/foot X 35 feet) + 0.13 gallons = 0.16 gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 23.3	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 23.3	PURGING INITIATED AT: 1105	PURGING ENDED AT: 1113	TOTAL VOLUME PURGED (gallons): 1.2

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) ~~µmhos/cm~~ or (µS/cm)	DISSOLVED OXYGEN (circle units) (mg/L) or ~~% saturation~~	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
1107	0.30	0.30	0.15	10.17	6.65	25.78	475.0	0.47	0.77	Clear	None
1110	0.45	0.75	0.15	10.17	6.63	25.83	477.0	0.43	3.43	Clear	None
1113	0.45	1.20	0.15	10.17	6.65	25.82	480.0	0.41	1.41		

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Sameswilson/Cardno	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT: 1113	SAMPLING ENDED AT: 1120
PUMP OR TUBING DEPTH IN WELL (feet): 23.3	TUBING MATERIAL CODE: PE	FIELD-FILTERED: Y (N) Filtration Equipment Type:	FILTER SIZE: ____ µm
FIELD DECONTAMINATION: PUMP Y (N)	TUBING Y ~~N~~ (replaced)	DUPLICATE: Y (N)	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
TBE-8	3	CG	40mL	HCl+Ice	—	—	VOC8260+Naph	RFPP	50
TBE-8	1	PE	250mL	Ice	—	—	TDS	APP	500

REMARKS:
At 1110 turbidity spiked with minor gray flakes floating in water.

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.

2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)

pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: February 12, 2009

Form FD 9000-24

GROUNDWATER SAMPLING LOG

BF#: 96488107-0

SITE NAME: Northwood Redevelopment Area	SITE LOCATION: West Palm Beach, FL	
WELL NO: TBE-10	SAMPLE ID: TBE-10	DATE: 3-25-14

PURGING DATA

WELL DIAMETER (inches): 1	TUBING DIAMETER (inches): 1/8	WELL SCREEN INTERVAL DEPTH: 7.9 feet to 17.9 feet	STATIC DEPTH TO WATER (feet): 10.11	PURGE PUMP TYPE OR BAILER: PP

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH – STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable) 0.32 = (17.9 feet – 10.11 feet) X 0.04 gallons/foot = 0.32 gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)
= gallons + (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 11	FINAL PUMP OR TUBING DEPTH IN WELL (feet): 11	PURGING INITIATED AT: 1414	PURGING ENDED AT: 1444	TOTAL VOLUME PURGED (gallons): 1.6

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) ~~µmhos/cm~~ or (µS/cm)	DISSOLVED OXYGEN (circle units) (mg/L) or ~~% saturation~~	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
1422	0.40	0.40	0.10	10.16	6.88	26.89	458.0	0.92	Offscale high	Cloudy orange/Brn	None
1427	0.50	0.90	0.10	10.16	6.81	26.98	453.0	0.92	163.0	" "	" "
1430	0.30	1.20	0.10	10.16	6.78	26.66	452.0	0.95	102.9	Cloudy white	" "
1433	0.09	1.29	0.03	10.14	6.80	27.56	451.0	1.01	52.6	" "	" "
1436	0.09	1.38	0.03	10.14	6.79	27.75	454.0	0.96	28.6	Clear	" "
1439	0.09	1.47	0.03	10.14	6.79	27.76	454.0	0.96	16.9	" "	" "
1442	0.09	1.56	0.03	10.14	6.79	27.80	454.0	0.93	8.33	" "	" "
1444	0.06	1.62	0.03	10.14	6.80	27.85	454.0	0.92	6.12	" "	" "

change flow to try for lower turbidity

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Sameswixson/Cardno	SAMPLER(S) SIGNATURE(S):	SAMPLING INITIATED AT: 1444	SAMPLING ENDED AT: 1455
PUMP OR TUBING DEPTH IN WELL (feet): 11	TUBING MATERIAL CODE: PE	FIELD-FILTERED: Y (N) Filtration Equipment Type:	FILTER SIZE: ____ µm
FIELD DECONTAMINATION: PUMP Y (N)	TUBING Y ~~N~~ (replaced)	DUPLICATE: Y (N)	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION					
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH	INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
TBE-10	3	CG	40mL	HCl+Ice	—	—	VOC8260+Naph	RFPP	50
TBE-10	1	PE	250mL	Ice	—	—	TDS	APP	115

REMARKS:
5 well volume = 1.6 gal.

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: ± 0.2 units **Temperature:** ± 0.2 °C **Specific Conductance:** ± 5% **Dissolved Oxygen:** all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) **Turbidity:** all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: February 12, 2009

DEP-SOP-001/01: Form FD 9000-8 (June 20, 2001)

Field Instrument Calibration Records

INSTRUMENT (MAKE/MODEL#) YSI 556 MPS **INSTRUMENT #** 04L2063AA

PARAMETER: *[check only one]*

☐ TEMPERATURE ☑ CONDUCTIVITY ☐ SALINITY ☑ pH ☐ ORP

☐ TURBIDITY ☐ RESIDUAL CL ☑ DO ☐ OTHER _____

STANDARDS: *[Specify the type(s) of standards used for calibration, the origin of the standards, the standard values, and the date the standards were prepared or purchased]*

Standard A DO %

Standard B Conductance 1000.0 µS/cm Lot: 3AK226 Exp: 11/14

Standard C pH 4 Lot: C255426 Exp: 08/14 / pH 7 Lot: C254804 Exp: 08/14 / pH 10 Lot: C256078 Exp: 10/14

DATE (yy/mm/dd)	TIME (hr:min)	STD (A, B, C)	STD VALUE	INSTRUMENT RESPONSE	% DEV	CALIBRATED (YES, NO)	TYPE (INIT, CONT)	SAMPLER INITIALS
14/03/24	0900	A	100.0	100.2		No	CONT	JAW
		B	1000	1000		No	CONT	JAW
		C	4.0	4.19		No	CONT	JAW
		C	7.0	6.99		No	CONT	JAW
		C	10.0	9.86		No	CONT	JAW
14/03/25	0850	A	100.0	107.8		No	CONT	JAW
		A	100.0	100.3		Yes	INIT	JAW
		B	1000	987		No	CONT	JAW
		C	4.0	4.14		No	CONT	JAW
		C	7.0	7.05		No	CONT	JAW
		C	10.0	9.42		No	CONT	JAW
14/03/26	0900	A	100.0	124.4 ~~0.43~~		No	CONT	JAW
		~~B~~ A	100.0	100.1		Yes	INIT	JAW
		B	1000	1005		No	CONT	JAW
		C	4.0	4.17		No	CONT	JAW
		C	7.0	6.97		No	CONT	JAW
		C	10.0	9.89		No	CONT	JAW

On night of 3/25 a cold front passed by and the 3/26 readings were done in Tampa.

DEP-SOP-001/01: Form FD 9000-8 (June 20, 2001)

Field Instrument Calibration Records

INSTRUMENT (MAKE/MODEL#) La Motte **INSTRUMENT #** 5362-4004

PARAMETER: *[check only one]*

☐ TEMPERATURE ☐ CONDUCTIVITY ☐ SALINITY ☐ pH ☐ ORP

☑ TURBIDITY ☐ RESIDUAL CL ☐ DO ☐ OTHER _____

STANDARDS: *[Specify the type(s) of standards used for calibration, the origin of the standards, the standard values, and the date the standards were prepared or purchased]*

Standard A 1.0 NTU LaMotte AMCO U.S. Environmental Lot: C361847 Exp: 2/15

Standard B 10.0 NTU LaMotte AMCO U.S. Environmental Lot: C364881 Exp: 6/15

Standard C _____

DATE (yy/mm/dd)	TIME (hr:min)	STD (A, B, C)	STD VALUE	INSTRUMENT RESPONSE	% DEV	CALIBRATED (YES, NO)	TYPE (INIT, CONT)	SAMPLER INITIALS
14/03/24	0900	A	1.0	0.90		No	CONT	JAW
		B	10.0	10.58		No	CONT	JAW
14/03/25	0850	A	1.0	0.95		No	CONT	JAW
		~~B~~	~~10.0~~	~~10.47~~				
		B	10.0	9.97		No	CONT	JAW
14/03/26	0900	A	~~100.0~~ 1.0	0.93		No	CONT	JAW
		B	10.0	10.14		No	CONT	JAW

Form FD 9000-8: FIELD INSTRUMENT CALIBRATION RECORDS

INSTRUMENT (MAKE/MODEL#) MiniRae 3000 **INSTRUMENT #** 592-000223

PARAMETER: *[check only one]*

☐ TEMPERATURE ☐ CONDUCTIVITY ☐ SALINITY ☐ pH ☐ ORP
☐ TURBIDITY ☐ RESIDUAL Cl ☐ DO ☒ OTHER OVA

STANDARDS: *[Specify the type(s) of standards used for calibration, the origin of the standards, the standard values, and the date the standards were prepared or purchased]*

Standard A Ambient Air

Standard B Isobutylene 100ppm: LTG243-RR-CM

Standard C _____

DATE (yy/mm/dd)	TIME (hr:min)	STD (A, B, C)	STD VALUE	INSTRUMENT RESPONSE	% DEV	CALIBRATED (YES, NO)	TYPE (INIT, CONT)	SAMPLER INITIALS
14/03/24	1230	A	0.0	0.0		No	CONT	JAW
		B	100.0	101.7		No	CONT	JAW
	1430	A	0.0	0.0		No	CONT	JAW
		B	100.0	98.1		No	CONT	JAW

APPENDIX E
GROUNDWATER ANALYTICAL REPORT
MARCH 2014

Terry Griffin
Cardno TBE, Inc.
380 Park Place Blvd, Suite 300
Clearwater, FL 33759

April 02, 2014

SunLabs Project Number: **4032618**
Client Project Description: **Northwood Anchor Site**

Dear Mr. Griffin,

Enclosed is the report of laboratory analysis for the following samples:

Sample Number	Sample Description	Date Collected	Date Received
4032618-01	TBE-3W	03/24/14 10:11	03/26/14 12:40
4032618-02	TBE-4W	03/25/14 10:53	03/26/14 12:40
4032618-03	TBE-5W	03/24/14 13:02	03/26/14 12:40
4032618-04	TBE-6DW	03/25/14 10:09	03/26/14 12:40
4032618-05	TBE-7R	03/25/14 17:22	03/26/14 12:40
4032618-06	TBE-8	03/24/14 11:13	03/26/14 12:40
4032618-07	TBE-10	03/25/14 14:44	03/26/14 12:40
4032618-08	MW-B3	03/24/14 10:40	03/26/14 12:40
4032618-09	MW-B4	03/25/14 16:44	03/26/14 12:40
4032618-10	EQ-1	03/25/14 17:40	03/26/14 12:40
4032618-11	Trip Blank	03/24/14 00:00	03/26/14 12:40
4032618-12	DUP-1	03/25/14 00:00	03/26/14 12:40

Narrative

Unless otherwise noted below or in the report and where applicable:

- Samples were received at the proper temperature and analyzed as received.
- Sample condition upon receipt is reported on the chain-of-custody attached to this report.
- Results for all solid matrices are reported on a dry weight basis.
- Appropriate calibration and QC criteria were satisfactorily met.
- All applicable holding times for analytes have been met.
- Copies of the chains-of-custody, if received, are attached to this report.

If you have any questions or comments concerning this report, please do not hesitate to contact us.

Michael W. Palmer
Vice President, Laboratory Operations

Unless Otherwise Noted and Where Applicable:
The result herein relate only to the items tested or to the samples as received by the laboratory. This report shall not be reproduced except in full, without the written approval of SunLabs. All samples will be disposed of within 60 days of the date of receipt of the samples. All results meet the requirements of the NELAC standards. Uncertainty values are available upon request.

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-01**
Sample Designation: **TBE-3W**

Matrix: **Groundwater**
Date Collected: **03/24/14 10:11**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
TDS by SM2540 C					Method Qualifier:				
Total Dissolved Solids	SM2540 C	mg/L	110	1	2.0	2.0	NA	03/28/14 17:07	03/28/14 10:31
Volatile Organic Compounds by EPA 8260					Method Qualifier:				
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	103	1			460-00-4	03/27/14 12:54	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	98.7	1			1868-53-7	03/27/14 12:54	03/27/14 08:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	102	1			2037-26-5	03/27/14 12:54	03/27/14 08:00
1,1,1-Trichloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.78	71-55-6	03/27/14 12:54	03/27/14 08:00
1,1,2,2-Tetrachloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	79-34-5	03/27/14 12:54	03/27/14 08:00
1,1,2-Trichloroethane	EPA 8260	ug/L	0.92 U	1	0.92	3.7	79-00-5	03/27/14 12:54	03/27/14 08:00
1,1-Dichloroethane	EPA 8260	ug/L	0.23 U	1	0.23	0.92	75-34-3	03/27/14 12:54	03/27/14 08:00
1,1-Dichloroethene	EPA 8260	ug/L	0.34 U	1	0.34	1.3	75-35-4	03/27/14 12:54	03/27/14 08:00
1,2-Dichlorobenzene	EPA 8260	ug/L	0.40 U	1	0.40	1.6	95-50-1	03/27/14 12:54	03/27/14 08:00
1,2-Dichloroethane	EPA 8260	ug/L	0.24 U	1	0.24	0.97	107-06-2	03/27/14 12:54	03/27/14 08:00
1,2-Dichloropropane	EPA 8260	ug/L	0.28 U	1	0.28	1.1	78-87-5	03/27/14 12:54	03/27/14 08:00
1,2,4-Trimethylbenzene	EPA 8260	ug/L	0.37 U	1	0.37	1.5	95-63-6	03/27/14 12:54	03/27/14 08:00
1,3,5-Trimethylbenzene	EPA 8260	ug/L	0.24 U	1	0.24	0.94	108-67-8	03/27/14 12:54	03/27/14 08:00
1,3-Dichlorobenzene	EPA 8260	ug/L	0.34 U	1	0.34	1.4	541-73-1	03/27/14 12:54	03/27/14 08:00
1,3-Dichloropropene (Total)	EPA 8260	ug/L	0.11 U	1	0.11	0.50	542-75-6	03/27/14 12:54	03/27/14 08:00
1,4-Dichlorobenzene	EPA 8260	ug/L	0.21 U	1	0.21	0.84	106-46-7	03/27/14 12:54	03/27/14 08:00
2-Butanone (MEK)	EPA 8260	ug/L	2.1 U	1	2.1	8.4	78-93-3	03/27/14 12:54	03/27/14 08:00
2-Hexanone	EPA 8260	ug/L	1.5 U	1	1.5	10	591-78-6	03/27/14 12:54	03/27/14 08:00
4-Methyl-2-pentanone (MIBK)	EPA 8260	ug/L	1.3 U	1	1.3	5.2	108-10-1	03/27/14 12:54	03/27/14 08:00
Acetone	EPA 8260	ug/L	6.9 U	1	6.9	28	67-64-1	03/27/14 12:54	03/27/14 08:00
Benzene	EPA 8260	ug/L	0.23 U	1	0.23	0.92	71-43-2	03/27/14 12:54	03/27/14 08:00
Bromochloromethane	EPA 8260	ug/L	0.18 U	1	0.18	0.72	74-97-5	03/27/14 12:54	03/27/14 08:00
Bromodichloromethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	75-27-4	03/27/14 12:54	03/27/14 08:00
Bromoform	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-25-2	03/27/14 12:54	03/27/14 08:00
Bromomethane	EPA 8260	ug/L	0.43 U	1	0.43	1.7	74-83-9	03/27/14 12:54	03/27/14 08:00
Carbon disulfide	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-15-0	03/27/14 12:54	03/27/14 08:00
Carbon tetrachloride	EPA 8260	ug/L	0.18 U	1	0.18	0.72	56-23-5	03/27/14 12:54	03/27/14 08:00
Chlorobenzene	EPA 8260	ug/L	0.19 U	1	0.19	0.76	108-90-7	03/27/14 12:54	03/27/14 08:00
Chloroethane	EPA 8260	ug/L	0.36 U	1	0.36	1.4	75-00-3	03/27/14 12:54	03/27/14 08:00
Chloroform	EPA 8260	ug/L	0.19 U	1	0.19	0.74	67-66-3	03/27/14 12:54	03/27/14 08:00
Chloromethane	EPA 8260	ug/L	0.32 U	1	0.32	1.3	74-87-3	03/27/14 12:54	03/27/14 08:00
cis-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-59-2	03/27/14 12:54	03/27/14 08:00
Dibromochloromethane	EPA 8260	ug/L	0.33 U	1	0.33	1.3	124-48-1	03/27/14 12:54	03/27/14 08:00
Dibromomethane	EPA 8260	ug/L	0.25 U	1	0.25	1.0	74-95-3	03/27/14 12:54	03/27/14 08:00
Dichlorodifluoromethane	EPA 8260	ug/L	0.42 U	1	0.42	1.7	75-71-8	03/27/14 12:54	03/27/14 08:00
Ethylbenzene	EPA 8260	ug/L	0.20 U	1	0.20	0.80	100-41-4	03/27/14 12:54	03/27/14 08:00
isopropylbenzene	EPA 8260	ug/L	0.41 I	1	0.26	1.0	98-82-8	03/27/14 12:54	03/27/14 08:00
Methylene Chloride	EPA 8260	ug/L	0.65 U	1	0.65	2.6	75-09-2	03/27/14 12:54	03/27/14 08:00
Methyl tert-Butyl Ether (MTBE)	EPA 8260	ug/L	0.28 U	1	0.28	1.1	1634-04-4	03/27/14 12:54	03/27/14 08:00
Naphthalene	EPA 8260	ug/L	0.23 U	1	0.23	0.90	91-20-3	03/27/14 12:54	03/27/14 08:00
Styrene	EPA 8260	ug/L	0.23 U	1	0.23	0.93	100-42-5	03/27/14 12:54	03/27/14 08:00
Tetrachloroethene	EPA 8260	ug/L	0.36 U	1	0.36	1.4	127-18-4	03/27/14 12:54	03/27/14 08:00
Toluene	EPA 8260	ug/L	0.20 U	1	0.20	0.80	108-88-3	03/27/14 12:54	03/27/14 08:00
Xylenes (Total)	EPA 8260	ug/L	0.22 U	1	0.22	0.88	1330-20-7	03/27/14 12:54	03/27/14 08:00
trans-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-60-5	03/27/14 12:54	03/27/14 08:00
Trichloroethene	EPA 8260	ug/L	0.48 U	1	0.48	1.9	79-01-6	03/27/14 12:54	03/27/14 08:00
Trichlorofluoromethane	EPA 8260	ug/L	0.51 U	1	0.51	2.0	75-69-4	03/27/14 12:54	03/27/14 08:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-01**
Sample Designation: **TBE-3W**

Matrix: **Groundwater**
Date Collected: **03/24/14 10:11**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
Volatile Organic Compounds by EPA 8260						Method Qualifier:			
Vinyl chloride	EPA 8260	ug/L	0.25 U	1	0.25	1.0	75-01-4	03/27/14 12:54	03/27/14 08:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-02**
Sample Designation: **TBE-4W**

Matrix: **Groundwater**
Date Collected: **03/25/14 10:53**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
TDS by SM2540 C					Method Qualifier:				
Total Dissolved Solids	SM2540 C	mg/L	200	1	2.0	2.0	NA	03/28/14 17:09	03/28/14 10:31
Volatile Organic Compounds by EPA 8260					Method Qualifier:				
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	89.4	1			460-00-4	03/28/14 15:48	03/28/14 09:00
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	106	1			460-00-4	03/27/14 13:13	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	95.9	1			1868-53-7	03/27/14 13:13	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	93.3	1			1868-53-7	03/28/14 15:48	03/28/14 09:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	104	1			2037-26-5	03/27/14 13:13	03/27/14 08:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	98.5	1			2037-26-5	03/28/14 15:48	03/28/14 09:00
1,1,1-Trichloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.78	71-55-6	03/27/14 13:13	03/27/14 08:00
1,1,2,2-Tetrachloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	79-34-5	03/27/14 13:13	03/27/14 08:00
1,1,2-Trichloroethane	EPA 8260	ug/L	0.92 U	1	0.92	3.7	79-00-5	03/27/14 13:13	03/27/14 08:00
1,1-Dichloroethane	EPA 8260	ug/L	0.23 U	1	0.23	0.92	75-34-3	03/27/14 13:13	03/27/14 08:00
1,1-Dichloroethene	EPA 8260	ug/L	0.34 U	1	0.34	1.3	75-35-4	03/27/14 13:13	03/27/14 08:00
1,2-Dichlorobenzene	EPA 8260	ug/L	0.40 U	1	0.40	1.6	95-50-1	03/27/14 13:13	03/27/14 08:00
1,2-Dichloroethane	EPA 8260	ug/L	0.24 U	1	0.24	0.97	107-06-2	03/27/14 13:13	03/27/14 08:00
1,2-Dichloropropane	EPA 8260	ug/L	0.28 U	1	0.28	1.1	78-87-5	03/27/14 13:13	03/27/14 08:00
1,2,4-Trimethylbenzene	EPA 8260	ug/L	730	10	3.7	15	95-63-6	03/28/14 15:48	03/28/14 09:00
1,3,5-Trimethylbenzene	EPA 8260	ug/L	29	1	0.24	0.94	108-67-8	03/27/14 13:13	03/27/14 08:00
1,3-Dichlorobenzene	EPA 8260	ug/L	0.34 U	1	0.34	1.4	541-73-1	03/27/14 13:13	03/27/14 08:00
1,3-Dichloropropene (Total)	EPA 8260	ug/L	0.11 U	1	0.11	0.50	542-75-6	03/27/14 13:13	03/27/14 08:00
1,4-Dichlorobenzene	EPA 8260	ug/L	0.21 U	1	0.21	0.84	106-46-7	03/27/14 13:13	03/27/14 08:00
2-Butanone (MEK)	EPA 8260	ug/L	2.1 U	1	2.1	8.4	78-93-3	03/27/14 13:13	03/27/14 08:00
2-Hexanone	EPA 8260	ug/L	1.5 U	1	1.5	10	591-78-6	03/27/14 13:13	03/27/14 08:00
4-Methyl-2-pentanone (MIBK)	EPA 8260	ug/L	1.3 U	1	1.3	5.2	108-10-1	03/27/14 13:13	03/27/14 08:00
Acetone	EPA 8260	ug/L	89	1	6.9	28	67-64-1	03/27/14 13:13	03/27/14 08:00
Benzene	EPA 8260	ug/L	0.23 U	1	0.23	0.92	71-43-2	03/27/14 13:13	03/27/14 08:00
Bromochloromethane	EPA 8260	ug/L	0.18 U	1	0.18	0.72	74-97-5	03/27/14 13:13	03/27/14 08:00
Bromodichloromethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	75-27-4	03/27/14 13:13	03/27/14 08:00
Bromoform	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-25-2	03/27/14 13:13	03/27/14 08:00
Bromomethane	EPA 8260	ug/L	0.43 U	1	0.43	1.7	74-83-9	03/27/14 13:13	03/27/14 08:00
Carbon disulfide	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-15-0	03/27/14 13:13	03/27/14 08:00
Carbon tetrachloride	EPA 8260	ug/L	0.18 U	1	0.18	0.72	56-23-5	03/27/14 13:13	03/27/14 08:00
Chlorobenzene	EPA 8260	ug/L	0.19 U	1	0.19	0.76	108-90-7	03/27/14 13:13	03/27/14 08:00
Chloroethane	EPA 8260	ug/L	0.36 U	1	0.36	1.4	75-00-3	03/27/14 13:13	03/27/14 08:00
Chloroform	EPA 8260	ug/L	0.19 U	1	0.19	0.74	67-66-3	03/27/14 13:13	03/27/14 08:00
Chloromethane	EPA 8260	ug/L	0.32 U	1	0.32	1.3	74-87-3	03/27/14 13:13	03/27/14 08:00
cis-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-59-2	03/27/14 13:13	03/27/14 08:00
Dibromochloromethane	EPA 8260	ug/L	0.33 U	1	0.33	1.3	124-48-1	03/27/14 13:13	03/27/14 08:00
Dibromomethane	EPA 8260	ug/L	0.25 U	1	0.25	1.0	74-95-3	03/27/14 13:13	03/27/14 08:00
Dichlorodifluoromethane	EPA 8260	ug/L	0.42 U	1	0.42	1.7	75-71-8	03/27/14 13:13	03/27/14 08:00
Ethylbenzene	EPA 8260	ug/L	1000	10	2.0	8.0	100-41-4	03/28/14 15:48	03/28/14 09:00
Isopropylbenzene	EPA 8260	ug/L	74	1	0.26	1.0	98-82-8	03/27/14 13:13	03/27/14 08:00
Methylene Chloride	EPA 8260	ug/L	0.65 U	1	0.65	2.6	75-09-2	03/27/14 13:13	03/27/14 08:00
Methyl tert-Butyl Ether (MTBE)	EPA 8260	ug/L	0.28 U	1	0.28	1.1	1634-04-4	03/27/14 13:13	03/27/14 08:00
Naphthalene	EPA 8260	ug/L	960	10	2.3	9.0	91-20-3	03/28/14 15:48	03/28/14 09:00
Styrene	EPA 8260	ug/L	0.23 U	1	0.23	0.93	100-42-5	03/27/14 13:13	03/27/14 08:00
Tetrachloroethene	EPA 8260	ug/L	0.36 U	1	0.36	1.4	127-18-4	03/27/14 13:13	03/27/14 08:00
Toluene	EPA 8260	ug/L	8.9	1	0.20	0.80	108-88-3	03/27/14 13:13	03/27/14 08:00
Xylenes (Total)	EPA 8260	ug/L	800	10	2.2	8.8	1330-20-7	03/28/14 15:48	03/28/14 09:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-02**
Sample Designation: **TBE-4W**

Matrix: **Groundwater**
Date Collected: **03/25/14 10:53**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
Volatile Organic Compounds by EPA 8260				Method Qualifier:					
trans-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-60-5	03/27/14 13:13	03/27/14 08:00
Trichloroethene	EPA 8260	ug/L	0.48 U	1	0.48	1.9	79-01-6	03/27/14 13:13	03/27/14 08:00
Trichlorofluoromethane	EPA 8260	ug/L	0.51 U	1	0.51	2.0	75-69-4	03/27/14 13:13	03/27/14 08:00
Vinyl chloride	EPA 8260	ug/L	0.25 U	1	0.25	1.0	75-01-4	03/27/14 13:13	03/27/14 08:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-03**
Sample Designation: **TBE-5W**

Matrix: **Groundwater**
Date Collected: **03/24/14 13:02**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
TDS by SM2540 C					Method Qualifier:				
Total Dissolved Solids	SM2540 C	mg/L	340	1	2.0	2.0	NA	03/28/14 17:11	03/28/14 10:31
Volatile Organic Compounds by EPA 8260					Method Qualifier:				
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	95.2	1			460-00-4	03/28/14 14:11	03/28/14 09:00
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	105	1			460-00-4	03/27/14 13:33	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	92.8	1			1868-53-7	03/27/14 13:33	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	91.8	1			1868-53-7	03/28/14 14:11	03/28/14 09:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	104	1			2037-26-5	03/27/14 13:33	03/27/14 08:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	98.9	1			2037-26-5	03/28/14 14:11	03/28/14 09:00
1,1,1-Trichloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.78	71-55-6	03/27/14 13:33	03/27/14 08:00
1,1,2,2-Tetrachloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	79-34-5	03/27/14 13:33	03/27/14 08:00
1,1,2-Trichloroethane	EPA 8260	ug/L	0.92 U	1	0.92	3.7	79-00-5	03/27/14 13:33	03/27/14 08:00
1,1-Dichloroethane	EPA 8260	ug/L	0.23 U	1	0.23	0.92	75-34-3	03/27/14 13:33	03/27/14 08:00
1,1-Dichloroethene	EPA 8260	ug/L	0.34 U	1	0.34	1.3	75-35-4	03/27/14 13:33	03/27/14 08:00
1,2-Dichlorobenzene	EPA 8260	ug/L	0.40 U	1	0.40	1.6	95-50-1	03/27/14 13:33	03/27/14 08:00
1,2-Dichloroethane	EPA 8260	ug/L	0.24 U	1	0.24	0.97	107-06-2	03/27/14 13:33	03/27/14 08:00
1,2-Dichloropropane	EPA 8260	ug/L	0.28 U	1	0.28	1.1	78-87-5	03/27/14 13:33	03/27/14 08:00
1,2,4-Trimethylbenzene	EPA 8260	ug/L	0.37 U	1	0.37	1.5	95-63-6	03/28/14 14:11	03/28/14 09:00
1,3,5-Trimethylbenzene	EPA 8260	ug/L	0.24 U	1	0.24	0.94	108-67-8	03/28/14 14:11	03/28/14 09:00
1,3,5-Trimethylbenzene	EPA 8260	ug/L	0.24 U	1	0.24	0.94	108-67-8	03/27/14 13:33	03/27/14 08:00
1,3-Dichlorobenzene	EPA 8260	ug/L	0.34 U	1	0.34	1.4	541-73-1	03/27/14 13:33	03/27/14 08:00
1,3-Dichloropropene (Total)	EPA 8260	ug/L	0.11 U	1	0.11	0.50	542-75-6	03/27/14 13:33	03/27/14 08:00
1,4-Dichlorobenzene	EPA 8260	ug/L	0.21 U	1	0.21	0.84	106-46-7	03/27/14 13:33	03/27/14 08:00
2-Butanone (MEK)	EPA 8260	ug/L	2.1 U	1	2.1	8.4	78-93-3	03/27/14 13:33	03/27/14 08:00
2-Hexanone	EPA 8260	ug/L	1.5 U	1	1.5	10	591-78-6	03/27/14 13:33	03/27/14 08:00
4-Methyl-2-pentanone (MIBK)	EPA 8260	ug/L	1.3 U	1	1.3	5.2	108-10-1	03/27/14 13:33	03/27/14 08:00
Acetone	EPA 8260	ug/L	20 I	1	6.9	28	67-64-1	03/27/14 13:33	03/27/14 08:00
Benzene	EPA 8260	ug/L	0.23 U	1	0.23	0.92	71-43-2	03/27/14 13:33	03/27/14 08:00
Bromochloromethane	EPA 8260	ug/L	0.18 U	1	0.18	0.72	74-97-5	03/27/14 13:33	03/27/14 08:00
Bromodichloromethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	75-27-4	03/27/14 13:33	03/27/14 08:00
Bromoform	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-25-2	03/27/14 13:33	03/27/14 08:00
Bromomethane	EPA 8260	ug/L	0.43 U	1	0.43	1.7	74-83-9	03/27/14 13:33	03/27/14 08:00
Carbon disulfide	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-15-0	03/27/14 13:33	03/27/14 08:00
Carbon tetrachloride	EPA 8260	ug/L	0.18 U	1	0.18	0.72	56-23-5	03/27/14 13:33	03/27/14 08:00
Chlorobenzene	EPA 8260	ug/L	0.19 U	1	0.19	0.76	108-90-7	03/27/14 13:33	03/27/14 08:00
Chloroethane	EPA 8260	ug/L	0.36 U	1	0.36	1.4	75-00-3	03/27/14 13:33	03/27/14 08:00
Chloroform	EPA 8260	ug/L	0.19 U	1	0.19	0.74	67-66-3	03/27/14 13:33	03/27/14 08:00
Chloromethane	EPA 8260	ug/L	0.32 U	1	0.32	1.3	74-87-3	03/27/14 13:33	03/27/14 08:00
cis-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-59-2	03/27/14 13:33	03/27/14 08:00
Dibromochloromethane	EPA 8260	ug/L	0.33 U	1	0.33	1.3	124-48-1	03/27/14 13:33	03/27/14 08:00
Dibromomethane	EPA 8260	ug/L	0.25 U	1	0.25	1.0	74-95-3	03/27/14 13:33	03/27/14 08:00
Dichlorodifluoromethane	EPA 8260	ug/L	0.42 U	1	0.42	1.7	75-71-8	03/27/14 13:33	03/27/14 08:00
Ethylbenzene	EPA 8260	ug/L	0.20 U	1	0.20	0.80	100-41-4	03/28/14 14:11	03/28/14 09:00
isopropylbenzene	EPA 8260	ug/L	0.47 I	1	0.26	1.0	98-82-8	03/27/14 13:33	03/27/14 08:00
Methylene Chloride	EPA 8260	ug/L	0.65 U	1	0.65	2.6	75-09-2	03/27/14 13:33	03/27/14 08:00
Methyl tert-Butyl Ether (MTBE)	EPA 8260	ug/L	0.28 U	1	0.28	1.1	1634-04-4	03/27/14 13:33	03/27/14 08:00
Naphthalene	EPA 8260	ug/L	0.23 U	1	0.23	0.90	91-20-3	03/28/14 14:11	03/28/14 09:00
Styrene	EPA 8260	ug/L	0.23 U	1	0.23	0.93	100-42-5	03/27/14 13:33	03/27/14 08:00
Tetrachloroethene	EPA 8260	ug/L	0.36 U	1	0.36	1.4	127-18-4	03/27/14 13:33	03/27/14 08:00
Toluene	EPA 8260	ug/L	0.20 U	1	0.20	0.80	108-88-3	03/27/14 13:33	03/27/14 08:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-03**
Sample Designation: **TBE-5W**

Matrix: **Groundwater**
Date Collected: **03/24/14 13:02**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
Volatile Organic Compounds by EPA 8260						Method Qualifier:			
Xylenes (Total)	EPA 8260	ug/L	0.22 U	1	0.22	0.88	1330-20-7	03/28/14 14:11	03/28/14 09:00
trans-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-60-5	03/27/14 13:33	03/27/14 08:00
Trichloroethene	EPA 8260	ug/L	0.48 U	1	0.48	1.9	79-01-6	03/27/14 13:33	03/27/14 08:00
Trichlorofluoromethane	EPA 8260	ug/L	0.51 U	1	0.51	2.0	75-69-4	03/27/14 13:33	03/27/14 08:00
Vinyl chloride	EPA 8260	ug/L	0.25 U	1	0.25	1.0	75-01-4	03/27/14 13:33	03/27/14 08:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-04**
Sample Designation: **TBE-6DW**

Matrix: **Groundwater**
Date Collected: **03/25/14 10:09**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
TDS by SM2540 C					Method Qualifier:				
Total Dissolved Solids	SM2540 C	mg/L	230	1	2.0	2.0	NA	03/28/14 17:13	03/28/14 10:31
Volatile Organic Compounds by EPA 8260					Method Qualifier:				
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	98.8	1			460-00-4	03/27/14 13:52	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	101	1			1868-53-7	03/27/14 13:52	03/27/14 08:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	98.6	1			2037-26-5	03/27/14 13:52	03/27/14 08:00
1,1,1-Trichloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.78	71-55-6	03/27/14 13:52	03/27/14 08:00
1,1,2,2-Tetrachloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	79-34-5	03/27/14 13:52	03/27/14 08:00
1,1,2-Trichloroethane	EPA 8260	ug/L	0.92 U	1	0.92	3.7	79-00-5	03/27/14 13:52	03/27/14 08:00
1,1-Dichloroethane	EPA 8260	ug/L	0.23 U	1	0.23	0.92	75-34-3	03/27/14 13:52	03/27/14 08:00
1,1-Dichloroethene	EPA 8260	ug/L	0.34 U	1	0.34	1.3	75-35-4	03/27/14 13:52	03/27/14 08:00
1,2-Dichlorobenzene	EPA 8260	ug/L	0.40 U	1	0.40	1.6	95-50-1	03/27/14 13:52	03/27/14 08:00
1,2-Dichloroethane	EPA 8260	ug/L	0.24 U	1	0.24	0.97	107-06-2	03/27/14 13:52	03/27/14 08:00
1,2-Dichloropropane	EPA 8260	ug/L	0.28 U	1	0.28	1.1	78-87-5	03/27/14 13:52	03/27/14 08:00
1,2,4-Trimethylbenzene	EPA 8260	ug/L	0.37 U	1	0.37	1.5	95-63-6	03/27/14 13:52	03/27/14 08:00
1,3,5-Trimethylbenzene	EPA 8260	ug/L	0.24 U	1	0.24	0.94	108-67-8	03/27/14 13:52	03/27/14 08:00
1,3-Dichlorobenzene	EPA 8260	ug/L	0.34 U	1	0.34	1.4	541-73-1	03/27/14 13:52	03/27/14 08:00
1,3-Dichloropropene (Total)	EPA 8260	ug/L	0.11 U	1	0.11	0.50	542-75-6	03/27/14 13:52	03/27/14 08:00
1,4-Dichlorobenzene	EPA 8260	ug/L	0.21 U	1	0.21	0.84	106-46-7	03/27/14 13:52	03/27/14 08:00
2-Butanone (MEK)	EPA 8260	ug/L	2.1 U	1	2.1	8.4	78-93-3	03/27/14 13:52	03/27/14 08:00
2-Hexanone	EPA 8260	ug/L	1.5 U	1	1.5	10	591-78-6	03/27/14 13:52	03/27/14 08:00
4-Methyl-2-pentanone (MIBK)	EPA 8260	ug/L	1.3 U	1	1.3	5.2	108-10-1	03/27/14 13:52	03/27/14 08:00
Acetone	EPA 8260	ug/L	8.7 I	1	6.9	28	67-64-1	03/27/14 13:52	03/27/14 08:00
Benzene	EPA 8260	ug/L	0.23 U	1	0.23	0.92	71-43-2	03/27/14 13:52	03/27/14 08:00
Bromochloromethane	EPA 8260	ug/L	0.18 U	1	0.18	0.72	74-97-5	03/27/14 13:52	03/27/14 08:00
Bromodichloromethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	75-27-4	03/27/14 13:52	03/27/14 08:00
Bromoform	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-25-2	03/27/14 13:52	03/27/14 08:00
Bromomethane	EPA 8260	ug/L	0.43 U	1	0.43	1.7	74-83-9	03/27/14 13:52	03/27/14 08:00
Carbon disulfide	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-15-0	03/27/14 13:52	03/27/14 08:00
Carbon tetrachloride	EPA 8260	ug/L	0.18 U	1	0.18	0.72	56-23-5	03/27/14 13:52	03/27/14 08:00
Chlorobenzene	EPA 8260	ug/L	0.19 U	1	0.19	0.76	108-90-7	03/27/14 13:52	03/27/14 08:00
Chloroethane	EPA 8260	ug/L	0.36 U	1	0.36	1.4	75-00-3	03/27/14 13:52	03/27/14 08:00
Chloroform	EPA 8260	ug/L	0.19 U	1	0.19	0.74	67-66-3	03/27/14 13:52	03/27/14 08:00
Chloromethane	EPA 8260	ug/L	0.32 U	1	0.32	1.3	74-87-3	03/27/14 13:52	03/27/14 08:00
cis-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-59-2	03/27/14 13:52	03/27/14 08:00
Dibromochloromethane	EPA 8260	ug/L	0.33 U	1	0.33	1.3	124-48-1	03/27/14 13:52	03/27/14 08:00
Dibromomethane	EPA 8260	ug/L	0.25 U	1	0.25	1.0	74-95-3	03/27/14 13:52	03/27/14 08:00
Dichlorodifluoromethane	EPA 8260	ug/L	0.42 U	1	0.42	1.7	75-71-8	03/27/14 13:52	03/27/14 08:00
Ethylbenzene	EPA 8260	ug/L	0.20 U	1	0.20	0.80	100-41-4	03/27/14 13:52	03/27/14 08:00
isopropylbenzene	EPA 8260	ug/L	0.26 U	1	0.26	1.0	98-82-8	03/27/14 13:52	03/27/14 08:00
Methylene Chloride	EPA 8260	ug/L	0.65 U	1	0.65	2.6	75-09-2	03/27/14 13:52	03/27/14 08:00
Methyl tert-Butyl Ether (MTBE)	EPA 8260	ug/L	0.28 U	1	0.28	1.1	1634-04-4	03/27/14 13:52	03/27/14 08:00
Naphthalene	EPA 8260	ug/L	6.1	1	0.23	0.90	91-20-3	03/27/14 13:52	03/27/14 08:00
Styrene	EPA 8260	ug/L	0.23 U	1	0.23	0.93	100-42-5	03/27/14 13:52	03/27/14 08:00
Tetrachloroethene	EPA 8260	ug/L	0.36 U	1	0.36	1.4	127-18-4	03/27/14 13:52	03/27/14 08:00
Toluene	EPA 8260	ug/L	0.20 U	1	0.20	0.80	108-88-3	03/27/14 13:52	03/27/14 08:00
Xylenes (Total)	EPA 8260	ug/L	0.22 U	1	0.22	0.88	1330-20-7	03/27/14 13:52	03/27/14 08:00
trans-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-60-5	03/27/14 13:52	03/27/14 08:00
Trichloroethene	EPA 8260	ug/L	0.48 U	1	0.48	1.9	79-01-6	03/27/14 13:52	03/27/14 08:00
Trichlorofluoromethane	EPA 8260	ug/L	0.51 U	1	0.51	2.0	75-69-4	03/27/14 13:52	03/27/14 08:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-04**
Sample Designation: **TBE-6DW**

Matrix: **Groundwater**
Date Collected: **03/25/14 10:09**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
Volatile Organic Compounds by EPA 8260						Method Qualifier:			
Vinyl chloride	EPA 8260	ug/L	0.25 U	1	0.25	1.0	75-01-4	03/27/14 13:52	03/27/14 08:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-05**
Sample Designation: **TBE-7R**

Matrix: **Groundwater**
Date Collected: **03/25/14 17:22**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
TDS by SM2540 C				Method Qualifier:					
Total Dissolved Solids	SM2540 C	mg/L	190	1	2.0	2.0	NA	03/28/14 17:15	03/28/14 10:31
Volatile Organic Compounds by EPA 8260				Method Qualifier:					
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	95.3	1			460-00-4	03/28/14 16:07	03/28/14 09:00
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	107	1			460-00-4	03/27/14 14:11	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	91.5	1			1868-53-7	03/27/14 14:11	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	95.6	1			1868-53-7	03/28/14 16:07	03/28/14 09:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	101	1			2037-26-5	03/27/14 14:11	03/27/14 08:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	102	1			2037-26-5	03/28/14 16:07	03/28/14 09:00
1,1,1-Trichloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.78	71-55-6	03/27/14 14:11	03/27/14 08:00
1,1,2,2-Tetrachloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	79-34-5	03/27/14 14:11	03/27/14 08:00
1,1,2-Trichloroethane	EPA 8260	ug/L	0.92 U	1	0.92	3.7	79-00-5	03/27/14 14:11	03/27/14 08:00
1,1-Dichloroethane	EPA 8260	ug/L	0.23 U	1	0.23	0.92	75-34-3	03/27/14 14:11	03/27/14 08:00
1,1-Dichloroethene	EPA 8260	ug/L	0.34 U	1	0.34	1.3	75-35-4	03/27/14 14:11	03/27/14 08:00
1,2-Dichlorobenzene	EPA 8260	ug/L	0.40 U	1	0.40	1.6	95-50-1	03/27/14 14:11	03/27/14 08:00
1,2-Dichloroethane	EPA 8260	ug/L	0.24 U	1	0.24	0.97	107-06-2	03/27/14 14:11	03/27/14 08:00
1,2-Dichloropropane	EPA 8260	ug/L	0.28 U	1	0.28	1.1	78-87-5	03/27/14 14:11	03/27/14 08:00
1,2,4-Trimethylbenzene	EPA 8260	ug/L	1200	10	3.7	15	95-63-6	03/28/14 16:07	03/28/14 09:00
1,3,5-Trimethylbenzene	EPA 8260	ug/L	380	10	2.4	9.4	108-67-8	03/28/14 16:07	03/28/14 09:00
1,3-Dichlorobenzene	EPA 8260	ug/L	0.34 U	1	0.34	1.4	541-73-1	03/27/14 14:11	03/27/14 08:00
1,3-Dichloropropene (Total)	EPA 8260	ug/L	0.11 U	1	0.11	0.50	542-75-6	03/27/14 14:11	03/27/14 08:00
1,4-Dichlorobenzene	EPA 8260	ug/L	0.21 U	1	0.21	0.84	106-46-7	03/27/14 14:11	03/27/14 08:00
2-Butanone (MEK)	EPA 8260	ug/L	2.1 U	1	2.1	8.4	78-93-3	03/27/14 14:11	03/27/14 08:00
2-Hexanone	EPA 8260	ug/L	1.5 U	1	1.5	10	591-78-6	03/27/14 14:11	03/27/14 08:00
4-Methyl-2-pentanone (MIBK)	EPA 8260	ug/L	1.3 U	1	1.3	5.2	108-10-1	03/27/14 14:11	03/27/14 08:00
Acetone	EPA 8260	ug/L	41	1	6.9	28	67-64-1	03/27/14 14:11	03/27/14 08:00
Benzene	EPA 8260	ug/L	0.23 U	1	0.23	0.92	71-43-2	03/27/14 14:11	03/27/14 08:00
Bromochloromethane	EPA 8260	ug/L	0.18 U	1	0.18	0.72	74-97-5	03/27/14 14:11	03/27/14 08:00
Bromodichloromethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	75-27-4	03/27/14 14:11	03/27/14 08:00
Bromoform	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-25-2	03/27/14 14:11	03/27/14 08:00
Bromomethane	EPA 8260	ug/L	0.43 U	1	0.43	1.7	74-83-9	03/27/14 14:11	03/27/14 08:00
Carbon disulfide	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-15-0	03/27/14 14:11	03/27/14 08:00
Carbon tetrachloride	EPA 8260	ug/L	0.18 U	1	0.18	0.72	56-23-5	03/27/14 14:11	03/27/14 08:00
Chlorobenzene	EPA 8260	ug/L	0.19 U	1	0.19	0.76	108-90-7	03/27/14 14:11	03/27/14 08:00
Chloroethane	EPA 8260	ug/L	0.36 U	1	0.36	1.4	75-00-3	03/27/14 14:11	03/27/14 08:00
Chloroform	EPA 8260	ug/L	0.19 U	1	0.19	0.74	67-66-3	03/27/14 14:11	03/27/14 08:00
Chloromethane	EPA 8260	ug/L	0.32 U	1	0.32	1.3	74-87-3	03/27/14 14:11	03/27/14 08:00
cis-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-59-2	03/27/14 14:11	03/27/14 08:00
Dibromochloromethane	EPA 8260	ug/L	0.33 U	1	0.33	1.3	124-48-1	03/27/14 14:11	03/27/14 08:00
Dibromomethane	EPA 8260	ug/L	0.25 U	1	0.25	1.0	74-95-3	03/27/14 14:11	03/27/14 08:00
Dichlorodifluoromethane	EPA 8260	ug/L	0.42 U	1	0.42	1.7	75-71-8	03/27/14 14:11	03/27/14 08:00
Ethylbenzene	EPA 8260	ug/L	300	10	2.0	8.0	100-41-4	03/28/14 16:07	03/28/14 09:00
isopropylbenzene	EPA 8260	ug/L	40	1	0.26	1.0	98-82-8	03/27/14 14:11	03/27/14 08:00
Methylene Chloride	EPA 8260	ug/L	0.65 U	1	0.65	2.6	75-09-2	03/27/14 14:11	03/27/14 08:00
Methyl tert-Butyl Ether (MTBE)	EPA 8260	ug/L	0.28 U	1	0.28	1.1	1634-04-4	03/27/14 14:11	03/27/14 08:00
Naphthalene	EPA 8260	ug/L	500	10	2.3	9.0	91-20-3	03/28/14 16:07	03/28/14 09:00
Styrene	EPA 8260	ug/L	0.23 U	1	0.23	0.93	100-42-5	03/27/14 14:11	03/27/14 08:00
Tetrachloroethene	EPA 8260	ug/L	0.36 U	1	0.36	1.4	127-18-4	03/27/14 14:11	03/27/14 08:00
Toluene	EPA 8260	ug/L	93	1	0.20	0.80	108-88-3	03/27/14 14:11	03/27/14 08:00
Xylenes (Total)	EPA 8260	ug/L	2100	10	2.2	8.8	1330-20-7	03/28/14 16:07	03/28/14 09:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-05**
Sample Designation: **TBE-7R**

Matrix: **Groundwater**
Date Collected: **03/25/14 17:22**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
Volatile Organic Compounds by EPA 8260							Method Qualifier:		
trans-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-60-5	03/27/14 14:11	03/27/14 08:00
Trichloroethene	EPA 8260	ug/L	0.48 U	1	0.48	1.9	79-01-6	03/27/14 14:11	03/27/14 08:00
Trichlorofluoromethane	EPA 8260	ug/L	0.51 U	1	0.51	2.0	75-69-4	03/27/14 14:11	03/27/14 08:00
Vinyl chloride	EPA 8260	ug/L	0.25 U	1	0.25	1.0	75-01-4	03/27/14 14:11	03/27/14 08:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-06**
Sample Designation: **TBE-8**

Matrix: **Groundwater**
Date Collected: **03/24/14 11:13**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
TDS by SM2540 C				Method Qualifier:					
Total Dissolved Solids	SM2540 C	mg/L	220	1	2.0	2.0	NA	03/28/14 17:17	03/28/14 10:31
Volatile Organic Compounds by EPA 8260				Method Qualifier:					
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	95.7	1			460-00-4	03/28/14 14:30	03/28/14 09:00
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	100	1			460-00-4	03/27/14 14:31	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	95.2	1			1868-53-7	03/27/14 14:31	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	99.6	1			1868-53-7	03/28/14 14:30	03/28/14 09:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	101	1			2037-26-5	03/27/14 14:31	03/27/14 08:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	94.4	1			2037-26-5	03/28/14 14:30	03/28/14 09:00
1,1,1-Trichloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.78	71-55-6	03/27/14 14:31	03/27/14 08:00
1,1,2,2-Tetrachloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	79-34-5	03/27/14 14:31	03/27/14 08:00
1,1,2-Trichloroethane	EPA 8260	ug/L	0.92 U	1	0.92	3.7	79-00-5	03/27/14 14:31	03/27/14 08:00
1,1-Dichloroethane	EPA 8260	ug/L	0.23 U	1	0.23	0.92	75-34-3	03/27/14 14:31	03/27/14 08:00
1,1-Dichloroethene	EPA 8260	ug/L	0.34 U	1	0.34	1.3	75-35-4	03/27/14 14:31	03/27/14 08:00
1,2-Dichlorobenzene	EPA 8260	ug/L	0.40 U	1	0.40	1.6	95-50-1	03/27/14 14:31	03/27/14 08:00
1,2-Dichloroethane	EPA 8260	ug/L	0.24 U	1	0.24	0.97	107-06-2	03/27/14 14:31	03/27/14 08:00
1,2-Dichloropropane	EPA 8260	ug/L	0.28 U	1	0.28	1.1	78-87-5	03/27/14 14:31	03/27/14 08:00
1,2,4-Trimethylbenzene	EPA 8260	ug/L	0.54 I	1	0.37	1.5	95-63-6	03/28/14 14:30	03/28/14 09:00
1,3,5-Trimethylbenzene	EPA 8260	ug/L	1.2	1	0.24	0.94	108-67-8	03/28/14 14:30	03/28/14 09:00
1,3-Dichlorobenzene	EPA 8260	ug/L	0.34 U	1	0.34	1.4	541-73-1	03/27/14 14:31	03/27/14 08:00
1,3-Dichloropropene (Total)	EPA 8260	ug/L	0.11 U	1	0.11	0.50	542-75-6	03/27/14 14:31	03/27/14 08:00
1,4-Dichlorobenzene	EPA 8260	ug/L	0.21 U	1	0.21	0.84	106-46-7	03/27/14 14:31	03/27/14 08:00
2-Butanone (MEK)	EPA 8260	ug/L	2.1 U	1	2.1	8.4	78-93-3	03/27/14 14:31	03/27/14 08:00
2-Hexanone	EPA 8260	ug/L	1.5 U	1	1.5	10	591-78-6	03/27/14 14:31	03/27/14 08:00
4-Methyl-2-pentanone (MIBK)	EPA 8260	ug/L	1.3 U	1	1.3	5.2	108-10-1	03/27/14 14:31	03/27/14 08:00
Acetone	EPA 8260	ug/L	6.9 U	1	6.9	28	67-64-1	03/27/14 14:31	03/27/14 08:00
Benzene	EPA 8260	ug/L	0.23 U	1	0.23	0.92	71-43-2	03/27/14 14:31	03/27/14 08:00
Bromochloromethane	EPA 8260	ug/L	0.18 U	1	0.18	0.72	74-97-5	03/27/14 14:31	03/27/14 08:00
Bromodichloromethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	75-27-4	03/27/14 14:31	03/27/14 08:00
Bromoform	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-25-2	03/27/14 14:31	03/27/14 08:00
Bromomethane	EPA 8260	ug/L	0.43 U	1	0.43	1.7	74-83-9	03/27/14 14:31	03/27/14 08:00
Carbon disulfide	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-15-0	03/27/14 14:31	03/27/14 08:00
Carbon tetrachloride	EPA 8260	ug/L	0.18 U	1	0.18	0.72	56-23-5	03/27/14 14:31	03/27/14 08:00
Chlorobenzene	EPA 8260	ug/L	0.19 U	1	0.19	0.76	108-90-7	03/27/14 14:31	03/27/14 08:00
Chloroethane	EPA 8260	ug/L	0.36 U	1	0.36	1.4	75-00-3	03/27/14 14:31	03/27/14 08:00
Chloroform	EPA 8260	ug/L	0.19 U	1	0.19	0.74	67-66-3	03/27/14 14:31	03/27/14 08:00
Chloromethane	EPA 8260	ug/L	0.32 U	1	0.32	1.3	74-87-3	03/27/14 14:31	03/27/14 08:00
cis-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-59-2	03/27/14 14:31	03/27/14 08:00
Dibromochloromethane	EPA 8260	ug/L	0.33 U	1	0.33	1.3	124-48-1	03/27/14 14:31	03/27/14 08:00
Dibromomethane	EPA 8260	ug/L	0.25 U	1	0.25	1.0	74-95-3	03/27/14 14:31	03/27/14 08:00
Dichlorodifluoromethane	EPA 8260	ug/L	0.42 U	1	0.42	1.7	75-71-8	03/27/14 14:31	03/27/14 08:00
Ethylbenzene	EPA 8260	ug/L	1.4	1	0.20	0.80	100-41-4	03/28/14 14:30	03/28/14 09:00
Isopropylbenzene	EPA 8260	ug/L	0.37 I	1	0.26	1.0	98-82-8	03/27/14 14:31	03/27/14 08:00
Methylene Chloride	EPA 8260	ug/L	0.65 U	1	0.65	2.6	75-09-2	03/27/14 14:31	03/27/14 08:00
Methyl tert-Butyl Ether (MTBE)	EPA 8260	ug/L	0.28 U	1	0.28	1.1	1634-04-4	03/27/14 14:31	03/27/14 08:00
Naphthalene	EPA 8260	ug/L	0.23 U	1	0.23	0.90	91-20-3	03/28/14 14:30	03/28/14 09:00
Styrene	EPA 8260	ug/L	0.23 U	1	0.23	0.93	100-42-5	03/27/14 14:31	03/27/14 08:00
Tetrachloroethene	EPA 8260	ug/L	0.36 U	1	0.36	1.4	127-18-4	03/27/14 14:31	03/27/14 08:00
Toluene	EPA 8260	ug/L	0.20 U	1	0.20	0.80	108-88-3	03/27/14 14:31	03/27/14 08:00
Xylenes (Total)	EPA 8260	ug/L	0.22 U	1	0.22	0.88	1330-20-7	03/28/14 14:30	03/28/14 09:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-06**
Sample Designation: **TBE-8**

Matrix: **Groundwater**
Date Collected: **03/24/14 11:13**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
Volatile Organic Compounds by EPA 8260							Method Qualifier:		
trans-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-60-5	03/27/14 14:31	03/27/14 08:00
Trichloroethene	EPA 8260	ug/L	0.48 U	1	0.48	1.9	79-01-6	03/27/14 14:31	03/27/14 08:00
Trichlorofluoromethane	EPA 8260	ug/L	0.51 U	1	0.51	2.0	75-69-4	03/27/14 14:31	03/27/14 08:00
Vinyl chloride	EPA 8260	ug/L	0.25 U	1	0.25	1.0	75-01-4	03/27/14 14:31	03/27/14 08:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-07**
Sample Designation: **TBE-10**

Matrix: **Groundwater**
Date Collected: **03/25/14 14:44**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
TDS by SM2540 C					Method Qualifier:				
Total Dissolved Solids	SM2540 C	mg/L	230	1	2.0	2.0	NA	03/28/14 17:19	03/28/14 10:31
Volatile Organic Compounds by EPA 8260					Method Qualifier:				
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	103	1			460-00-4	03/27/14 14:50	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	98.7	1			1868-53-7	03/27/14 14:50	03/27/14 08:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	99.7	1			2037-26-5	03/27/14 14:50	03/27/14 08:00
1,1,1-Trichloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.78	71-55-6	03/27/14 14:50	03/27/14 08:00
1,1,2,2-Tetrachloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	79-34-5	03/27/14 14:50	03/27/14 08:00
1,1,2-Trichloroethane	EPA 8260	ug/L	0.92 U	1	0.92	3.7	79-00-5	03/27/14 14:50	03/27/14 08:00
1,1-Dichloroethane	EPA 8260	ug/L	0.23 U	1	0.23	0.92	75-34-3	03/27/14 14:50	03/27/14 08:00
1,1-Dichloroethene	EPA 8260	ug/L	0.34 U	1	0.34	1.3	75-35-4	03/27/14 14:50	03/27/14 08:00
1,2-Dichlorobenzene	EPA 8260	ug/L	0.40 U	1	0.40	1.6	95-50-1	03/27/14 14:50	03/27/14 08:00
1,2-Dichloroethane	EPA 8260	ug/L	0.24 U	1	0.24	0.97	107-06-2	03/27/14 14:50	03/27/14 08:00
1,2-Dichloropropane	EPA 8260	ug/L	0.28 U	1	0.28	1.1	78-87-5	03/27/14 14:50	03/27/14 08:00
1,2,4-Trimethylbenzene	EPA 8260	ug/L	0.42 I	1	0.37	1.5	95-63-6	03/27/14 14:50	03/27/14 08:00
1,3,5-Trimethylbenzene	EPA 8260	ug/L	0.24 U	1	0.24	0.94	108-67-8	03/27/14 14:50	03/27/14 08:00
1,3-Dichlorobenzene	EPA 8260	ug/L	0.34 U	1	0.34	1.4	541-73-1	03/27/14 14:50	03/27/14 08:00
1,3-Dichloropropene (Total)	EPA 8260	ug/L	0.11 U	1	0.11	0.50	542-75-6	03/27/14 14:50	03/27/14 08:00
1,4-Dichlorobenzene	EPA 8260	ug/L	0.21 U	1	0.21	0.84	106-46-7	03/27/14 14:50	03/27/14 08:00
2-Butanone (MEK)	EPA 8260	ug/L	2.1 U	1	2.1	8.4	78-93-3	03/27/14 14:50	03/27/14 08:00
2-Hexanone	EPA 8260	ug/L	1.5 U	1	1.5	10	591-78-6	03/27/14 14:50	03/27/14 08:00
4-Methyl-2-pentanone (MIBK)	EPA 8260	ug/L	1.3 U	1	1.3	5.2	108-10-1	03/27/14 14:50	03/27/14 08:00
Acetone	EPA 8260	ug/L	600	1	6.9	28	67-64-1	03/27/14 14:50	03/27/14 08:00
Benzene	EPA 8260	ug/L	0.23 U	1	0.23	0.92	71-43-2	03/27/14 14:50	03/27/14 08:00
Bromochloromethane	EPA 8260	ug/L	0.18 U	1	0.18	0.72	74-97-5	03/27/14 14:50	03/27/14 08:00
Bromodichloromethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	75-27-4	03/27/14 14:50	03/27/14 08:00
Bromoform	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-25-2	03/27/14 14:50	03/27/14 08:00
Bromomethane	EPA 8260	ug/L	0.43 U	1	0.43	1.7	74-83-9	03/27/14 14:50	03/27/14 08:00
Carbon disulfide	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-15-0	03/27/14 14:50	03/27/14 08:00
Carbon tetrachloride	EPA 8260	ug/L	0.18 U	1	0.18	0.72	56-23-5	03/27/14 14:50	03/27/14 08:00
Chlorobenzene	EPA 8260	ug/L	0.19 U	1	0.19	0.76	108-90-7	03/27/14 14:50	03/27/14 08:00
Chloroethane	EPA 8260	ug/L	0.36 U	1	0.36	1.4	75-00-3	03/27/14 14:50	03/27/14 08:00
Chloroform	EPA 8260	ug/L	0.19 U	1	0.19	0.74	67-66-3	03/27/14 14:50	03/27/14 08:00
Chloromethane	EPA 8260	ug/L	0.32 U	1	0.32	1.3	74-87-3	03/27/14 14:50	03/27/14 08:00
cis-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-59-2	03/27/14 14:50	03/27/14 08:00
Dibromochloromethane	EPA 8260	ug/L	0.33 U	1	0.33	1.3	124-48-1	03/27/14 14:50	03/27/14 08:00
Dibromomethane	EPA 8260	ug/L	0.25 U	1	0.25	1.0	74-95-3	03/27/14 14:50	03/27/14 08:00
Dichlorodifluoromethane	EPA 8260	ug/L	0.42 U	1	0.42	1.7	75-71-8	03/27/14 14:50	03/27/14 08:00
Ethylbenzene	EPA 8260	ug/L	0.20 U	1	0.20	0.80	100-41-4	03/27/14 14:50	03/27/14 08:00
Isopropylbenzene	EPA 8260	ug/L	0.26 U	1	0.26	1.0	98-82-8	03/27/14 14:50	03/27/14 08:00
Methylene Chloride	EPA 8260	ug/L	0.65 U	1	0.65	2.6	75-09-2	03/27/14 14:50	03/27/14 08:00
Methyl tert-Butyl Ether (MTBE)	EPA 8260	ug/L	0.28 U	1	0.28	1.1	1634-04-4	03/27/14 14:50	03/27/14 08:00
Naphthalene	EPA 8260	ug/L	4.0	1	0.23	0.90	91-20-3	03/27/14 14:50	03/27/14 08:00
Styrene	EPA 8260	ug/L	0.23 U	1	0.23	0.93	100-42-5	03/27/14 14:50	03/27/14 08:00
Tetrachloroethene	EPA 8260	ug/L	0.36 U	1	0.36	1.4	127-18-4	03/27/14 14:50	03/27/14 08:00
Toluene	EPA 8260	ug/L	0.20 U	1	0.20	0.80	108-88-3	03/27/14 14:50	03/27/14 08:00
Xylenes (Total)	EPA 8260	ug/L	0.22 U	1	0.22	0.88	1330-20-7	03/27/14 14:50	03/27/14 08:00
trans-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-60-5	03/27/14 14:50	03/27/14 08:00
Trichloroethene	EPA 8260	ug/L	0.48 U	1	0.48	1.9	79-01-6	03/27/14 14:50	03/27/14 08:00
Trichlorofluoromethane	EPA 8260	ug/L	0.51 U	1	0.51	2.0	75-69-4	03/27/14 14:50	03/27/14 08:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-07**
Sample Designation: **TBE-10**

Matrix: **Groundwater**
Date Collected: **03/25/14 14:44**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
Volatile Organic Compounds by EPA 8260				Method Qualifier:					
Vinyl chloride	EPA 8260	ug/L	0.25 U	1	0.25	1.0	75-01-4	03/27/14 14:50	03/27/14 08:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-08**
Sample Designation: **MW-B3**

Matrix: **Groundwater**
Date Collected: **03/24/14 10:40**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
TDS by SM2540 C				Method Qualifier:					
Total Dissolved Solids	SM2540 C	mg/L	170	1	2.0	2.0	NA	03/28/14 17:21	03/28/14 10:31
Volatile Organic Compounds by EPA 8260				Method Qualifier:					
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	100	1			460-00-4	03/27/14 15:10	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	100	1			1868-53-7	03/27/14 15:10	03/27/14 08:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	98.5	1			2037-26-5	03/27/14 15:10	03/27/14 08:00
1,1,1-Trichloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.78	71-55-6	03/27/14 15:10	03/27/14 08:00
1,1,2,2-Tetrachloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	79-34-5	03/27/14 15:10	03/27/14 08:00
1,1,2-Trichloroethane	EPA 8260	ug/L	0.92 U	1	0.92	3.7	79-00-5	03/27/14 15:10	03/27/14 08:00
1,1-Dichloroethane	EPA 8260	ug/L	0.23 U	1	0.23	0.92	75-34-3	03/27/14 15:10	03/27/14 08:00
1,1-Dichloroethene	EPA 8260	ug/L	0.34 U	1	0.34	1.3	75-35-4	03/27/14 15:10	03/27/14 08:00
1,2-Dichlorobenzene	EPA 8260	ug/L	0.40 U	1	0.40	1.6	95-50-1	03/27/14 15:10	03/27/14 08:00
1,2-Dichloroethane	EPA 8260	ug/L	0.24 U	1	0.24	0.97	107-06-2	03/27/14 15:10	03/27/14 08:00
1,2-Dichloropropane	EPA 8260	ug/L	0.28 U	1	0.28	1.1	78-87-5	03/27/14 15:10	03/27/14 08:00
1,2,4-Trimethylbenzene	EPA 8260	ug/L	0.37 U	1	0.37	1.5	95-63-6	03/27/14 15:10	03/27/14 08:00
1,3,5-Trimethylbenzene	EPA 8260	ug/L	0.24 U	1	0.24	0.94	108-67-8	03/27/14 15:10	03/27/14 08:00
1,3-Dichlorobenzene	EPA 8260	ug/L	0.34 U	1	0.34	1.4	541-73-1	03/27/14 15:10	03/27/14 08:00
1,3-Dichloropropene (Total)	EPA 8260	ug/L	0.11 U	1	0.11	0.50	542-75-6	03/27/14 15:10	03/27/14 08:00
1,4-Dichlorobenzene	EPA 8260	ug/L	0.21 U	1	0.21	0.84	106-46-7	03/27/14 15:10	03/27/14 08:00
2-Butanone (MEK)	EPA 8260	ug/L	2.1 U	1	2.1	8.4	78-93-3	03/27/14 15:10	03/27/14 08:00
2-Hexanone	EPA 8260	ug/L	1.5 U	1	1.5	10	591-78-6	03/27/14 15:10	03/27/14 08:00
4-Methyl-2-pentanone (MIBK)	EPA 8260	ug/L	1.3 U	1	1.3	5.2	108-10-1	03/27/14 15:10	03/27/14 08:00
Acetone	EPA 8260	ug/L	6.9 U	1	6.9	28	67-64-1	03/27/14 15:10	03/27/14 08:00
Benzene	EPA 8260	ug/L	0.23 U	1	0.23	0.92	71-43-2	03/27/14 15:10	03/27/14 08:00
Bromochloromethane	EPA 8260	ug/L	0.18 U	1	0.18	0.72	74-97-5	03/27/14 15:10	03/27/14 08:00
Bromodichloromethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	75-27-4	03/27/14 15:10	03/27/14 08:00
Bromoform	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-25-2	03/27/14 15:10	03/27/14 08:00
Bromomethane	EPA 8260	ug/L	0.43 U	1	0.43	1.7	74-83-9	03/27/14 15:10	03/27/14 08:00
Carbon disulfide	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-15-0	03/27/14 15:10	03/27/14 08:00
Carbon tetrachloride	EPA 8260	ug/L	0.18 U	1	0.18	0.72	56-23-5	03/27/14 15:10	03/27/14 08:00
Chlorobenzene	EPA 8260	ug/L	0.19 U	1	0.19	0.76	108-90-7	03/27/14 15:10	03/27/14 08:00
Chloroethane	EPA 8260	ug/L	0.36 U	1	0.36	1.4	75-00-3	03/27/14 15:10	03/27/14 08:00
Chloroform	EPA 8260	ug/L	0.19 U	1	0.19	0.74	67-66-3	03/27/14 15:10	03/27/14 08:00
Chloromethane	EPA 8260	ug/L	0.32 U	1	0.32	1.3	74-87-3	03/27/14 15:10	03/27/14 08:00
cis-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-59-2	03/27/14 15:10	03/27/14 08:00
Dibromochloromethane	EPA 8260	ug/L	0.33 U	1	0.33	1.3	124-48-1	03/27/14 15:10	03/27/14 08:00
Dibromomethane	EPA 8260	ug/L	0.25 U	1	0.25	1.0	74-95-3	03/27/14 15:10	03/27/14 08:00
Dichlorodifluoromethane	EPA 8260	ug/L	0.42 U	1	0.42	1.7	75-71-8	03/27/14 15:10	03/27/14 08:00
Ethylbenzene	EPA 8260	ug/L	0.20 U	1	0.20	0.80	100-41-4	03/27/14 15:10	03/27/14 08:00
Isopropylbenzene	EPA 8260	ug/L	0.26 U	1	0.26	1.0	98-82-8	03/27/14 15:10	03/27/14 08:00
Methylene Chloride	EPA 8260	ug/L	0.65 U	1	0.65	2.6	75-09-2	03/27/14 15:10	03/27/14 08:00
Methyl tert-Butyl Ether (MTBE)	EPA 8260	ug/L	0.28 U	1	0.28	1.1	1634-04-4	03/27/14 15:10	03/27/14 08:00
Naphthalene	EPA 8260	ug/L	1.6	1	0.23	0.90	91-20-3	03/27/14 15:10	03/27/14 08:00
Styrene	EPA 8260	ug/L	0.23 U	1	0.23	0.93	100-42-5	03/27/14 15:10	03/27/14 08:00
Tetrachloroethene	EPA 8260	ug/L	0.36 U	1	0.36	1.4	127-18-4	03/27/14 15:10	03/27/14 08:00
Toluene	EPA 8260	ug/L	0.20 U	1	0.20	0.80	108-88-3	03/27/14 15:10	03/27/14 08:00
Xylenes (Total)	EPA 8260	ug/L	0.22 U	1	0.22	0.88	1330-20-7	03/27/14 15:10	03/27/14 08:00
trans-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-60-5	03/27/14 15:10	03/27/14 08:00
Trichloroethene	EPA 8260	ug/L	0.48 U	1	0.48	1.9	79-01-6	03/27/14 15:10	03/27/14 08:00
Trichlorofluoromethane	EPA 8260	ug/L	0.51 U	1	0.51	2.0	75-69-4	03/27/14 15:10	03/27/14 08:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-08**
Sample Designation: **MW-B3**

Matrix: **Groundwater**
Date Collected: **03/24/14 10:40**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
Volatile Organic Compounds by EPA 8260						Method Qualifier:			
Vinyl chloride	EPA 8260	ug/L	0.25 U	1	0.25	1.0	75-01-4	03/27/14 15:10	03/27/14 08:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-09**
Sample Designation: **MW-B4**

Matrix: **Groundwater**
Date Collected: **03/25/14 16:44**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
TDS by SM2540 C					Method Qualifier:				
Total Dissolved Solids	SM2540 C	mg/L	260	1	2.0	2.0	NA	03/28/14 17:23	03/28/14 10:31
Volatile Organic Compounds by EPA 8260					Method Qualifier:				
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	96.3	1			460-00-4	03/28/14 16:29	03/28/14 09:00
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	118	1			460-00-4	03/27/14 15:29	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	92.8	1			1868-53-7	03/27/14 15:29	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	92.0	1			1868-53-7	03/28/14 16:29	03/28/14 09:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	99.8	1			2037-26-5	03/27/14 15:29	03/27/14 08:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	99.4	1			2037-26-5	03/28/14 16:29	03/28/14 09:00
1,1,1-Trichloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.78	71-55-6	03/27/14 15:29	03/27/14 08:00
1,1,2,2-Tetrachloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	79-34-5	03/27/14 15:29	03/27/14 08:00
1,1,2-Trichloroethane	EPA 8260	ug/L	0.92 U	1	0.92	3.7	79-00-5	03/27/14 15:29	03/27/14 08:00
1,1-Dichloroethane	EPA 8260	ug/L	0.23 U	1	0.23	0.92	75-34-3	03/27/14 15:29	03/27/14 08:00
1,1-Dichloroethene	EPA 8260	ug/L	0.34 U	1	0.34	1.3	75-35-4	03/27/14 15:29	03/27/14 08:00
1,2-Dichlorobenzene	EPA 8260	ug/L	0.40 U	1	0.40	1.6	95-50-1	03/27/14 15:29	03/27/14 08:00
1,2-Dichloroethane	EPA 8260	ug/L	0.24 U	1	0.24	0.97	107-06-2	03/27/14 15:29	03/27/14 08:00
1,2-Dichloropropane	EPA 8260	ug/L	0.28 U	1	0.28	1.1	78-87-5	03/27/14 15:29	03/27/14 08:00
1,2,4-Trimethylbenzene	EPA 8260	ug/L	1500	10	3.7	15	95-63-6	03/28/14 16:29	03/28/14 09:00
1,3,5-Trimethylbenzene	EPA 8260	ug/L	490	10	2.4	9.4	108-67-8	03/28/14 16:29	03/28/14 09:00
1,3-Dichlorobenzene	EPA 8260	ug/L	0.34 U	1	0.34	1.4	541-73-1	03/27/14 15:29	03/27/14 08:00
1,3-Dichloropropene (Total)	EPA 8260	ug/L	0.11 U	1	0.11	0.50	542-75-6	03/27/14 15:29	03/27/14 08:00
1,4-Dichlorobenzene	EPA 8260	ug/L	0.21 U	1	0.21	0.84	106-46-7	03/27/14 15:29	03/27/14 08:00
2-Butanone (MEK)	EPA 8260	ug/L	2.1 U	1	2.1	8.4	78-93-3	03/27/14 15:29	03/27/14 08:00
2-Hexanone	EPA 8260	ug/L	1.5 U	1	1.5	10	591-78-6	03/27/14 15:29	03/27/14 08:00
4-Methyl-2-pentanone (MIBK)	EPA 8260	ug/L	1.3 U	1	1.3	5.2	108-10-1	03/27/14 15:29	03/27/14 08:00
Acetone	EPA 8260	ug/L	63	1	6.9	28	67-64-1	03/27/14 15:29	03/27/14 08:00
Benzene	EPA 8260	ug/L	0.23 U	1	0.23	0.92	71-43-2	03/27/14 15:29	03/27/14 08:00
Bromochloromethane	EPA 8260	ug/L	0.18 U	1	0.18	0.72	74-97-5	03/27/14 15:29	03/27/14 08:00
Bromodichloromethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	75-27-4	03/27/14 15:29	03/27/14 08:00
Bromoform	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-25-2	03/27/14 15:29	03/27/14 08:00
Bromomethane	EPA 8260	ug/L	0.43 U	1	0.43	1.7	74-83-9	03/27/14 15:29	03/27/14 08:00
Carbon disulfide	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-15-0	03/27/14 15:29	03/27/14 08:00
Carbon tetrachloride	EPA 8260	ug/L	0.18 U	1	0.18	0.72	56-23-5	03/27/14 15:29	03/27/14 08:00
Chlorobenzene	EPA 8260	ug/L	0.19 U	1	0.19	0.76	108-90-7	03/27/14 15:29	03/27/14 08:00
Chloroethane	EPA 8260	ug/L	0.36 U	1	0.36	1.4	75-00-3	03/27/14 15:29	03/27/14 08:00
Chloroform	EPA 8260	ug/L	0.19 U	1	0.19	0.74	67-66-3	03/27/14 15:29	03/27/14 08:00
Chloromethane	EPA 8260	ug/L	0.32 U	1	0.32	1.3	74-87-3	03/27/14 15:29	03/27/14 08:00
cis-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-59-2	03/27/14 15:29	03/27/14 08:00
Dibromochloromethane	EPA 8260	ug/L	0.33 U	1	0.33	1.3	124-48-1	03/27/14 15:29	03/27/14 08:00
Dibromomethane	EPA 8260	ug/L	0.25 U	1	0.25	1.0	74-95-3	03/27/14 15:29	03/27/14 08:00
Dichlorodifluoromethane	EPA 8260	ug/L	0.42 U	1	0.42	1.7	75-71-8	03/27/14 15:29	03/27/14 08:00
Ethylbenzene	EPA 8260	ug/L	640	10	2.0	8.0	100-41-4	03/28/14 16:29	03/28/14 09:00
Isopropylbenzene	EPA 8260	ug/L	120	1	0.26	1.0	98-82-8	03/27/14 15:29	03/27/14 08:00
Methylene Chloride	EPA 8260	ug/L	0.65 U	1	0.65	2.6	75-09-2	03/27/14 15:29	03/27/14 08:00
Methyl tert-Butyl Ether (MTBE)	EPA 8260	ug/L	0.28 U	1	0.28	1.1	1634-04-4	03/27/14 15:29	03/27/14 08:00
Naphthalene	EPA 8260	ug/L	900	10	2.3	9.0	91-20-3	03/28/14 16:29	03/28/14 09:00
Styrene	EPA 8260	ug/L	0.23 U	1	0.23	0.93	100-42-5	03/27/14 15:29	03/27/14 08:00
Tetrachloroethene	EPA 8260	ug/L	0.36 U	1	0.36	1.4	127-18-4	03/27/14 15:29	03/27/14 08:00
Toluene	EPA 8260	ug/L	0.20 U	1	0.20	0.80	108-88-3	03/27/14 15:29	03/27/14 08:00
Xylenes (Total)	EPA 8260	ug/L	2100	10	2.2	8.8	1330-20-7	03/28/14 16:29	03/28/14 09:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-09**
Sample Designation: **MW-B4**

Matrix: **Groundwater**
Date Collected: **03/25/14 16:44**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
Volatile Organic Compounds by EPA 8260				Method Qualifier:					
trans-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-60-5	03/27/14 15:29	03/27/14 08:00
Trichloroethene	EPA 8260	ug/L	0.48 U	1	0.48	1.9	79-01-6	03/27/14 15:29	03/27/14 08:00
Trichlorofluoromethane	EPA 8260	ug/L	0.51 U	1	0.51	2.0	75-69-4	03/27/14 15:29	03/27/14 08:00
Vinyl chloride	EPA 8260	ug/L	0.25 U	1	0.25	1.0	75-01-4	03/27/14 15:29	03/27/14 08:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-10**
Sample Designation: **EQ-1**

Matrix: **Groundwater**
Date Collected: **03/25/14 17:40**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
Volatile Organic Compounds by EPA 8260				Method Qualifier:					
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	97.9	1			460-00-4	03/28/14 14:49	03/28/14 09:00
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	102	1			460-00-4	03/27/14 15:49	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	95.5	1			1868-53-7	03/27/14 15:49	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	99.7	1			1868-53-7	03/28/14 14:49	03/28/14 09:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	101	1			2037-26-5	03/27/14 15:49	03/27/14 08:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	93.7	1			2037-26-5	03/28/14 14:49	03/28/14 09:00
1,1,1-Trichloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.78	71-55-6	03/27/14 15:49	03/27/14 08:00
1,1,2,2-Tetrachloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	79-34-5	03/27/14 15:49	03/27/14 08:00
1,1,2-Trichloroethane	EPA 8260	ug/L	0.92 U	1	0.92	3.7	79-00-5	03/27/14 15:49	03/27/14 08:00
1,1-Dichloroethane	EPA 8260	ug/L	0.23 U	1	0.23	0.92	75-34-3	03/27/14 15:49	03/27/14 08:00
1,1-Dichloroethene	EPA 8260	ug/L	0.34 U	1	0.34	1.3	75-35-4	03/27/14 15:49	03/27/14 08:00
1,2-Dichlorobenzene	EPA 8260	ug/L	0.40 U	1	0.40	1.6	95-50-1	03/27/14 15:49	03/27/14 08:00
1,2-Dichloroethane	EPA 8260	ug/L	0.24 U	1	0.24	0.97	107-06-2	03/27/14 15:49	03/27/14 08:00
1,2-Dichloropropane	EPA 8260	ug/L	0.28 U	1	0.28	1.1	78-87-5	03/27/14 15:49	03/27/14 08:00
1,2,4-Trimethylbenzene	EPA 8260	ug/L	0.37 U	1	0.37	1.5	95-63-6	03/28/14 14:49	03/28/14 09:00
1,3,5-Trimethylbenzene	EPA 8260	ug/L	0.24 U	1	0.24	0.94	108-67-8	03/28/14 14:49	03/28/14 09:00
1,3-Dichlorobenzene	EPA 8260	ug/L	0.34 U	1	0.34	1.4	541-73-1	03/27/14 15:49	03/27/14 08:00
1,3-Dichloropropene (Total)	EPA 8260	ug/L	0.11 U	1	0.11	0.50	542-75-6	03/27/14 15:49	03/27/14 08:00
1,4-Dichlorobenzene	EPA 8260	ug/L	0.21 U	1	0.21	0.84	106-46-7	03/27/14 15:49	03/27/14 08:00
2-Butanone (MEK)	EPA 8260	ug/L	2.1 U	1	2.1	8.4	78-93-3	03/27/14 15:49	03/27/14 08:00
2-Hexanone	EPA 8260	ug/L	1.5 U	1	1.5	10	591-78-6	03/27/14 15:49	03/27/14 08:00
4-Methyl-2-pentanone (MIBK)	EPA 8260	ug/L	1.3 U	1	1.3	5.2	108-10-1	03/27/14 15:49	03/27/14 08:00
Acetone	EPA 8260	ug/L	6.9 U	1	6.9	28	67-64-1	03/27/14 15:49	03/27/14 08:00
Benzene	EPA 8260	ug/L	0.23 U	1	0.23	0.92	71-43-2	03/27/14 15:49	03/27/14 08:00
Bromochloromethane	EPA 8260	ug/L	0.18 U	1	0.18	0.72	74-97-5	03/27/14 15:49	03/27/14 08:00
Bromodichloromethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	75-27-4	03/27/14 15:49	03/27/14 08:00
Bromoform	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-25-2	03/27/14 15:49	03/27/14 08:00
Bromomethane	EPA 8260	ug/L	0.43 U	1	0.43	1.7	74-83-9	03/27/14 15:49	03/27/14 08:00
Carbon disulfide	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-15-0	03/27/14 15:49	03/27/14 08:00
Carbon tetrachloride	EPA 8260	ug/L	0.18 U	1	0.18	0.72	56-23-5	03/27/14 15:49	03/27/14 08:00
Chlorobenzene	EPA 8260	ug/L	0.19 U	1	0.19	0.76	108-90-7	03/27/14 15:49	03/27/14 08:00
Chloroethane	EPA 8260	ug/L	0.36 U	1	0.36	1.4	75-00-3	03/27/14 15:49	03/27/14 08:00
Chloroform	EPA 8260	ug/L	0.19 U	1	0.19	0.74	67-66-3	03/27/14 15:49	03/27/14 08:00
Chloromethane	EPA 8260	ug/L	0.32 U	1	0.32	1.3	74-87-3	03/27/14 15:49	03/27/14 08:00
cis-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-59-2	03/27/14 15:49	03/27/14 08:00
Dibromochloromethane	EPA 8260	ug/L	0.33 U	1	0.33	1.3	124-48-1	03/27/14 15:49	03/27/14 08:00
Dibromomethane	EPA 8260	ug/L	0.25 U	1	0.25	1.0	74-95-3	03/27/14 15:49	03/27/14 08:00
Dichlorodifluoromethane	EPA 8260	ug/L	0.42 U	1	0.42	1.7	75-71-8	03/27/14 15:49	03/27/14 08:00
Ethylbenzene	EPA 8260	ug/L	0.20 U	1	0.20	0.80	100-41-4	03/28/14 14:49	03/28/14 09:00
isopropylbenzene	EPA 8260	ug/L	0.26 U	1	0.26	1.0	98-82-8	03/27/14 15:49	03/27/14 08:00
Methylene Chloride	EPA 8260	ug/L	0.65 U	1	0.65	2.6	75-09-2	03/27/14 15:49	03/27/14 08:00
Methyl tert-Butyl Ether (MTBE)	EPA 8260	ug/L	0.28 U	1	0.28	1.1	1634-04-4	03/27/14 15:49	03/27/14 08:00
Naphthalene	EPA 8260	ug/L	0.23 U	1	0.23	0.90	91-20-3	03/28/14 14:49	03/28/14 09:00
Styrene	EPA 8260	ug/L	0.23 U	1	0.23	0.93	100-42-5	03/27/14 15:49	03/27/14 08:00
Tetrachloroethene	EPA 8260	ug/L	0.36 U	1	0.36	1.4	127-18-4	03/27/14 15:49	03/27/14 08:00
Toluene	EPA 8260	ug/L	0.20 U	1	0.20	0.80	108-88-3	03/27/14 15:49	03/27/14 08:00
Xylenes (Total)	EPA 8260	ug/L	0.22 U	1	0.22	0.88	1330-20-7	03/28/14 14:49	03/28/14 09:00
trans-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-60-5	03/27/14 15:49	03/27/14 08:00
Trichloroethene	EPA 8260	ug/L	0.48 U	1	0.48	1.9	79-01-6	03/27/14 15:49	03/27/14 08:00
Trichlorofluoromethane	EPA 8260	ug/L	0.51 U	1	0.51	2.0	75-69-4	03/27/14 15:49	03/27/14 08:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-10**
Sample Designation: **EQ-1**

Matrix: **Groundwater**
Date Collected: **03/25/14 17:40**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
Volatile Organic Compounds by EPA 8260						Method Qualifier:			
Vinyl chloride	EPA 8260	ug/L	0.25 U	1	0.25	1.0	75-01-4	03/27/14 15:49	03/27/14 08:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-11**
Sample Designation: **Trip Blank**

Matrix: **Water**
Date Collected: **03/24/14 00:00**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
Volatile Organic Compounds by EPA 8260				Method Qualifier:					
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	92.2	1			460-00-4	03/27/14 12:15	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	108	1			1868-53-7	03/27/14 12:15	03/27/14 08:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	99.3	1			2037-26-5	03/27/14 12:15	03/27/14 08:00
1,1,1-Trichloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.78	71-55-6	03/27/14 12:15	03/27/14 08:00
1,1,2,2-Tetrachloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	79-34-5	03/27/14 12:15	03/27/14 08:00
1,1,2-Trichloroethane	EPA 8260	ug/L	0.92 U	1	0.92	3.7	79-00-5	03/27/14 12:15	03/27/14 08:00
1,1-Dichloroethane	EPA 8260	ug/L	0.23 U	1	0.23	0.92	75-34-3	03/27/14 12:15	03/27/14 08:00
1,1-Dichloroethene	EPA 8260	ug/L	0.34 U	1	0.34	1.3	75-35-4	03/27/14 12:15	03/27/14 08:00
1,2-Dichlorobenzene	EPA 8260	ug/L	0.40 U	1	0.40	1.6	95-50-1	03/27/14 12:15	03/27/14 08:00
1,2-Dichloroethane	EPA 8260	ug/L	0.24 U	1	0.24	0.97	107-06-2	03/27/14 12:15	03/27/14 08:00
1,2-Dichloropropane	EPA 8260	ug/L	0.28 U	1	0.28	1.1	78-87-5	03/27/14 12:15	03/27/14 08:00
1,2,4-Trimethylbenzene	EPA 8260	ug/L	0.37 U	1	0.37	1.5	95-63-6	03/27/14 12:15	03/27/14 08:00
1,3,5-Trimethylbenzene	EPA 8260	ug/L	0.24 U	1	0.24	0.94	108-67-8	03/27/14 12:15	03/27/14 08:00
1,3-Dichlorobenzene	EPA 8260	ug/L	0.34 U	1	0.34	1.4	541-73-1	03/27/14 12:15	03/27/14 08:00
1,3-Dichloropropene (Total)	EPA 8260	ug/L	0.11 U	1	0.11	0.50	542-75-6	03/27/14 12:15	03/27/14 08:00
1,4-Dichlorobenzene	EPA 8260	ug/L	0.21 U	1	0.21	0.84	106-46-7	03/27/14 12:15	03/27/14 08:00
2-Butanone (MEK)	EPA 8260	ug/L	2.1 U	1	2.1	8.4	78-93-3	03/27/14 12:15	03/27/14 08:00
2-Hexanone	EPA 8260	ug/L	1.5 U	1	1.5	10	591-78-6	03/27/14 12:15	03/27/14 08:00
4-Methyl-2-pentanone (MIBK)	EPA 8260	ug/L	1.3 U	1	1.3	5.2	108-10-1	03/27/14 12:15	03/27/14 08:00
Acetone	EPA 8260	ug/L	6.9 U	1	6.9	28	67-64-1	03/27/14 12:15	03/27/14 08:00
Benzene	EPA 8260	ug/L	0.23 U	1	0.23	0.92	71-43-2	03/27/14 12:15	03/27/14 08:00
Bromochloromethane	EPA 8260	ug/L	0.18 U	1	0.18	0.72	74-97-5	03/27/14 12:15	03/27/14 08:00
Bromodichloromethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	75-27-4	03/27/14 12:15	03/27/14 08:00
Bromoform	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-25-2	03/27/14 12:15	03/27/14 08:00
Bromomethane	EPA 8260	ug/L	0.43 U	1	0.43	1.7	74-83-9	03/27/14 12:15	03/27/14 08:00
Carbon disulfide	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-15-0	03/27/14 12:15	03/27/14 08:00
Carbon tetrachloride	EPA 8260	ug/L	0.18 U	1	0.18	0.72	56-23-5	03/27/14 12:15	03/27/14 08:00
Chlorobenzene	EPA 8260	ug/L	0.19 U	1	0.19	0.76	108-90-7	03/27/14 12:15	03/27/14 08:00
Chloroethane	EPA 8260	ug/L	0.36 U	1	0.36	1.4	75-00-3	03/27/14 12:15	03/27/14 08:00
Chloroform	EPA 8260	ug/L	0.19 U	1	0.19	0.74	67-66-3	03/27/14 12:15	03/27/14 08:00
Chloromethane	EPA 8260	ug/L	0.32 U	1	0.32	1.3	74-87-3	03/27/14 12:15	03/27/14 08:00
cis-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-59-2	03/27/14 12:15	03/27/14 08:00
Dibromochloromethane	EPA 8260	ug/L	0.33 U	1	0.33	1.3	124-48-1	03/27/14 12:15	03/27/14 08:00
Dibromomethane	EPA 8260	ug/L	0.25 U	1	0.25	1.0	74-95-3	03/27/14 12:15	03/27/14 08:00
Dichlorodifluoromethane	EPA 8260	ug/L	0.42 U	1	0.42	1.7	75-71-8	03/27/14 12:15	03/27/14 08:00
Ethylbenzene	EPA 8260	ug/L	0.20 U	1	0.20	0.80	100-41-4	03/27/14 12:15	03/27/14 08:00
isopropylbenzene	EPA 8260	ug/L	0.26 U	1	0.26	1.0	98-82-8	03/27/14 12:15	03/27/14 08:00
Methylene Chloride	EPA 8260	ug/L	3.1	1	0.65	2.6	75-09-2	03/27/14 12:15	03/27/14 08:00
Methyl tert-Butyl Ether (MTBE)	EPA 8260	ug/L	0.28 U	1	0.28	1.1	1634-04-4	03/27/14 12:15	03/27/14 08:00
Naphthalene	EPA 8260	ug/L	0.23 U	1	0.23	0.90	91-20-3	03/27/14 12:15	03/27/14 08:00
Styrene	EPA 8260	ug/L	0.23 U	1	0.23	0.93	100-42-5	03/27/14 12:15	03/27/14 08:00
Tetrachloroethene	EPA 8260	ug/L	0.36 U	1	0.36	1.4	127-18-4	03/27/14 12:15	03/27/14 08:00
Toluene	EPA 8260	ug/L	0.20 U	1	0.20	0.80	108-88-3	03/27/14 12:15	03/27/14 08:00
Xylenes (Total)	EPA 8260	ug/L	0.22 U	1	0.22	0.88	1330-20-7	03/27/14 12:15	03/27/14 08:00
trans-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-60-5	03/27/14 12:15	03/27/14 08:00
Trichloroethene	EPA 8260	ug/L	0.48 U	1	0.48	1.9	79-01-6	03/27/14 12:15	03/27/14 08:00
Trichlorofluoromethane	EPA 8260	ug/L	0.51 U	1	0.51	2.0	75-69-4	03/27/14 12:15	03/27/14 08:00
Vinyl chloride	EPA 8260	ug/L	0.25 U	1	0.25	1.0	75-01-4	03/27/14 12:15	03/27/14 08:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-12**
Sample Designation: **DUP-1**

Matrix: **Groundwater**
Date Collected: **03/25/14 00:00**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
Volatile Organic Compounds by EPA 8260				Method Qualifier:					
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	93.5	1			460-00-4	03/28/14 16:48	03/28/14 09:00
Surrogate: 4-Bromofluorobenzene (82-118)	EPA 8260	%	114	1			460-00-4	03/27/14 16:08	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	88.9	1			1868-53-7	03/27/14 16:08	03/27/14 08:00
Surrogate: Dibromofluoromethane (85-120)	EPA 8260	%	95.2	1			1868-53-7	03/28/14 16:48	03/28/14 09:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	99.8	1			2037-26-5	03/27/14 16:08	03/27/14 08:00
Surrogate: Toluene-d8 (83-115)	EPA 8260	%	96.0	1			2037-26-5	03/28/14 16:48	03/28/14 09:00
1,1,1-Trichloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.78	71-55-6	03/27/14 16:08	03/27/14 08:00
1,1,2,2-Tetrachloroethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	79-34-5	03/27/14 16:08	03/27/14 08:00
1,1,2-Trichloroethane	EPA 8260	ug/L	0.92 U	1	0.92	3.7	79-00-5	03/27/14 16:08	03/27/14 08:00
1,1-Dichloroethane	EPA 8260	ug/L	0.23 U	1	0.23	0.92	75-34-3	03/27/14 16:08	03/27/14 08:00
1,1-Dichloroethene	EPA 8260	ug/L	0.34 U	1	0.34	1.3	75-35-4	03/27/14 16:08	03/27/14 08:00
1,2-Dichlorobenzene	EPA 8260	ug/L	0.40 U	1	0.40	1.6	95-50-1	03/27/14 16:08	03/27/14 08:00
1,2-Dichloroethane	EPA 8260	ug/L	0.24 U	1	0.24	0.97	107-06-2	03/27/14 16:08	03/27/14 08:00
1,2-Dichloropropane	EPA 8260	ug/L	0.28 U	1	0.28	1.1	78-87-5	03/27/14 16:08	03/27/14 08:00
1,2,4-Trimethylbenzene	EPA 8260	ug/L	600	10	3.7	15	95-63-6	04/02/14 13:38	04/02/14 10:00
1,3,5-Trimethylbenzene	EPA 8260	ug/L	24	1	0.24	0.94	108-67-8	03/27/14 16:08	03/27/14 08:00
1,3-Dichlorobenzene	EPA 8260	ug/L	0.34 U	1	0.34	1.4	541-73-1	03/27/14 16:08	03/27/14 08:00
1,3-Dichloropropene (Total)	EPA 8260	ug/L	0.11 U	1	0.11	0.50	542-75-6	03/27/14 16:08	03/27/14 08:00
1,4-Dichlorobenzene	EPA 8260	ug/L	0.21 U	1	0.21	0.84	106-46-7	03/27/14 16:08	03/27/14 08:00
2-Butanone (MEK)	EPA 8260	ug/L	2.1 U	1	2.1	8.4	78-93-3	03/27/14 16:08	03/27/14 08:00
2-Hexanone	EPA 8260	ug/L	1.5 U	1	1.5	10	591-78-6	03/27/14 16:08	03/27/14 08:00
4-Methyl-2-pentanone (MIBK)	EPA 8260	ug/L	1.3 U	1	1.3	5.2	108-10-1	03/27/14 16:08	03/27/14 08:00
Acetone	EPA 8260	ug/L	6.9 U	1	6.9	28	67-64-1	03/27/14 16:08	03/27/14 08:00
Benzene	EPA 8260	ug/L	0.23 U	1	0.23	0.92	71-43-2	03/27/14 16:08	03/27/14 08:00
Bromochloromethane	EPA 8260	ug/L	0.18 U	1	0.18	0.72	74-97-5	03/27/14 16:08	03/27/14 08:00
Bromodichloromethane	EPA 8260	ug/L	0.19 U	1	0.19	0.76	75-27-4	03/27/14 16:08	03/27/14 08:00
Bromoform	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-25-2	03/27/14 16:08	03/27/14 08:00
Bromomethane	EPA 8260	ug/L	0.43 U	1	0.43	1.7	74-83-9	03/27/14 16:08	03/27/14 08:00
Carbon disulfide	EPA 8260	ug/L	0.35 U	1	0.35	1.4	75-15-0	03/27/14 16:08	03/27/14 08:00
Carbon tetrachloride	EPA 8260	ug/L	0.18 U	1	0.18	0.72	56-23-5	03/27/14 16:08	03/27/14 08:00
Chlorobenzene	EPA 8260	ug/L	0.19 U	1	0.19	0.76	108-90-7	03/27/14 16:08	03/27/14 08:00
Chloroethane	EPA 8260	ug/L	0.36 U	1	0.36	1.4	75-00-3	03/27/14 16:08	03/27/14 08:00
Chloroform	EPA 8260	ug/L	0.19 U	1	0.19	0.74	67-66-3	03/27/14 16:08	03/27/14 08:00
Chloromethane	EPA 8260	ug/L	0.32 U	1	0.32	1.3	74-87-3	03/27/14 16:08	03/27/14 08:00
cis-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-59-2	03/27/14 16:08	03/27/14 08:00
Dibromochloromethane	EPA 8260	ug/L	0.33 U	1	0.33	1.3	124-48-1	03/27/14 16:08	03/27/14 08:00
Dibromomethane	EPA 8260	ug/L	0.25 U	1	0.25	1.0	74-95-3	03/27/14 16:08	03/27/14 08:00
Dichlorodifluoromethane	EPA 8260	ug/L	0.42 U	1	0.42	1.7	75-71-8	03/27/14 16:08	03/27/14 08:00
Ethylbenzene	EPA 8260	ug/L	900	10	2.0	8.0	100-41-4	04/02/14 13:38	04/02/14 10:00
isopropylbenzene	EPA 8260	ug/L	65	1	0.26	1.0	98-82-8	03/27/14 16:08	03/27/14 08:00
Methylene Chloride	EPA 8260	ug/L	0.65 U	1	0.65	2.6	75-09-2	03/27/14 16:08	03/27/14 08:00
Methyl tert-Butyl Ether (MTBE)	EPA 8260	ug/L	0.28 U	1	0.28	1.1	1634-04-4	03/27/14 16:08	03/27/14 08:00
Naphthalene	EPA 8260	ug/L	860	10	2.3	9.0	91-20-3	04/02/14 13:38	04/02/14 10:00
Styrene	EPA 8260	ug/L	0.23 U	1	0.23	0.93	100-42-5	03/27/14 16:08	03/27/14 08:00
Tetrachloroethene	EPA 8260	ug/L	0.36 U	1	0.36	1.4	127-18-4	03/27/14 16:08	03/27/14 08:00
Toluene	EPA 8260	ug/L	8.0	1	0.20	0.80	108-88-3	03/27/14 16:08	03/27/14 08:00
Xylenes (Total)	EPA 8260	ug/L	670	10	2.2	8.8	1330-20-7	04/02/14 13:38	04/02/14 10:00
trans-1,2-Dichloroethene	EPA 8260	ug/L	0.22 U	1	0.22	0.88	156-60-5	03/27/14 16:08	03/27/14 08:00
trans-1,2-Dichloroethene	EPA 8260	ug/L	2.2 U	10	2.2	8.8	156-60-5	03/28/14 16:48	03/28/14 09:00
Trichloroethene	EPA 8260	ug/L	0.48 U	1	0.48	1.9	79-01-6	03/27/14 16:08	03/27/14 08:00

Report of Laboratory Analysis

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

April 02, 2014

SunLabs Sample Number: **4032618-12**
Sample Designation: **DUP-1**

Matrix: **Groundwater**
Date Collected: **03/25/14 00:00**
Date Received: **03/26/14 12:40**

Parameters	Method	Units	Results	Dil Factor	MDL	PQL	CAS Number	Date/Time Analyzed	Date/Time Prep
Volatile Organic Compounds by EPA 8260							Method Qualifier:		
Trichlorofluoromethane	EPA 8260	ug/L	0.51 U	1	0.51	2.0	75-69-4	03/27/14 16:08	03/27/14 08:00
Vinyl chloride	EPA 8260	ug/L	0.25 U	1	0.25	1.0	75-01-4	03/27/14 16:08	03/27/14 08:00

Footnotes

U	*The compound was analyzed for but not detected.*
I	*The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.*
****	*SunLabs is not currently NELAC certified for this analyte. Unless directed otherwise by client, a NELAC certified sub-contract laboratory has performed this analysis (see cover letter for details).*
LCS / LCSD	*Laboratory Control Sample / Laboratory Control Sample Duplicate*
MB	*Method Blank*
MS / MSD	*Matrix Spike / Matrix Spike Duplicate*
RPD	*Relative Percent Difference*

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

Batch No: **B004195**
Test: **8260 VOC/NAPH**

Analyte	Result	Units	Spike Level	Parent Result	%REC	%REC Limits	RPD	RPD Limit	Flags
Blank (B004195-BLK1)				Prepared & Analyzed: 03/27/14					
Surrogate: 4-Bromofluorobenzene	49	ng/mL	50		97.4	82-118			
Surrogate: Dibromofluoromethane	58	ng/mL	50		116	85-120			
Surrogate: Toluene-d8	50	ng/mL	50		100	83-115			
1,1,1-Trichloroethane	0.19 U	ug/L							
1,1,2,2-Tetrachloroethane	0.19 U	ug/L							
1,1,2-Trichloroethane	0.92 U	ug/L							
1,1-Dichloroethane	0.23 U	ug/L							
1,1-Dichloroethene	0.34 U	ug/L							
1,2-Dichlorobenzene	0.40 U	ug/L							
1,2-Dichloroethane	0.24 U	ug/L							
1,2-Dichloropropane	0.28 U	ug/L							
1,2,4-Trimethylbenzene	0.37 U	ug/L							
1,3,5-Trimethylbenzene	0.24 U	ug/L							
1,3-Dichlorobenzene	0.34 U	ug/L							
1,3-Dichloropropene (Total)	0.11 U	ug/L							
1,4-Dichlorobenzene	0.21 U	ug/L							
2-Butanone (MEK)	2.1 U	ug/L							
2-Hexanone	1.5 U	ug/L							
4-Methyl-2-pentanone (MIBK)	1.3 U	ug/L							
Acetone	6.9 U	ug/L							
Benzene	0.23 U	ug/L							
Bromochloromethane	0.18 U	ug/L							
Bromodichloromethane	0.19 U	ug/L							
Bromoform	0.35 U	ug/L							
Bromomethane	0.43 U	ug/L							
Carbon disulfide	0.35 U	ug/L							
Carbon tetrachloride	0.18 U	ug/L							
Chlorobenzene	0.19 U	ug/L							
Chloroethane	0.36 U	ug/L							
Chloroform	0.19 U	ug/L							
Chloromethane	0.32 U	ug/L							
cis-1,2-Dichloroethene	0.22 U	ug/L							
Dibromochloromethane	0.33 U	ug/L							
Dibromomethane	0.25 U	ug/L							
Dichlorodifluoromethane	0.42 U	ug/L							
Ethylbenzene	0.20 U	ug/L							
isopropylbenzene	0.26 U	ug/L							
Methylene Chloride	0.65 U	ug/L							
Methyl tert-Butyl Ether (MTBE)	0.28 U	ug/L							
Naphthalene	0.23 U	ug/L							
Styrene	0.23 U	ug/L							
Tetrachloroethene	0.36 U	ug/L							
Toluene	0.20 U	ug/L							
Xylenes (Total)	0.22 U	ug/L							
trans-1,2-Dichloroethene	0.22 U	ug/L							
Trichloroethene	0.48 U	ug/L							
Trichlorofluoromethane	0.51 U	ug/L							
Vinyl chloride	0.25 U	ug/L							
LCS (B004195-BS1)				Prepared & Analyzed: 03/27/14					

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

Batch No: **B004195**
Test: **8260 VOC/NAPH**

Analyte	Result	Units	Spike Level	Parent Result	%REC	%REC Limits	RPD	RPD Limit	Flags
LCS (B004195-BS1)				Prepared & Analyzed: 03/27/14					
Surrogate: 4-Bromofluorobenzene	47	ng/mL	50		94.6	82-118			
Surrogate: Dibromofluoromethane	51	ng/mL	50		102	85-120			
Surrogate: Toluene-d8	49	ng/mL	50		98.4	83-115			
1,1,1-Trichloroethane	10	ug/L	10		101	78-120			
1,1,2,2-Tetrachloroethane	9.2	ug/L	10		91.7	69-124			
1,1,2-Trichloroethane	10	ug/L	10		99.8	80-125			
1,1-Dichloroethane	10	ug/L	10		100	80-120			
1,1-Dichloroethene	11	ug/L	10		105	80-120			
1,2-Dichlorobenzene	9.8	ug/L	10		98.4	80-120			
1,2-Dichloroethane	10	ug/L	10		100	80-120			
1,2-Dichloropropane	9.6	ug/L	10		96.5	80-120			
1,2,4-Trimethylbenzene	9.6	ug/L	10		96.3	77-120			
1,3,5-Trimethylbenzene	9.8	ug/L	10		98.0	67-120			
1,3-Dichlorobenzene	9.9	ug/L	10		98.7	74-145			
1,3-Dichloropropene (Total)	20	ug/L	20		97.7	73-121			
1,4-Dichlorobenzene	10	ug/L	10		101	69-135			
2-Butanone (MEK)	99	ug/L	100		98.9	53-130			
2-Hexanone	95	ug/L	100		94.8	51-137			
4-Methyl-2-pentanone (MIBK)	110	ug/L	100		107	57-129			
Acetone	110	ug/L	100		108	70-149			
Benzene	11	ug/L	10		108	80-120			
Bromochloromethane	10	ug/L	10		103	80-120			
Bromodichloromethane	9.9	ug/L	10		99.1	80-120			
Bromoform	9.2	ug/L	10		91.7	76-120			
Bromomethane	12	ug/L	10		121	76-137			
Carbon disulfide	10	ug/L	10		104	71-146			
Carbon tetrachloride	10	ug/L	10		104	75-120			
Chlorobenzene	9.6	ug/L	10		96.2	80-120			
Chloroethane	11	ug/L	10		111	80-123			
Chloroform	10	ug/L	10		103	80-120			
Chloromethane	10	ug/L	10		102	70-126			
cis-1,2-Dichloroethene	9.9	ug/L	10		99.4	80-120			
Dibromochloromethane	9.8	ug/L	10		98.5	80-120			
Dibromomethane	9.8	ug/L	10		97.9	80-120			
Dichlorodifluoromethane	10	ug/L	10		105	78-128			
Ethylbenzene	9.1	ug/L	10		90.6	80-120			
Isopropylbenzene	9.7	ug/L	10		97.0	80-120			
Methylene Chloride	10	ug/L	10		104	72-145			
Methyl tert-Butyl Ether (MTBE)	9.8	ug/L	10		97.8	80-120			
Naphthalene	10	ug/L	10		101	66-136			
Styrene	8.7	ug/L	10		87.0	80-120			
Tetrachloroethene	9.8	ug/L	10		97.8	80-120			
Toluene	9.9	ug/L	10		98.6	74-127			
Xylenes (Total)	31	ug/L	30		104	74-129			
trans-1,2-Dichloroethene	11	ug/L	10		106	80-120			
Trichloroethene	11	ug/L	10		107	80-120			
Trichlorofluoromethane	10	ug/L	10		99.8	74-127			
Vinyl chloride	10	ug/L	10		104	78-131			
LCS Dup (B004195-BSD1)				Prepared & Analyzed: 03/27/14					
Surrogate: 4-Bromofluorobenzene	47	ng/mL	50		94.8	82-118			

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

Batch No: **B004195**

Test: **8260 VOC/NAPH**

Analyte	Result	Units	Spike Level	Parent Result	%REC	%REC Limits	RPD	RPD Limit	Flags
LCS Dup (B004195-BSD1)			Prepared & Analyzed: 03/27/14						
Surrogate: Dibromofluoromethane	53	ng/mL	50		105	85-120			
Surrogate: Toluene-d8	51	ng/mL	50		102	83-115			
1,1,1-Trichloroethane	9.8	ug/L	10		98.5	78-120	2.31	20	
1,1,2,2-Tetrachloroethane	10	ug/L	10		100	69-124	8.86	20	
1,1,2-Trichloroethane	10	ug/L	10		102	80-125	2.57	20	
1,1-Dichloroethane	11	ug/L	10		107	80-120	7.04	20	
1,1-Dichloroethene	11	ug/L	10		114	80-120	8.12	20	
1,2-Dichlorobenzene	10	ug/L	10		104	80-120	6.01	20	
1,2-Dichloroethane	11	ug/L	10		105	80-120	4.87	20	
1,2-Dichloropropane	10	ug/L	10		102	80-120	6.03	20	
1,3,5-Trimethylbenzene	10	ug/L	10		99.6	67-120	1.62	22	
1,2,4-Trimethylbenzene	10	ug/L	10		100	77-120	4.17	20	
1,3-Dichlorobenzene	10	ug/L	10		103	74-145	3.87	20	
1,3-Dichloropropene (Total)	20	ug/L	20		99.5	73-121	1.83	20	
1,4-Dichlorobenzene	11	ug/L	10		106	69-135	4.75	20	
2-Butanone (MEK)	100	ug/L	100		100	53-130	1.34	20	
2-Hexanone	96	ug/L	100		95.9	51-137	1.21	20	
4-Methyl-2-pentanone (MIBK)	110	ug/L	100		106	57-129	0.281	20	
Acetone	120	ug/L	100		123	70-149	13.0	20	
Benzene	11	ug/L	10		111	80-120	3.47	20	
Bromochloromethane	12	ug/L	10		115	80-120	11.0	20	
Bromodichloromethane	10	ug/L	10		102	80-120	3.28	20	
Bromoform	9.7	ug/L	10		97.0	76-120	5.62	20	
Bromomethane	13	ug/L	10		126	76-137	3.65	20	
Carbon disulfide	11	ug/L	10		113	71-146	8.09	20	
Carbon tetrachloride	10	ug/L	10		103	75-120	1.45	20	
Chlorobenzene	9.8	ug/L	10		97.9	80-120	1.75	20	
Chloroethane	11	ug/L	10		105	80-123	5.64	20	
Chloroform	11	ug/L	10		108	80-120	5.11	20	
Chloromethane	12	ug/L	10		118	70-126	14.8	20	
cis-1,2-Dichloroethene	10	ug/L	10		102	80-120	2.09	20	
Dibromochloromethane	9.8	ug/L	10		98.0	80-120	0.509	20	
Dibromomethane	10	ug/L	10		104	80-120	5.66	20	
Dichlorodifluoromethane	11	ug/L	10		111	78-128	5.65	20	
Ethylbenzene	9.5	ug/L	10		95.0	80-120	4.74	20	
isopropylbenzene	9.5	ug/L	10		95.0	80-120	2.08	20	
Methylene Chloride	11	ug/L	10		111	72-145	5.77	20	
Methyl tert-Butyl Ether (MTBE)	10	ug/L	10		102	80-120	3.71	20	
Naphthalene	9.8	ug/L	10		97.9	66-136	3.51	20	
Styrene	8.9	ug/L	10		89.4	80-120	2.72	20	
Tetrachloroethene	11	ug/L	10		107	80-120	8.80	20	
Toluene	10	ug/L	10		103	74-127	4.07	20	
Xylenes (Total)	32	ug/L	30		108	74-129	3.84	20	
trans-1,2-Dichloroethene	11	ug/L	10		110	80-120	3.99	20	
Trichloroethene	11	ug/L	10		107	80-120	0.280	20	
Trichlorofluoromethane	11	ug/L	10		111	74-127	10.6	20	
Vinyl chloride	11	ug/L	10		110	78-131	5.14	20	
Duplicate (B004195-DUP1)	**Parent Sample: 4032701-05**		Prepared & Analyzed: 03/27/14						
Surrogate: 4-Bromofluorobenzene	49	ng/mL	50		98.2	82-118			
Surrogate: Dibromofluoromethane	50	ng/mL	50		101	85-120			

Batch No: **B004195**

Test: **8260 VOC/NAPH**

Analyte	Result	Units	Spike Level	Parent Result	%REC	%REC Limits	RPD	RPD Limit	Flags
Duplicate (B004195-DUP1)	**Parent Sample: 4032701-05**		Prepared & Analyzed: 03/27/14						
Surrogate: Toluene-d8	49	ng/mL	50		97.7	83-115			
1,1,1-Trichloroethane	0.19 U	ug/L		ND				200	
1,1,2,2-Tetrachloroethane	0.19 U	ug/L		ND				200	
1,1,2-Trichloroethane	0.92 U	ug/L		ND				200	
1,1-Dichloroethane	0.23 U	ug/L		ND				200	
1,1-Dichloroethene	0.34 U	ug/L		ND				200	
1,2-Dichlorobenzene	0.40 U	ug/L		ND				200	
1,2-Dichloroethane	0.24 U	ug/L		ND				200	
1,2-Dichloropropane	0.28 U	ug/L		ND				200	
1,3,5-Trimethylbenzene	0.24 U	ug/L		ND				200	
1,2,4-Trimethylbenzene	0.37 U	ug/L		ND				200	
1,3-Dichlorobenzene	0.34 U	ug/L		ND				200	
1,3-Dichloropropene (Total)	0.11 U	ug/L		ND				200	
1,4-Dichlorobenzene	0.21 U	ug/L		ND				200	
2-Butanone (MEK)	2.1 U	ug/L		ND				200	
2-Hexanone	1.5 U	ug/L		ND				200	
4-Methyl-2-pentanone (MIBK)	1.3 U	ug/L		ND				200	
Acetone	6.9 U	ug/L		ND				200	
Benzene	0.23 U	ug/L		ND				200	
Bromochloromethane	0.18 U	ug/L		ND				200	
Bromodichloromethane	0.19 U	ug/L		ND				200	
Bromoform	0.35 U	ug/L		ND				200	
Bromomethane	0.43 U	ug/L		ND				200	
Carbon disulfide	0.35 U	ug/L		ND				200	
Carbon tetrachloride	0.18 U	ug/L		ND				200	
Chlorobenzene	0.19 U	ug/L		ND				200	
Chloroethane	0.36 U	ug/L		ND				200	
Chloroform	0.19 U	ug/L		ND				200	
Chloromethane	0.32 U	ug/L		ND				200	
cis-1,2-Dichloroethene	0.22 U	ug/L		ND				200	
Dibromochloromethane	0.33 U	ug/L		ND				200	
Dibromomethane	0.25 U	ug/L		ND				200	
Dichlorodifluoromethane	0.42 U	ug/L		ND				200	
Ethylbenzene	0.20 U	ug/L		ND				200	
Isopropylbenzene	0.26 U	ug/L		ND				200	
Methylene Chloride	0.65 U	ug/L		ND				200	
Methyl tert-Butyl Ether (MTBE)	0.28 U	ug/L		ND				200	
Naphthalene	0.55	ug/L		3.6			147	200	
Styrene	0.23 U	ug/L		ND				200	
Tetrachloroethene	0.36 U	ug/L		ND				200	
Toluene	0.20 U	ug/L		ND				200	
Xylenes (Total)	0.22 U	ug/L		ND				200	
trans-1,2-Dichloroethene	0.22 U	ug/L		ND				200	
Trichloroethene	0.48 U	ug/L		ND				200	
Trichlorofluoromethane	0.51 U	ug/L		ND				200	
Vinyl chloride	0.25 U	ug/L		ND				200	
Matrix Spike (B004195-MS1)	**Parent Sample: 4032701-07**		Prepared & Analyzed: 03/27/14						
Surrogate: 4-Bromofluorobenzene	51	ng/mL	50		102	82-118			
Surrogate: Dibromofluoromethane	49	ng/mL	50		98.8	85-120			
Surrogate: Toluene-d8	50	ng/mL	50		100	83-115			

Batch No: **B004195**
Test: **8260 VOC/NAPH**

Analyte	Result	Units	Spike Level	Parent Result	%REC	%REC Limits	RPD	RPD Limit	Flags
Matrix Spike (B004195-MS1)	**Parent Sample: 4032701-07**		Prepared & Analyzed: 03/27/14						
1,1,1-Trichloroethane	11	ug/L	10	ND	105	71-120			
1,1,2,2-Tetrachloroethane	10	ug/L	10	ND	101	71-124			
1,1,2-Trichloroethane	9.8	ug/L	10	ND	97.8	77-127			
1,1-Dichloroethane	10	ug/L	10	ND	105	79-120			
1,1-Dichloroethene	11	ug/L	10	ND	114	63-126			
1,2-Dichlorobenzene	10	ug/L	10	ND	104	80-122			
1,2-Dichloroethane	10	ug/L	10	ND	102	81-122			
1,2-Dichloropropane	9.7	ug/L	10	ND	97.4	80-120			
1,2,4-Trimethylbenzene	11	ug/L	10	ND	110	52-129			
1,3,5-Trimethylbenzene	11	ug/L	10	ND	108	46-129			
1,3-Dichlorobenzene	11	ug/L	10	ND	105	60-154			
1,3-Dichloropropene (Total)	18	ug/L	20	ND	91.4	57-120			
1,4-Dichlorobenzene	10	ug/L	10	ND	103	68-135			
2-Butanone (MEK)	88	ug/L	100	ND	87.7	55-143			
2-Hexanone	85	ug/L	100	ND	84.9	51-150			
4-Methyl-2-pentanone (MIBK)	96	ug/L	100	ND	96.5	61-135			
Acetone	99	ug/L	100	ND	98.8	45-169			
Benzene	11	ug/L	10	ND	106	45-149			
Bromochloromethane	10	ug/L	10	ND	101	80-120			
Bromodichloromethane	9.7	ug/L	10	ND	96.9	80-123			
Bromoform	7.7	ug/L	10	ND	77.3	65-120			
Bromomethane	11	ug/L	10	ND	106	56-160			
Carbon disulfide	11	ug/L	10	ND	108	74-143			
Carbon tetrachloride	9.4	ug/L	10	ND	94.3	70-120			
Chlorobenzene	10	ug/L	10	ND	101	73-120			
Chloroethane	10	ug/L	10	ND	105	76-129			
Chloroform	10	ug/L	10	ND	102	77-122			
Chloromethane	9.8	ug/L	10	ND	97.9	58-147			
cis-1,2-Dichloroethene	10	ug/L	10	ND	105	75-121			
Dibromochloromethane	9.2	ug/L	10	ND	92.3	74-120			
Dibromomethane	10	ug/L	10	ND	104	80-120			
Dichlorodifluoromethane	11	ug/L	10	ND	106	57-145			
Ethylbenzene	10	ug/L	10	ND	102	73-120			
isopropylbenzene	11	ug/L	10	ND	107	68-120			
Methylene Chloride	8.7	ug/L	10	ND	86.9	66-141			
Methyl tert-Butyl Ether (MTBE)	9.7	ug/L	10	ND	96.8	79-128			
Naphthalene	9.0	ug/L	10	2.1	68.7	54-145			
Styrene	9.4	ug/L	10	ND	94.2	42-130			
Tetrachloroethene	11	ug/L	10	ND	105	57-141			
Toluene	11	ug/L	10	ND	107	62-122			
Xylenes (Total)	34	ug/L	30	ND	114	44-136			
trans-1,2-Dichloroethene	11	ug/L	10	ND	108	72-120			
Trichloroethene	12	ug/L	10	ND	118	66-124			
Trichlorofluoromethane	12	ug/L	10	ND	117	62-138			
Vinyl chloride	10	ug/L	10	ND	103	71-142			

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

Batch No: B004199

Test: **TDS SM2540 C**

Analyte	Result	Units	Spike Level	Parent Result	%REC	%REC Limits	RPD	RPD Limit	Flags
Blank (B004199-BLK1)				Prepared & Analyzed: 03/28/14					
Total Dissolved Solids	2.0 U	mg/L							
LCS (B004199-BS1)				Prepared & Analyzed: 03/28/14					
Total Dissolved Solids	950	mg/L	1000		95.4	75-120			
LCS Dup (B004199-BSD1)				Prepared & Analyzed: 03/28/14					
Total Dissolved Solids	960	mg/L	1000		96.0	75-120	0.627	20	
Duplicate (B004199-DUP1)	**Parent Sample: 4032504-02**			Prepared & Analyzed: 03/28/14					
Total Dissolved Solids	560	mg/L		540			3.61	10	
Duplicate (B004199-DUP2)	**Parent Sample: 4032701-01**			Prepared & Analyzed: 03/28/14					
Total Dissolved Solids	160	mg/L		160			3.73	10	

Batch No: B004201

Test: **8260 VOC/NAPH**

Analyte	Result	Units	Spike Level	Parent Result	%REC	%REC Limits	RPD	RPD Limit	Flags
Blank (B004201-BLK1)				Prepared & Analyzed: 03/28/14					
Surrogate: 4-Bromofluorobenzene	49	ng/mL	50		98.5	82-118			
Surrogate: Dibromofluoromethane	52	ng/mL	50		103	85-120			
Surrogate: Toluene-d8	50	ng/mL	50		99.9	83-115			
1,1,1-Trichloroethane	0.19 U	ug/L							
1,1,2,2-Tetrachloroethane	0.19 U	ug/L							
1,1,2-Trichloroethane	0.92 U	ug/L							
1,1-Dichloroethane	0.23 U	ug/L							
1,1-Dichloroethene	0.34 U	ug/L							
1,2-Dichlorobenzene	0.40 U	ug/L							
1,2-Dichloroethane	0.24 U	ug/L							
1,2-Dichloropropane	0.28 U	ug/L							
1,2,4-Trimethylbenzene	0.37 U	ug/L							
1,3,5-Trimethylbenzene	0.24 U	ug/L							
1,3-Dichlorobenzene	0.34 U	ug/L							
1,3-Dichloropropene (Total)	0.11 U	ug/L							
1,4-Dichlorobenzene	0.21 U	ug/L							
2-Butanone (MEK)	2.1 U	ug/L							
2-Hexanone	1.5 U	ug/L							
4-Methyl-2-pentanone (MIBK)	1.3 U	ug/L							
Acetone	6.9 U	ug/L							
Benzene	0.23 U	ug/L							
Bromochloromethane	0.18 U	ug/L							
Bromodichloromethane	0.19 U	ug/L							
Bromoform	0.35 U	ug/L							
Bromomethane	0.43 U	ug/L							
Carbon disulfide	0.35 U	ug/L							
Carbon tetrachloride	0.18 U	ug/L							
Chlorobenzene	0.19 U	ug/L							
Chloroethane	0.36 U	ug/L							

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

Batch No: **B004201**
Test: **8260 VOC/NAPH**

Analyte	Result	Units	Spike Level	Parent Result	%REC	%REC Limits	RPD	RPD Limit	Flags
Blank (B004201-BLK1)			Prepared & Analyzed: 03/28/14						
Chloroform	0.19 U	ug/L							
Chloromethane	0.32 U	ug/L							
cis-1,2-Dichloroethene	0.22 U	ug/L							
Dibromochloromethane	0.33 U	ug/L							
Dibromomethane	0.25 U	ug/L							
Dichlorodifluoromethane	0.42 U	ug/L							
Ethylbenzene	0.20 U	ug/L							
isopropylbenzene	0.26 U	ug/L							
Methylene Chloride	0.65 U	ug/L							
Methyl tert-Butyl Ether (MTBE)	0.28 U	ug/L							
Naphthalene	0.23 U	ug/L							
Styrene	0.23 U	ug/L							
Tetrachloroethene	0.36 U	ug/L							
Toluene	0.20 U	ug/L							
Xylenes (Total)	0.22 U	ug/L							
trans-1,2-Dichloroethene	0.22 U	ug/L							
Trichloroethene	0.48 U	ug/L							
Trichlorofluoromethane	0.51 U	ug/L							
Vinyl chloride	0.25 U	ug/L							
LCS (B004201-BS1)			Prepared & Analyzed: 03/28/14						
Surrogate: 4-Bromofluorobenzene	49	ng/mL	50		98.5	82-118			
Surrogate: Dibromofluoromethane	50	ng/mL	50		99.8	85-120			
Surrogate: Toluene-d8	50	ng/mL	50		99.0	83-115			
1,1,1-Trichloroethane	10	ug/L	10		101	78-120			
1,1,2,2-Tetrachloroethane	10	ug/L	10		102	69-124			
1,1,2-Trichloroethane	10	ug/L	10		101	80-125			
1,1-Dichloroethane	10	ug/L	10		103	80-120			
1,1-Dichloroethene	10	ug/L	10		102	80-120			
1,2-Dichlorobenzene	10	ug/L	10		100	80-120			
1,2-Dichloroethane	9.9	ug/L	10		99.0	80-120			
1,2-Dichloropropane	10	ug/L	10		99.9	80-120			
1,3,5-Trimethylbenzene	10	ug/L	10		103	67-120			
1,2,4-Trimethylbenzene	10	ug/L	10		103	77-120			
1,3-Dichlorobenzene	10	ug/L	10		105	74-145			
1,3-Dichloropropene (Total)	20	ug/L	20		100	73-121			
1,4-Dichlorobenzene	10	ug/L	10		101	69-135			
2-Butanone (MEK)	92	ug/L	100		92.5	53-130			
2-Hexanone	90	ug/L	100		89.7	51-137			
4-Methyl-2-pentanone (MIBK)	98	ug/L	100		98.3	57-129			
Acetone	110	ug/L	100		108	70-149			
Benzene	10	ug/L	10		105	80-120			
Bromochloromethane	11	ug/L	10		108	80-120			
Bromodichloromethane	9.8	ug/L	10		97.8	80-120			
Bromoform	9.2	ug/L	10		91.6	76-120			
Bromomethane	11	ug/L	10		112	76-137			
Carbon disulfide	11	ug/L	10		107	71-146			
Carbon tetrachloride	10	ug/L	10		101	75-120			
Chlorobenzene	10	ug/L	10		101	80-120			
Chloroethane	10	ug/L	10		100	80-123			
Chloroform	10	ug/L	10		105	80-120			

Batch No: **B004201**
Test: **8260 VOC/NAPH**

Analyte	Result	Units	Spike Level	Parent Result	%REC	%REC Limits	RPD	RPD Limit	Flags
LCS (B004201-BS1)			Prepared & Analyzed: 03/28/14						
Chloromethane	10	ug/L	10		100	70-126			
cis-1,2-Dichloroethene	10	ug/L	10		100	80-120			
Dibromochloromethane	10	ug/L	10		103	80-120			
Dibromomethane	10	ug/L	10		99.9	80-120			
Dichlorodifluoromethane	9.2	ug/L	10		91.6	78-128			
Ethylbenzene	9.7	ug/L	10		97.0	80-120			
Isopropylbenzene	10	ug/L	10		103	80-120			
Methylene Chloride	9.7	ug/L	10		96.6	72-145			
Methyl tert-Butyl Ether (MTBE)	10	ug/L	10		101	80-120			
Naphthalene	8.8	ug/L	10		88.4	66-136			
Styrene	9.1	ug/L	10		91.0	80-120			
Tetrachloroethene	11	ug/L	10		106	80-120			
Toluene	10	ug/L	10		103	74-127			
Xylenes (Total)	32	ug/L	30		107	74-129			
trans-1,2-Dichloroethene	10	ug/L	10		102	80-120			
Trichloroethene	10	ug/L	10		102	80-120			
Trichlorofluoromethane	9.9	ug/L	10		98.6	74-127			
Vinyl chloride	9.0	ug/L	10		90.3	78-131			
LCS Dup (B004201-BSD1)			Prepared & Analyzed: 03/28/14						
Surrogate: 4-Bromofluorobenzene	50	ng/mL	50		99.0	82-118			
Surrogate: Dibromofluoromethane	49	ng/mL	50		97.5	85-120			
Surrogate: Toluene-d8	49	ng/mL	50		97.5	83-115			
1,1,1-Trichloroethane	9.5	ug/L	10		95.0	78-120	6.02	20	
1,1,2,2-Tetrachloroethane	10	ug/L	10		103	69-124	0.293	20	
1,1,2-Trichloroethane	9.9	ug/L	10		99.2	80-125	2.00	20	
1,1-Dichloroethane	9.9	ug/L	10		99.1	80-120	3.57	20	
1,1-Dichloroethene	10	ug/L	10		102	80-120	0.489	20	
1,2-Dichlorobenzene	9.8	ug/L	10		98.4	80-120	1.91	20	
1,2-Dichloroethane	9.7	ug/L	10		97.3	80-120	1.73	20	
1,2-Dichloropropane	9.9	ug/L	10		98.6	80-120	1.31	20	
1,2,4-Trimethylbenzene	10	ug/L	10		105	77-120	1.83	20	
1,3,5-Trimethylbenzene	10	ug/L	10		103	67-120	0.195	22	
1,3-Dichlorobenzene	10	ug/L	10		102	74-145	3.39	20	
1,3-Dichloropropene (Total)	20	ug/L	20		99.3	73-121	0.902	20	
1,4-Dichlorobenzene	10	ug/L	10		102	69-135	0.983	20	
2-Butanone (MEK)	92	ug/L	100		91.8	53-130	0.705	20	
2-Hexanone	89	ug/L	100		88.8	51-137	1.01	20	
4-Methyl-2-pentanone (MIBK)	99	ug/L	100		98.5	57-129	0.254	20	
Acetone	96	ug/L	100		95.7	70-149	12.4	20	
Benzene	10	ug/L	10		101	80-120	3.30	20	
Bromochloromethane	10	ug/L	10		104	80-120	4.05	20	
Bromodichloromethane	9.6	ug/L	10		95.5	80-120	2.38	20	
Bromoform	9.6	ug/L	10		96.3	76-120	5.00	20	
Bromomethane	13	ug/L	10		126	76-137	11.7	20	
Carbon disulfide	10	ug/L	10		103	71-146	3.52	20	
Carbon tetrachloride	9.4	ug/L	10		94.5	75-120	6.95	20	
Chlorobenzene	9.6	ug/L	10		96.1	80-120	4.67	20	
Chloroethane	9.2	ug/L	10		92.4	80-123	8.30	20	
Chloroform	9.8	ug/L	10		98.5	80-120	6.39	20	
Chloromethane	9.6	ug/L	10		95.9	70-126	4.39	20	

SunLabs

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

Batch No: **B004201**
Test: **8260 VOC/NAPH**

Analyte	Result	Units	Spike Level	Parent Result	%REC	%REC Limits	RPD	RPD Limit	Flags
LCS Dup (B004201-BSD1)			Prepared & Analyzed: 03/28/14						
cis-1,2-Dichloroethene	9.9	ug/L	10		98.6	80-120	1.51	20	
Dibromochloromethane	9.5	ug/L	10		95.1	80-120	8.36	20	
Dibromomethane	10	ug/L	10		100	80-120	0.300	20	
Dichlorodifluoromethane	9.2	ug/L	10		92.4	78-128	0.870	20	
Ethylbenzene	9.6	ug/L	10		95.5	80-120	1.56	20	
Isopropylbenzene	10	ug/L	10		100	80-120	2.36	20	
Methylene Chloride	9.3	ug/L	10		93.0	72-145	3.80	20	
Methyl tert-Butyl Ether (MTBE)	9.6	ug/L	10		95.8	80-120	4.99	20	
Naphthalene	10	ug/L	10		99.5	66-136	11.8	20	
Styrene	9.3	ug/L	10		93.1	80-120	2.28	20	
Tetrachloroethene	10	ug/L	10		105	80-120	0.759	20	
Toluene	10	ug/L	10		101	74-127	1.66	20	
Xylenes (Total)	33	ug/L	30		110	74-129	2.98	20	
trans-1,2-Dichloroethene	9.8	ug/L	10		98.5	80-120	3.39	20	
Trichloroethene	10	ug/L	10		102	80-120	0.785	20	
Trichlorofluoromethane	9.8	ug/L	10		98.0	74-127	0.610	20	
Vinyl chloride	9.3	ug/L	10		93.1	78-131	3.05	20	
Duplicate (B004201-DUP1)	**Parent Sample: 4032701-17**		Prepared & Analyzed: 03/28/14						
Surrogate: 4-Bromofluorobenzene	47	ng/mL	50		94.1	82-118			
Surrogate: Dibromofluoromethane	51	ng/mL	50		101	85-120			
Surrogate: Toluene-d8	47	ng/mL	50		93.7	83-115			
1,1,1-Trichloroethane	0.19 U	ug/L		ND				200	
1,1,2,2-Tetrachloroethane	0.19 U	ug/L		ND				200	
1,1,2-Trichloroethane	0.92 U	ug/L		ND				200	
1,1-Dichloroethane	0.23 U	ug/L		ND				200	
1,1-Dichloroethene	0.34 U	ug/L		ND				200	
1,2-Dichlorobenzene	0.40 U	ug/L		ND				200	
1,2-Dichloroethane	0.24 U	ug/L		ND				200	
1,2-Dichloropropane	0.28 U	ug/L		ND				200	
1,2,4-Trimethylbenzene	0.37 U	ug/L		ND				200	
1,3,5-Trimethylbenzene	0.24 U	ug/L		ND				200	
1,3-Dichlorobenzene	0.34 U	ug/L		ND				200	
1,3-Dichloropropene (Total)	0.11 U	ug/L		ND				200	
1,4-Dichlorobenzene	0.21 U	ug/L		ND				200	
2-Butanone (MEK)	2.1 U	ug/L		ND				200	
2-Hexanone	1.5 U	ug/L		ND				200	
4-Methyl-2-pentanone (MIBK)	1.3 U	ug/L		ND				200	
Acetone	6.9 U	ug/L		ND				200	
Benzene	0.23 U	ug/L		ND				200	
Bromochloromethane	0.18 U	ug/L		ND				200	
Bromodichloromethane	0.19 U	ug/L		ND				200	
Bromoform	0.35 U	ug/L		ND				200	
Bromomethane	0.43 U	ug/L		ND				200	
Carbon disulfide	0.35 U	ug/L		ND				200	
Carbon tetrachloride	0.18 U	ug/L		ND				200	
Chlorobenzene	0.19 U	ug/L		ND				200	
Chloroethane	0.36 U	ug/L		ND				200	
Chloroform	0.19 U	ug/L		ND				200	
Chloromethane	0.32 U	ug/L		ND				200	
cis-1,2-Dichloroethene	0.22 U	ug/L		ND				200	

Batch No: **B004201**

Test: **8260 VOC/NAPH**

Analyte	Result	Units	Spike Level	Parent Result	%REC	%REC Limits	RPD	RPD Limit	Flags
Duplicate (B004201-DUP1)	**Parent Sample: 4032701-17**		Prepared & Analyzed: 03/28/14						
Dibromochloromethane	0.33 U	ug/L		ND				200	
Dibromomethane	0.25 U	ug/L		ND				200	
Dichlorodifluoromethane	0.42 U	ug/L		ND				200	
Ethylbenzene	0.20 U	ug/L		ND				200	
isopropylbenzene	0.26 U	ug/L		ND				200	
Methylene Chloride	0.65 U	ug/L		ND				200	
Methyl tert-Butyl Ether (MTBE)	0.28 U	ug/L		ND				200	
Naphthalene	0.23 U	ug/L		1.2			200	200	
Styrene	0.23 U	ug/L		ND				200	
Tetrachloroethene	0.36 U	ug/L		ND				200	
Toluene	0.20 U	ug/L		ND				200	
Xylenes (Total)	0.22 U	ug/L		ND				200	
trans-1,2-Dichloroethene	0.22 U	ug/L		ND				200	
Trichloroethene	0.48 U	ug/L		ND				200	
Trichlorofluoromethane	0.51 U	ug/L		ND				200	
Vinyl chloride	0.25 U	ug/L		ND				200	
Matrix Spike (B004201-MS1)	**Parent Sample: 4032701-19**		Prepared & Analyzed: 03/28/14						
Surrogate: 4-Bromofluorobenzene	47	ng/mL	50		94.8	82-118			
Surrogate: Dibromofluoromethane	49	ng/mL	50		97.7	85-120			
Surrogate: Toluene-d8	49	ng/mL	50		98.0	83-115			
1,1,1-Trichloroethane	9.5	ug/L	10	ND	95.0	71-120			
1,1,2,2-Tetrachloroethane	8.5	ug/L	10	ND	84.9	71-124			
1,1,2-Trichloroethane	9.5	ug/L	10	ND	95.1	77-127			
1,1-Dichloroethane	8.7	ug/L	10	ND	87.4	79-120			
1,1-Dichloroethene	9.4	ug/L	10	ND	93.9	63-126			
1,2-Dichlorobenzene	9.0	ug/L	10	ND	89.5	80-122			
1,2-Dichloroethane	8.8	ug/L	10	ND	88.1	81-122			
1,2-Dichloropropane	8.4	ug/L	10	ND	84.4	80-120			
1,2,4-Trimethylbenzene	9.0	ug/L	10	ND	89.8	52-129			
1,3,5-Trimethylbenzene	8.7	ug/L	10	ND	86.8	46-129			
1,3-Dichlorobenzene	8.6	ug/L	10	ND	85.9	60-154			
1,3-Dichloropropene (Total)	17	ug/L	20	ND	83.9	57-120			
1,4-Dichlorobenzene	8.9	ug/L	10	ND	89.1	68-135			
2-Butanone (MEK)	75	ug/L	100	ND	75.3	55-143			
2-Hexanone	75	ug/L	100	ND	75.1	51-150			
4-Methyl-2-pentanone (MIBK)	86	ug/L	100	ND	85.8	61-135			
Acetone	92	ug/L	100	ND	92.4	45-169			
Benzene	9.4	ug/L	10	ND	94.2	45-149			
Bromochloromethane	8.6	ug/L	10	ND	86.5	80-120			
Bromodichloromethane	8.7	ug/L	10	ND	86.8	80-123			
Bromoform	8.2	ug/L	10	ND	81.6	65-120			
Bromomethane	10	ug/L	10	ND	104	56-160			
Carbon disulfide	9.0	ug/L	10	ND	90.1	74-143			
Carbon tetrachloride	9.4	ug/L	10	ND	93.6	70-120			
Chlorobenzene	8.7	ug/L	10	ND	87.2	73-120			
Chloroethane	9.3	ug/L	10	ND	93.2	76-129			
Chloroform	9.1	ug/L	10	ND	91.2	77-122			
Chloromethane	8.7	ug/L	10	ND	87.4	58-147			
cis-1,2-Dichloroethene	8.7	ug/L	10	ND	87.2	75-121			
Dibromochloromethane	8.2	ug/L	10	ND	81.5	74-120			

SunLabs

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

Batch No: B004201

Test: 8260 VOC/NAPH

Analyte	Result	Units	Spike Level	Parent Result	%REC	%REC Limits	RPD	RPD Limit	Flags
Matrix Spike (B004201-MS1)	**Parent Sample: 4032701-19**			Prepared & Analyzed: 03/28/14					
Dibromomethane	9.3	ug/L	10	ND	92.6	80-120			
Dichlorodifluoromethane	9.1	ug/L	10	ND	91.0	57-145			
Ethylbenzene	8.4	ug/L	10	ND	83.8	73-120			
Isopropylbenzene	8.8	ug/L	10	ND	88.3	68-120			
Methylene Chloride	7.5	ug/L	10	ND	75.4	66-141			
Methyl tert-Butyl Ether (MTBE)	8.2	ug/L	10	ND	81.7	79-128			
Naphthalene	7.8	ug/L	10	0.53	72.4	54-145			
Styrene	7.7	ug/L	10	ND	76.8	42-130			
Tetrachloroethene	9.3	ug/L	10	ND	92.7	57-141			
Toluene	8.8	ug/L	10	ND	88.0	62-122			
Xylenes (Total)	28	ug/L	30	ND	94.1	44-136			
trans-1,2-Dichloroethene	9.0	ug/L	10	ND	90.5	72-120			
Trichloroethene	9.9	ug/L	10	ND	99.1	66-124			
Trichlorofluoromethane	8.9	ug/L	10	ND	89.0	62-138			
Vinyl chloride	8.9	ug/L	10	ND	89.0	71-142			

Batch No: B004254

Test: 8260 VOC/NAPH

Analyte	Result	Units	Spike Level	Parent Result	%REC	%REC Limits	RPD	RPD Limit	Flags
Blank (B004254-BLK1)				Prepared & Analyzed: 04/02/14					
Surrogate: 4-Bromofluorobenzene	50	ng/mL	50		99.2	82-118			
Surrogate: Dibromofluoromethane	53	ng/mL	50		106	85-120			
Surrogate: Toluene-d8	47	ng/mL	50		94.4	83-115			
1,1,1-Trichloroethane	0.19 U	ug/L							
1,1,2,2-Tetrachloroethane	0.19 U	ug/L							
1,1,2-Trichloroethane	0.92 U	ug/L							
1,1-Dichloroethane	0.23 U	ug/L							
1,1-Dichloroethene	0.34 U	ug/L							
1,2-Dichlorobenzene	0.40 U	ug/L							
1,2-Dichloroethane	0.24 U	ug/L							
1,2-Dichloropropane	0.28 U	ug/L							
1,3,5-Trimethylbenzene	0.24 U	ug/L							
1,2,4-Trimethylbenzene	0.37 U	ug/L							
1,3-Dichlorobenzene	0.34 U	ug/L							
1,3-Dichloropropene (Total)	0.11 U	ug/L							
1,4-Dichlorobenzene	0.21 U	ug/L							
2-Butanone (MEK)	2.1 U	ug/L							
2-Hexanone	1.5 U	ug/L							
4-Methyl-2-pentanone (MIBK)	1.3 U	ug/L							
Acetone	6.9 U	ug/L							
Benzene	0.23 U	ug/L							
Bromochloromethane	0.18 U	ug/L							
Bromodichloromethane	0.19 U	ug/L							
Bromoform	0.35 U	ug/L							
Bromomethane	0.43 U	ug/L							
Carbon disulfide	0.35 U	ug/L							
Carbon tetrachloride	0.18 U	ug/L							

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

Batch No: **B004254**
Test: **8260 VOC/NAPH**

Analyte	Result	Units	Spike Level	Parent Result	%REC	%REC Limits	RPD	RPD Limit	Flags
Blank (B004254-BLK1)			Prepared & Analyzed: 04/02/14						
Chlorobenzene	0.19 U	ug/L							
Chloroethane	0.36 U	ug/L							
Chloroform	0.19 U	ug/L							
Chloromethane	0.32 U	ug/L							
cis-1,2-Dichloroethene	0.22 U	ug/L							
Dibromochloromethane	0.33 U	ug/L							
Dibromomethane	0.25 U	ug/L							
Dichlorodifluoromethane	0.42 U	ug/L							
Ethylbenzene	0.20 U	ug/L							
isopropylbenzene	0.26 U	ug/L							
Methylene Chloride	0.65 U	ug/L							
Methyl tert-Butyl Ether (MTBE)	0.28 U	ug/L							
Naphthalene	0.23 U	ug/L							
Styrene	0.23 U	ug/L							
Tetrachloroethene	0.36 U	ug/L							
Toluene	0.20 U	ug/L							
Xylenes (Total)	0.22 U	ug/L							
trans-1,2-Dichloroethene	0.22 U	ug/L							
Trichloroethene	0.48 U	ug/L							
Trichlorofluoromethane	0.51 U	ug/L							
Vinyl chloride	0.25 U	ug/L							
LCS (B004254-BS1)			Prepared & Analyzed: 04/02/14						
Surrogate: 4-Bromofluorobenzene	50	ng/mL	50		99.2	82-118			
Surrogate: Dibromofluoromethane	50	ng/mL	50		99.3	85-120			
Surrogate: Toluene-d8	50	ng/mL	50		99.4	83-115			
1,1,1-Trichloroethane	10	ug/L	10		103	78-120			
1,1,2,2-Tetrachloroethane	9.7	ug/L	10		96.9	69-124			
1,1,2-Trichloroethane	10	ug/L	10		99.5	80-125			
1,1-Dichloroethane	9.9	ug/L	10		99.2	80-120			
1,1-Dichloroethene	9.4	ug/L	10		94.3	80-120			
1,2-Dichlorobenzene	9.6	ug/L	10		96.3	80-120			
1,2-Dichloroethane	10	ug/L	10		103	80-120			
1,2-Dichloropropane	9.7	ug/L	10		96.6	80-120			
1,3,5-Trimethylbenzene	9.4	ug/L	10		93.9	67-120			
1,2,4-Trimethylbenzene	10	ug/L	10		103	77-120			
1,3-Dichlorobenzene	10	ug/L	10		99.5	74-145			
1,3-Dichloropropene (Total)	19	ug/L	20		96.2	73-121			
1,4-Dichlorobenzene	9.9	ug/L	10		98.7	69-135			
2-Butanone (MEK)	89	ug/L	100		89.4	53-130			
2-Hexanone	84	ug/L	100		84.0	51-137			
4-Methyl-2-pentanone (MIBK)	86	ug/L	100		86.4	57-129			
Acetone	92	ug/L	100		92.0	70-149			
Benzene	9.8	ug/L	10		97.8	80-120			
Bromochloromethane	10	ug/L	10		102	80-120			
Bromodichloromethane	9.1	ug/L	10		91.3	80-120			
Bromoform	9.2	ug/L	10		91.5	76-120			
Bromomethane	9.9	ug/L	10		99.1	76-137			
Carbon disulfide	10	ug/L	10		102	71-146			
Carbon tetrachloride	10	ug/L	10		102	75-120			
Chlorobenzene	9.7	ug/L	10		96.9	80-120			

Batch No: **B004254**

Test: **8260 VOC/NAPH**

Analyte	Result	Units	Spike Level	Parent Result	%REC	%REC Limits	RPD	RPD Limit	Flags
LCS (B004254-BS1)			Prepared & Analyzed: 04/02/14						
Chloroethane	11	ug/L	10		110	80-123			
Chloroform	9.5	ug/L	10		94.6	80-120			
Chloromethane	9.9	ug/L	10		99.0	70-126			
cis-1,2-Dichloroethene	9.6	ug/L	10		95.5	80-120			
Dibromochloromethane	9.2	ug/L	10		92.1	80-120			
Dibromomethane	9.6	ug/L	10		95.5	80-120			
Dichlorodifluoromethane	9.3	ug/L	10		92.7	78-128			
Ethylbenzene	9.5	ug/L	10		95.4	80-120			
isopropylbenzene	9.6	ug/L	10		96.4	80-120			
Methylene Chloride	8.4	ug/L	10		84.4	72-145			
Methyl tert-Butyl Ether (MTBE)	9.5	ug/L	10		95.1	80-120			
Naphthalene	9.2	ug/L	10		91.9	66-136			
Styrene	9.0	ug/L	10		90.4	80-120			
Tetrachloroethene	9.9	ug/L	10		99.1	80-120			
Toluene	9.6	ug/L	10		96.4	74-127			
Xylenes (Total)	32	ug/L	30		106	74-129			
trans-1,2-Dichloroethene	9.6	ug/L	10		95.7	80-120			
Trichloroethene	9.8	ug/L	10		98.3	80-120			
Trichlorofluoromethane	9.5	ug/L	10		95.2	74-127			
Vinyl chloride	9.4	ug/L	10		93.8	78-131			
LCS Dup (B004254-BSD1)			Prepared & Analyzed: 04/02/14						
Surrogate: 4-Bromofluorobenzene	50	ng/mL	50		100	82-118			
Surrogate: Dibromofluoromethane	49	ng/mL	50		98.0	85-120			
Surrogate: Toluene-d8	50	ng/mL	50		99.5	83-115			
1,1,1-Trichloroethane	10	ug/L	10		105	78-120	1.63	20	
1,1,2,2-Tetrachloroethane	9.7	ug/L	10		96.9	69-124	0.00	20	
1,1,2-Trichloroethane	10	ug/L	10		100	80-125	0.601	20	
1,1-Dichloroethane	9.3	ug/L	10		93.3	80-120	6.13	20	
1,1-Dichloroethene	9.4	ug/L	10		94.0	80-120	0.319	20	
1,2-Dichlorobenzene	9.6	ug/L	10		95.6	80-120	0.730	20	
1,2-Dichloroethane	9.2	ug/L	10		92.2	80-120	10.8	20	
1,2-Dichloropropane	9.5	ug/L	10		94.8	80-120	1.88	20	
1,2,4-Trimethylbenzene	10	ug/L	10		101	77-120	1.67	20	
1,3,5-Trimethylbenzene	10	ug/L	10		99.6	67-120	5.89	22	
1,3-Dichlorobenzene	10	ug/L	10		99.5	74-145	0.00	20	
1,3-Dichloropropene (Total)	19	ug/L	20		94.5	73-121	1.73	20	
1,4-Dichlorobenzene	9.6	ug/L	10		96.5	69-135	2.25	20	
2-Butanone (MEK)	87	ug/L	100		87.4	53-130	2.23	20	
2-Hexanone	86	ug/L	100		85.7	51-137	1.92	20	
4-Methyl-2-pentanone (MIBK)	87	ug/L	100		86.9	57-129	0.623	20	
Acetone	88	ug/L	100		87.6	70-149	4.92	20	
Benzene	9.2	ug/L	10		92.4	80-120	5.68	20	
Bromochloromethane	9.5	ug/L	10		95.4	80-120	6.39	20	
Bromodichloromethane	9.4	ug/L	10		94.2	80-120	3.13	20	
Bromoform	8.9	ug/L	10		89.0	76-120	2.77	20	
Bromomethane	10	ug/L	10		101	76-137	1.60	20	
Carbon disulfide	9.4	ug/L	10		93.9	71-146	8.27	20	
Carbon tetrachloride	9.8	ug/L	10		97.6	75-120	4.60	20	
Chlorobenzene	9.6	ug/L	10		96.3	80-120	0.621	20	
Chloroethane	12	ug/L	10		118	80-123	7.62	20	

SunLabs Project Number	Cardno TBE, Inc.
4032618	Project Description: Northwood Anchor Site

Batch No: **B004254**
Test: **8260 VOC/NAPH**

Analyte	Result	Units	Spike Level	Parent Result	%REC	%REC Limits	RPD	RPD Limit	Flags
LCS Dup (B004254-BSD1)			Prepared & Analyzed: 04/02/14						
Chloroform	9.0	ug/L	10		90.2	80-120	4.76	20	
Chloromethane	9.5	ug/L	10		95.0	70-126	4.12	20	
cis-1,2-Dichloroethene	9.0	ug/L	10		90.0	80-120	5.93	20	
Dibromochloromethane	9.4	ug/L	10		94.3	80-120	2.36	20	
Dibromomethane	9.3	ug/L	10		92.8	80-120	2.87	20	
Dichlorodifluoromethane	8.8	ug/L	10		88.3	78-128	4.86	20	
Ethylbenzene	9.4	ug/L	10		94.4	80-120	1.05	20	
isopropylbenzene	10	ug/L	10		102	80-120	5.55	20	
Methylene Chloride	8.7	ug/L	10		86.8	72-145	2.80	20	
Methyl tert-Butyl Ether (MTBE)	9.3	ug/L	10		93.1	80-120	2.13	20	
Naphthalene	10	ug/L	10		102	66-136	10.4	20	
Styrene	9.1	ug/L	10		90.8	80-120	0.442	20	
Tetrachloroethene	9.4	ug/L	10		93.6	80-120	5.71	20	
Toluene	9.3	ug/L	10		92.9	74-127	3.70	20	
Xylenes (Total)	31	ug/L	30		104	74-129	2.00	20	
trans-1,2-Dichloroethene	9.0	ug/L	10		89.9	80-120	6.25	20	
Trichloroethene	9.1	ug/L	10		91.1	80-120	7.60	20	
Trichlorofluoromethane	10	ug/L	10		99.7	74-127	4.62	20	
Vinyl chloride	8.5	ug/L	10		85.1	78-131	9.73	20	

Samples Associated with QC Batches

QC Batch ID	Method	Sample List
B004195	EPA 8260	4032618-01, 4032618-02, 4032618-03, 4032618-04, 4032618-05, 4032618-06, 4032618-07, 4032618-08, 4032618-09, 4032618-10, 4032618-11, 4032618-12
B004199	SM2540 C	4032618-01, 4032618-02, 4032618-03, 4032618-04, 4032618-05, 4032618-06, 4032618-07, 4032618-08, 4032618-09
B004201	EPA 8260	4032618-02RE1, 4032618-03RE1, 4032618-05RE1, 4032618-06RE1, 4032618-09RE1, 4032618-10RE1, 4032618-12RE1
B004254	EPA 8260	4032618-02RE2, 4032618-12RE2

SunLabs, Inc. Chain of Custody

№ 42218

Client Name: Cardno TBE
Contact: Terry Griffin
Address: on file
Phone / Fax:
E-Mail :

SunLabs Project # 4032618

Project Name: Northwood Anchor Site
Project #: 00029.031.00
PO #:
Alt Bill To:

SunLabs Sample #	Sample Description	Sampled Date	Sampled Time	# of Bottles	Bottle Type	Preservative	Matrix	Analysis / Method Requested: VOC 8260 + Naph	Analysis / Method Requested: TDS
					GV	P			
					H	I			
					GW	GW			
-01	TBE-3W	3.24.14	1011	4				✓	✓
02	TBE-4W	3.25.14	1053	4				✓	✓
03	TBE-5W	3.24.14	1302	4				✓	✓
04	TBE-6DW	3.25.14	1009	4				✓	✓
05	TBE-7R	3.25.14	1722	4				✓	✓
06	TBE-8	3.24.14	1113	4				✓	✓
07	TBE-10	3.25.14	1444	4				✓	✓
08	MW-B3	3.24.14	1040	4				✓	✓
09	MW-B4	3.25.14	1644	4				✓	✓
10	EQ-1	3.25.14	1740	3				✓	
11	Trip Blank	—	—	2					
12	DUP-1	3.25.14	—	3				✓	

Due Date Requested*:

☐ FDEP PreApproval site
☐ ADaPT EDD (PGM:_____)
Facility/Site ID:

Remarks / Comments:
Run trip per PM request

Length of Record Retention if other than 5 years:*

Sampler Signature / Date: 3.25.14

Printed Name / Affiliation: James Wilson/Cardno

SUNLABS, INC. RESERVES THE RIGHT TO BILL FOR DISPOSAL OF UNUSED/ UNRETURNED SAMPLES AND TO RETURN UNUSED SAMPLES.

Relinquished By:	Relinquished To:	Date:	Time:
		3/12/14	13:47
Relinquished By:	Relinquished To:	Date:	Time:
		3.26.14	1240
Relinquished By:	Relinquished To:	Date:	Time:
Relinquished By:	Relinquished To:	Date:	Time:

Bottle Type Codes:
GV = Glass Vial; GVS = Low Level Volatile Kit
GA = Glass Amber; T = Tedlar Bag
P = Plastic; O = Other (Specify)
S = Soil Jar

Preservative Codes:
H = Hydrochloric Acid + Ice; S = Sulfuric Acid + Ice
I = Ice only; VS = NaHSO4, MeOH, + Ice
N = Nitric Acid; T = Sodium thiosulfate + ice
B = Sodium bisulfate + Ice; O = Other (Specify)

Matrix Codes:
A = Air; SO = Soil; SOL = Solid
DW = Drinking Water; SW = Surface Water
GW = Ground Water; WS = Waste; WW = Waste Water
SE = Sediment; W = Water (Blanks); O = Other (Specify:_____)

Internal Use Only
Temp upon receipt: 1.2, 2.3 °C
Received on Ice? (Y) N / NA

Internal Use Only
Sample Condition Upon Receipt:
Custody Seals present? Y (N) NA
Custody Seals intact? Y / N (NA)
Shipping Bills attached? Y / N (NA)
Sample containers intact? (Y) N / NA
Samples within holding times? (Y) N / NA
Sufficient volume for all analyses? (Y) N / NA
Are vials head-space free? (Y) N / NA
Proper containers and preservatives? (Y) N / NA

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Rev 11/11

* See General Terms and Conditions on Reverse

APPENDIX F
AIR SPARGE AND SOIL VAPOR EXTRACTION DESIGN CALCULATIONS

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PROJ. NO.:

AIR INJECTION SYSTEM DESIGN (AIR SPARGING)

Injection pressure must be adequate to overcome the summation of the static head pressure, the capillary entry resistance and frictional losses in the system.

Static head pressure (P_H)

Depth of deepest well =	25	ft
Depth to water =	10	ft
Depth of water column at point of injection =	15	ft
Specific weight of water =	62.4	lb/ft3

P_H = (62.4 lb/ft3) / (144 in^2/ft) ´ Depth of water column

6.5 psi

Capillary entry resistance (P_E)

Nyer and Suthersan, et. al. suggest a value of 2.3 ft H_2O per 3 ft saturated thickness for a silty sand and 2.3 ft H2O per 5 ft saturated thickness for coarse gravel.

P_E = 2.3 ft ´ (depth of water column/3 ft)

P_E = 5.0 psi

Pressure drop from piping (including fittings, elbows, etc.) (P_L)

h_L/L = head loss per foot of tubing in psi

h_L/L =	0.065	psi/ft	From nomograph or calculation
L =	414	ft	Equivalent length (Actual + 20%)

$P_L = (h_L/L)$ ´ L

P_L = 26.9 psi

Required pressure (P_{REQ})

$P_{REQ} = P_H + P_E + P_L$

P_{REQ} = 38.4 psi

Safety Factor of 20%

P_{REQ} = 46.1 psi

Proposed number of sparge wells	12			
Desired Air Flow at each well	5	cfm		
Total flow required by compressor	**60**	**cfm**		
Select a compressor capable of providing	60	cfm at a pressure of	46	psi

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HEADLOSS (PIPING - AIR SPARGE)

$$\frac{h_L}{L} = \frac{fV^2}{2gD}$$ Darcy-Weisbach equation (pipe friction equation)

Determine f from Reynolds number, Relative roughness (e/D), and Moody Diagram

Reynolds Number (Re)

$$\mathrm{Re} = \frac{DV}{\upsilon}$$

D=	1	in	=	0.08 ft
Q=	60	cfm	1.00 cfs	
V=	183.3	ft/s		
n=	0.000164	ft^2/s	viscosity of air at 70° F	
Re =	93,164		For Laminar flow Re<2000, f = 64/R	
e=	0.000005	ft (for smooth pipe)		
D=	0.1	ft		
e/D=	0.00006			

		Blasius	Koku
From Moody Diagram or calculation (f = 64/R), f =	0.02	0.0181	0.02

r =	0.075	lb/ft^3
h_L/L =	9.396	psf/ft
	0.06525	psi/ft
	1.8069	in H_2O/ft
	0.15057	ft H_2O/ft
L =	345	ft Equivalent length
h_L=	51.95	ft H_2O
	45.8	in Hg
	22.6	psi

Headloss to be incorporated into selection of appropriate equipment.

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SOIL VAPOR EXTRACTION DESIGN WORKSHEET

I. Method and Governing Design Equations

The governing equations used to design the soil vapor extraction system have been taken from the method of Johnson, et. al. in "A Practical Approach to the Design, Operation and Monitoring of In-Situ Soil Venting Operations", Shell Oil Company/Shell Development, Westhollow Research Center, 1990.

It has been proposed by Johnson, et. al. that an estimate of the vapor flowrate may be calculated from the following relation:

$$Q = \frac{p*k*Pw*H*[1-(Patm/Pw)^2]}{m*Ln(Rw/Ri)}$$

where:

Q =	estimated vapor flowrate [cm^3/s]
k =	soil permeability to air flow [cm^2]
m =	viscosity of air [g/cm*s]
Pw =	absolute pressure at the extraction well [$g/cm*s^2$]
Patm =	absolute ambient pressure [$g/cm*s^2$]
Rw =	radius of vapor extraction well [cm]
Ri =	radius of influence of vapor extraction well [cm]
H =	thickness of unsaturated zone exposed to vapor flow (screen thickness) [cm]

To calculate the vapor flowrate , it is necessary to determine the soil permeability to air flow from the following equation:

$$k = (m_g * Kg)/(r * g)$$

Kg =	gas conductivity	[cm/sec]
r_g =	density of gas	[g/cm3]
m_g =	viscosity of gas	[g/cm*s]
g =	gravitational acceleration	[cm/sec^2]

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SOIL VAPOR EXTRACTION DESIGN WORKSHEET

II. Project Design Parameters

Based on historical information and literature summarized in "References" section of this report.

Parameter	Value	Unit	Method/Conversion	
Aquifer hydraulic conductivity:	3.0	ft/day	Slug Test	
Gas conductivity:	0.2	ft/day	0.00008	cm/sec
Viscosity of air:	0.00018	g/cm-s		
Absolute ambient pressure:	406.8	in H_2O	1.01E+06	$g/cm*s^2$
Absolute pressure/vapor well:	-30	in H_2O	935516	$g/cm*s^2$
Exposed thickness:	5	ft	152	cm
Soil permeability to air flow:	1.06E-08	cm^2	1.1	darcy
Radius of proposed vapor well:	2	in	5.08	cm
Radius of Influence	15	ft	457	cm
Piping Headloss	12	in H_2O		

III. Calculated Results

From Johnson, et. al, "A Practical Approach to the Design, Operation, and Monitoring of In-Situ Soil Venting Systems

$$Q = \frac{(p)(k)(P_W)\,(1-(P_{ATM}/P_W)^2}{(m)(\ln(R_W/R_I)}$$

k= soil permeability to air flow (cm^2) or (darcy)
m= viscosity of air = 1.8×10^{-4} g/cm-s or 0.018 cp
P_W= absolute pressure at extraction well ($g/cm-s^2$) or (atm)
P_{ATM}= absolute ambient pressure » 1.01×10^6 $g/cm-s^2$ or 1 atm
R_W= radius of vapor extraction well (cm)
R_I= radius of influence of vapor extraction well (cm)

Est. vapor flowrate/well:	2	acfm per well			
Total Number of Design Wells:	20	per set	**Total Flow Reqd:**	**40 acfm**	
Select a blower capable of providing		40	cfm at a vacuum of	42	in H_2O