Operations & Maintenance Report
Fourth Quarter 2014

TOC Holdings Co.
Facility No. 01-176
24205 56th Avenue West
Mountlake Terrace WA 98043

Prepared for:
TOC Holdings Co.
2737 West Commodore Way
Seattle WA 98199

Prepared by:
Stantec Consulting Services Inc.
19101 36th Avenue West, Ste. 203
Lynnwood WA 98036
Phone: 425.977.4994

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Sign-off Sheet

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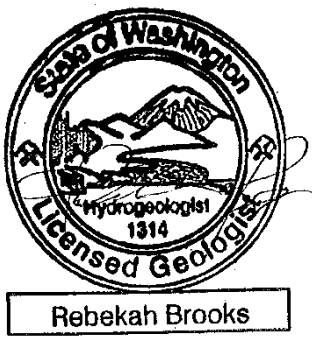
This document was prepared under the supervision and direction of the following key staff.

Prepared by: **Jeremy Fleege, PE**
Environmental Engineer

Reviewed by: **Rebekah Brooks, LG, LHg**
Senior Associate, Hydrogeology / Project Manager



Reviewed by: **Marty Minter, PG, RG**
Manager, Geology

Stantec

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Acronyms & Abbreviations

µg/L	micrograms per liter
AO	Agreed Order
AWS	Air/Water Separator
BTEX	Benzene, Toluene, Ethylbenzene and Total Xylenes
CatOx	Catalytic Oxidizer
City	City of Mountlake Terrace, Washington
DMR	Discharge Monitoring Report
DPE	Dual-Phase Extraction
Ecology	Washington State Department of Ecology
GAC	Granular-Activated Carbon
gallons/day	gallons per day
gallons/minute	gallons per minute
GRPH	Gasoline-Range Petroleum Hydrocarbons
HydroCon	HydroCon Environmental, LLC
IRAWP	Interim Remedial Action Work Plan
lb/day	pounds per day
LNAPL	Light Nonaqueous-Phase Liquid
mg/m^3	milligrams per cubic meter
mL	milliliter
MPE	Multi-Phase Extraction
MSDS	Material Safety Data Sheets
MTCA	Model Toxics Control Act
NOC	Notice of Construction
O&M	Operation and Maintenance
OWS	Oil/Water Separator
ppm	parts per million
ppmv	parts per million by volume
PSCAA	Puget Sound Clean Air Agency
ROW	Right-of-Way
SEPA	State Environmental Protection Act
SES	SoundEarth Strategies, Inc.
Stantec	Stantec Consulting Services Inc.
SUP	Special Use Permit
SVE	Soil Vapor Extraction
SWD	State Waste Discharge
THPS	Tetrakis-Hydroxymethyl Phosphonium Sulfate
TOC	TOC Holdings Co.
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This report documents the **Fourth Quarter 2014** operation and maintenance (O&M) activities performed by Stantec Consulting Services Inc. (Stantec) on behalf of TOC Holdings Co. (TOC). Field activities associated with interim remedial actions were conducted from October through December 2014 at Facility No. 01-176 located in Mountlake Terrace, Snohomish County, Washington.

1.1 SCOPE OF WORK

Ongoing interim remedial actions are conducted under Agreed Order (AO) No. DE 8661, entered in October 2011 between TOC and the Washington State Department of Ecology (Ecology 2011) at Facility No. 01-176. The O&M scope of work is defined in the *Interim Remedial Action Work Plan* (IRAWP) prepared by the previous consultant overseeing the project, SoundEarth Strategies, Inc. (SES), and is included as Exhibit C of the AO (SES 2011). Per the requirements of the IRAWP, the O&M scope of work includes monthly and quarterly field events. As specified in the IRAWP, the "TOC Site" encompasses the following four properties located in Mountlake Terrace, Washington:

- **TOC Property:** 24205 56th Avenue West
- **TOC/Farmasonis Property**: 24225 56th Avenue West
- **Drake Property:** 24309 56th Avenue West
- **56th Avenue West Right-of-Way (ROW):** adjacent to the TOC, TOC/Farmasonis and Drake properties

Elements of the O&M scope of work defined in the IRAWP encompass the four properties identified as the "TOC Site" as well as the following two adjacent properties:

- **Shin/Choi Property:** 24325 56th Avenue West (downgradient of the TOC Site)
- **242nd Street Southwest ROW:** adjacent to the TOC Property (upgradient of the TOC Site)

Following completion of the IRAWP, monitoring wells were installed on the following property:

- **Herman Property:** 24311 56th Avenue West (downgradient of the TOC Site)

O&M activities are conducted to document the performance of three multi-phase extraction (MPE) remediation systems (described in Section 2.0) located on the TOC Site. The MPE remediation systems were installed on the TOC Site for remediation of petroleum hydrocarbon-contaminated groundwater, vapor and free product (where present). The Unit 1 remediation system is located on the TOC Property and is associated with operation of remediation wells installed on the TOC Property. The Unit 2 and Unit 3 remediation systems are located on the TOC/Farmasonis Property and are associated with operation of remediation wells installed on the TOC/Farmasonis and Drake properties, respectively.

1.2 FOURTH QUARTER 2014 O&M ACTIVITIES

This report includes a description of the MPE systems, permit compliance, and performance and optimization efforts. A summary of the MPE system performance and maintenance activities performed by Stantec from October through December 2014 is provided below.

- O&M consisted of routine, scheduled maintenance activities (as described in the O&M Manual), as well as the following activities:
  - routine bag filter replacements;
  - replacement of steel Granular-Activated Carbon (GAC) canisters with stainless steel canisters at all units (three drums at Unit 1, one drum at Unit 2, and three drums at Unit 3), because of rusting and leakage; and
  - installation of valves (drain and bleed) on the bag filter housing at Unit 2 and Unit 3.
- A combined total of 141.2 pounds of vapor-phase hydrocarbons was removed during this reporting period, and a cumulative total of approximately 3,038 pounds has been removed since startup in October 2012.
- A combined total volume of 276,581 gallons of groundwater was extracted, treated and discharged during this period. The total volume of water processed since system startup is approximately 2,462,313 gallons.
- No light nonaqueous-phase liquid (LNAPL) was recovered from the three MPE systems during this quarter. Also, the oil/water separator (OWS) for each system was inspected, and no LNAPL was visible on the liquid contents.
- System optimization activities during this reporting period focused on balancing the flow of water through the OWS and addressing issues associated with the GAC canisters. These activities are described in more detail in the following sections.

2.0 REMEDIATION SYSTEM DESCRIPTION

The following sections provide a brief description of the remedial system history, current system configurations and a description of system modifications during this Quarter.

2.1 SYSTEM BACKGROUND

TOC (formerly Time Oil Co.) operated a retail gasoline station on the TOC Property between 1968 and 1990. One 8,000-gallon and two 6,000-gallon underground storage tanks were removed from the TOC Property in 1991. The TOC Property is currently vacant. In 1996, a dual-phase extraction (DPE) remediation system was installed at the TOC Property to remediate Shallow Zone groundwater impacted by petroleum hydrocarbons and remove LNAPL. The DPE system operated from February 1997 to June 2005 and was later removed following confirmation that the system effectively remediated Shallow Zone groundwater (SES 2013). In 2006, groundwater monitoring results collected by SES confirmed gasoline-related contamination extended directly downgradient of the TOC Property to the south and west.

Between 1992 and 2013, site investigations were conducted to determine the extent of petroleum contamination and led to the installation of 107 monitoring and remediation wells on the TOC Site and three adjacent properties (a portion of the 242nd Street Southwest ROW and the downgradient Herman and Shin/Choi properties). Six wells have been decommissioned. Currently, 101 active monitoring and remediation wells are installed in three groundwater zones (defined as Shallow, Intermediate, and Deep) on the TOC Site and three adjacent properties. Of the 101 active monitoring and remediation wells, 20 are installed in the Shallow Zone, 60 are installed in the Intermediate Zone, six wells are in the Deep Zone, and 15 wells have well screens intersecting multiple groundwater zones (either shallow-intermediate or intermediate-deep). The three groundwater zones are further discussed in the quarterly and annual groundwater monitoring reports prepared by Stantec.

In accordance with the AO entered between Ecology and TOC in October 2011 (described in Section 1.1), SES initiated a remedial investigation (RI) at the TOC Site and determined that remediation by the former DPE system in the Shallow Zone was effective, the DPE system was removed and three MPE systems were installed in the Intermediate Zone between November 2011 and August 2012. The three MPE systems (Units 1, 2 and 3) began operating in October 2012. MPE is an in situ remedial technology that simultaneously extracts multiple fluid phases from remediation wells. The phases generally include vapor phase, dissolved phase (i.e., groundwater), and LNAPL or free product.

2.2 SYSTEM CONFIGURATIONS

Each MPE system consists of a self-contained, aboveground equipment enclosure. The MPE system for the TOC Property (Unit 1) is located within a fenced enclosure on the TOC Property. The MPE systems for the TOC/Farmasonis Property (Unit 2) and Drake Property (Unit 3) are co-located within a single fenced enclosure on the TOC/Farmasonis Property. The three MPE systems are basically identical, with the exception of their orientation, mirror-image layouts, and the number of remediation wells serving each MPE system. A total of 23 remediation wells serve the three MPE systems: nine wells on the TOC Property, six wells on the TOC/Farmasonis Property, and eight wells on the Drake Property (**Figure 3**). It should be noted that MW84 (installed on the Drake Property and connected to Unit 3) was originally plumbed as a remediation well but currently serves as a monitoring well. According to SES field notes, the pump was removed from MW84 in July 2013 and reinstalled later the same month. The pump was again removed from MW84 in September 2013. Documentation of the purpose for removing the pump from MW84 does not exist in the SES files acquired by Stantec.

The table below identifies the remediation wells connected to each system and their location.

Wells Serving MPE Remediation Systems

System Name	System Location	Remediation Well ID	Remediation Well Location
Unit 1	TOC Property	• MW11 • MW29 • MW15 • MW32 • MW18 • MW90 • MW24 • MW91 • MW27	TOC Property
Unit 2	TOC/Farmasonis Property	• MW31 • MW92 • MW41 • MW93 • MW57 • MW94	TOC/Farmasonis Property
Unit 3	TOC/Farmasonis Property	• MW69 • MW97 • MW70 • MW98 • MW95 • MW99 • MW96 • MW101	Drake Property

The individual MPE equipment enclosures were custom fabricated in accordance with the Washington State Department of Labor and Industry requirements for factory-assembled structures. Each of the remediation wells is equipped with a down-hole pneumatic pump to extract petroleum-impacted groundwater (dissolved-phase petroleum hydrocarbons) and recoverable LNAPL. In addition, each MPE system is equipped with a soil vapor extraction (SVE) blower. The SVE blowers are intended to extract soil vapors (vapor-phase petroleum hydrocarbons) from the remediation wells and surrounding soil. Process piping is utilized to convey recovered fluids (groundwater and LNAPL) and vapor from the remediation wells to the MPE system enclosures. The piping and instrumentation diagram presented on **Figure 4** illustrates the process flow and major mechanical equipment associated with treatment systems. Extracted groundwater is conveyed to each MPE system for phase separation, treatment, and permitted discharge to the sanitary sewer in

accordance with Ecology State Waste Discharge Permit No. ST0007384. The extracted groundwater is processed through an OWS, which is designed to process up to 10 gallons per minute (gpm). The effluent from the OWS is pumped through three 55-gallon GAC canisters to remove dissolved phase volatile organic compounds (VOCs) prior to being discharged to the sanitary sewer. When present, LNAPL recovered with the OWS is temporarily stored in a 55-gallon product drum prior to disposal or recycling at an offsite facility.

The SVE blower(s) creates the vacuum pressure necessary to extract soil vapors from the remediation wells. The extracted soil vapors are processed through an air/water separator (AWS) and a catalytic oxidizer (CatOx), except as recently modified (see Section 2.3). The AWS removes particulate and liquids from the air stream to prevent damage to the SVE blower and ancillary equipment. The vapors are thermally treated by the CatOx prior to being discharged to the atmosphere, in accordance with the Puget Sound Clean Air Agency (PSCCA) Notice of Construction (NOC) No. 10384.

2.3 SYSTEM MODIFICATIONS

System modifications that were performed during this quarter are summarized below.

- Valves (drain and bleed) were installed on the bag filter housing at Unit 2 and Unit 3 to better facilitate bag filter change outs. This was completed during the Third Quarter 2014 at Unit 1.
- All remaining steel drums (GAC canisters) were replaced with stainless steel drums. This included replacing all three drums at Unit 1, one drum at Unit 2, and all three drums at Unit 3. The steel drums were replaced to address leakage caused from rusting, and to minimize drum degradation.
- Notification was provided to PSCAA on October 22, 2014, regarding shut-down of the CatOx unit at Unit 1 and commencing the 30-day notice for the CatOx removal. Prior to removal of the CatOx at Unit 1, an exceedance occurred on the influent sample (collected on October 22, 2014); therefore, the CatOx was not shut-down. The Unit 1 influent sample concentration of Gasoline-Range Petroleum Hydrocarbons (GRPH) on October 22, 2014 was 51.2 ppmv, exceeding the allowable, non-treated discharge value of 50 ppmv. Continued sampling and analysis will determine if a subsequent request for CatOx removal at Unit 1 can be made.

3.0 PERMITS

State, regional and local permit requirements apply to the interim remedial action. Pursuant to the Revised Code of Washington 70.105D.090(1), TOC's interim remedial actions under the AO are exempt from the procedural requirements of any laws requiring or authorizing local government permits or approvals; however, TOC must comply with the substantive requirements of such permits or approvals.

Local requirements for clearing, grading, and erosion control activities were addressed through review under the State Environmental Policy Act (SEPA), which included a public comment period through September 26, 2011. State and regional permit requirements beyond the jurisdiction of the AO are discussed below in Sections 3.1 (State Waste Discharge Permit), 3.2 (PSCAA Order of Approval), and 3.3 (Special Use Permit [SUP]).

3.1 STATE WASTE DISCHARGE PERMIT

State Waste Discharge Permit ST0007384 (SWD Permit) authorizes and regulates operation of and discharges from the three MPE systems on the TOC Site, effective July 2, 2012 through June 19, 2017.

Ecology's Water Quality Program administers the wastewater discharge permit, wastewater compliance sampling, record-keeping, and submittal schedule. Discharge Monitoring Reports (DMRs) are submitted to Ecology monthly. The DMR is a summary report which presents the monitoring data obtained during the monthly reporting period. A summary of the maximum daily effluent limits established by the permit are summarized below:

- The maximum daily volumes of water to be discharged to Outfalls 001 and 002 shall be 7,000 and 14,000 gallons per day (gallons/day), respectively.
- pH shall be between 6 and 10 Standard Units.
- Benzene concentrations shall not exceed 5 micrograms per liter (µg/L).
- Benzene, toluene, ethylbenzene and total xylene (BTEX) cumulative concentration shall not exceed 100 µg/L.
- Total petroleum hydrocarbons, gasoline range (GRPH) shall not exceed 1,000 µg/L.
- Total lead shall not exceed 1,090 µg/L.

The SWD Permit identifies two outfall locations where compliance with the maximum daily effluent limits must be attained: the MPE system for the TOC Property (Unit 1) discharges to Outfall 001; the MPE systems for the TOC/Farmasonis Property (Unit 2) and the Drake Property (Unit 3) discharge to Outfall 002. Effluent from each of the three MPE systems is sampled on a monthly basis at points adjacent to each MPE system **(Figure 5)**. Discharges from Units 2 and 3 combine after the effluent sampling points at approximately the location of Outfall 002. The minimum, maximum and average effluent concentrations are reported in the DMR submitted to Ecology.

3.2 PSCAA ORDER OF APPROVAL

PSCAA issued an Order of Approval for NOC 10384 on May 13, 2012, which establishes the conditions and restrictions for the operation of the CatOx units. The key conditions and restrictions are summarized below:

- All emissions from each of the three SVE blowers shall be routed through their associated CatOx.
- The flow through each CatOx shall not exceed 350 standard cubic feet per minute. The flow rate shall be monitored monthly.
- The temperature of the vapor entering the catalytic bed shall be at least 240 degrees Celsius (464 degrees Fahrenheit), and the temperature of the vapor exiting the oxidizer bed shall not exceed 620 degrees Celsius (1148 degrees Fahrenheit).
- The destruction and removal efficiency of the GRPH flowing into and out of the CatOx shall be 95 percent unless the concentration of GRPH in the vapor exiting the CatOx does not exceed 50 parts per million volume (ppmv).
- The CatOx units may be removed and SVE emissions can be vented directly to the atmosphere through a stack provided the benzene and GRPH concentrations remain below 0.5 and 50 ppmv, respectively, for a period of 3 consecutive months. The CatOx shall be reactivated if concentrations of benzene or GRPH exceed 0.5 or 50 ppmv, respectively.

3.3 SPECIAL USE PERMIT

The SUP executed between TOC and the City of Mountlake Terrace (City) addresses interim remedial activities that extend into City ROWs. Specifically, the SUP: (1) allows the discharge of treated wastewater to the City sanitary sewer network for conveyance to the City of Edmonds publicly owned treatment works under the State Waste Discharge Permit, and (2) retroactively administers the installation, maintenance, sampling, repair and/or decommissioning of monitoring wells that are located within City ROWs.

4.0 SYSTEM PERFORMANCE

According to SES data, prior to system startup in 2012, concentrations of BTEX and/or GRPH in groundwater exceeded their respective Washington State Model Toxics Control Act (MTCA) Method A Cleanup Levels in 17 of the 73 intermediate zone wells, including wells that intersect shallow-intermediate and intermediate-deep zone conditions. (Note that Stantec has re-evaluated the groundwater zone classifications at each well and some wells have been reclassified. This information is included in the groundwater monitoring reports.) Thirteen of these wells are connected to one of the three remediation systems. Based on groundwater data collected during the December 2014 sampling event, BTEX and/or GRPH concentrations in groundwater have decreased and only exceed the MTCA Method A levels in three (MW48, MW57 and MW73)of the 75 active wells installed in the Intermediate Zone, or wells that intersect shallow-intermediate and intermediate-deep zone conditions. One of these wells (MW57) is connected to a remediation system. These data will be presented in the *Fourth Quarter 2014 Groundwater Monitoring Report* prepared by Stantec.

4.1 TOC PROPERTY (UNIT 1)

The following is a summary of the **Fourth Quarter 2014** system O&M at the TOC Property:

- The MPE operation time this quarter was approximately 84 percent (**Table 1-1**). System down time was attributed to OWS high level conditions, mainly due to bag filter fouling, as well as containment high level in the GAC containment tray. The containment high level in the GAC containment sump was due to a leak in the first GAC, which was patched/repaired onsite.
- The vapor-phase hydrocarbon mass removal associated with the SVE system was approximately 132.0 pounds, and aqueous-phase hydrocarbon removal associated with the GAC treatment process was approximately 0.022 pounds for this reporting period. The cumulative vapor-phase and aqueous-phase hydrocarbon removal to date is approximately 2,183.9 pounds (**Tables 1-1, 1-2 and 1-3**).
- The volume of groundwater extracted during this reporting period was 53,355 gallons (**Tables 1-1 and 1-3**). The average flow rate of groundwater recovery was 650.7 gallons/day (**Tables 1-1 and 1-3**).
- No LNAPL was recovered from the OWS. Also, the OWS was inspected, and no LNAPL or sheen was visible on the liquid contents.
- The SVE daily mass removal rate ranged from 0.61 to 2.72 pounds per day (lb/day) during this Quarter (**Table 1-2**).
- The effluent concentration of GRPH exiting the CatOx was not detected at concentrations above the laboratory's lower reporting limit of 10 milligrams per cubic meter (mg/m^3; 2.329 ppmv; **Table 1-4**).
- All system operations were in compliance with Ecology's Water Quality Program and PSCAA permits (**Tables 1-4 and 1-5**).

4.2 TOC / FARMASONIS PROPERTY (UNIT 2)

The following is a summary of the **Fourth Quarter 2014** system O&M at the TOC/Farmasonis Property:

- The MPE operation time this quarter was approximately 66 percent (**Table 2-1**). System down time was mostly attributed to containment high level in the GAC containment tray. This was due to a leak in the second GAC, which was temporarily isolated from the treatment system until after the stainless steel GAC canisters were installed.
- The vapor-phase hydrocarbon mass removal associated with the SVE system was approximately 3.3 pounds, and aqueous-phase hydrocarbon removal associated with the GAC treatment process was 0.008 pounds for this reporting period. The cumulative vapor-phase and aqueous-phase hydrocarbon removal to date is approximately 711.8 pounds (**Tables 2-1, 2-2 and 2-3**).
- The volume of groundwater extracted during this reporting period was approximately 19,301 gallons (**Tables 2-1 and 2-3**). The average flow rate of groundwater recovery was 235.4 gallons/day (**Tables 2-1 and 2-3**).
- No LNAPL was recovered from the OWS. Also, the OWS was inspected, and no LNAPL or sheen was visible on the liquid contents.
- The daily vapor mass removal rate ranged from 0.05 to 0.07 lb/day during this quarter (**Table 2-2**).
- The effluent concentration of GRPH exiting the SVE system (with the CatOx not being operated, per the PSCAA permit allowance) was not detected at concentrations above the laboratory's lower reporting limit of 10 mg/m3 (2.329 ppmv; **Table 2-4**).
- All system operations were in compliance with Ecology's Water Quality Program and PSCAA permits, with the exception being effluent pH during the October 2014 event (**Tables 2-4 and 2-5**). The effluent pH reading during the October 2014 event was 5.92, and is the only time during the entire system operation that a pH value was measured outside of the allowable pH range (6 to 10). This is assumed to be an anomaly, and will be confirmed during continued monthly measurements during the routine O&M events.

4.3 DRAKE PROPERTY (UNIT 3)

The following is a summary of the **Fourth Quarter 2014** system O&M at the Drake Property:

- The MPE operation time this quarter was approximately 86 percent (**Table 3-1**). System down time was attributed to containment high level in the GAC containment tray. This was due to a leak in the second GAC, which was temporarily isolated from the treatment system until after the stainless steel GAC canisters were installed.
- The vapor-phase hydrocarbon mass removal associated with the SVE system was approximately 5.9 pounds, and aqueous-phase hydrocarbon removal associated with the GAC treatment process was 0.085 pounds for this reporting period. The cumulative vapor-phase and aqueous-phase hydrocarbon removal to date is approximately 156.9 pounds (**Tables 3-1, 3-2 and 3-3**).

- The volume of groundwater extracted during this reporting period was approximately 203,925 gallons (**Tables 3-1 and 3-3**). The average flow rate of groundwater recovery was 2,486.9 gallons/day (**Tables 3-1 and 3-3**).
- No LNAPL was recovered from the OWS. Also, the OWS was inspected, and no LNAPL or sheen was visible on the liquid contents.
- The average daily vapor mass removal rate was 0.1 lb/day during this Quarter (**Table 3-2**).
- The effluent concentration of GRPH exiting the SVE system (with the CatOx not being operated) was not detected at concentrations above the laboratory's lower reporting limit of 10 mg/m3 (2.329 ppmv; **Table 3-4**).
- All system operations were in compliance with PSCAA and Ecology's Water Quality Program permits, with the exception being effluent pH during the October 2014 event (**Tables 3-4 and 3-5**). The effluent pH reading during the October 2014 event was 5.97, and is the only time during the entire system operation that a pH value was measured outside of the allowable pH range (6 to 10). This is assumed to be an anomaly, and will be confirmed during continued monthly measurements during the routine O&M events.

5.0 TOLCIDE/AN-400 INJECTION PILOT TEST RESULTS

A pilot test was completed by Stantec at the Unit 1 MPE remediation system located on the TOC Property on November 5, 2014. The pilot test was conducted to evaluate if concentrations of a biocide (Tolcide PS20A) and sequestering agent (AN-400) were observed in the Unit 1 treatment system effluent water above Ecology discharge thresholds following injection. An email describing the pilot test procedures was sent by Adam Valenti (Stantec Project Engineer) to Jeanne Tran (Ecology Water Quality Project Manager) on September 4, 2014 (Valenti 2014); the pilot test was verbally approved by Ms. Tran during a telephone conversation with Mr. Valenti on October 13, 2014. Treated effluent water is discharged under Ecology State Waste Discharge (SWD) Permit #ST0007384 to outfall location 001Site-specific discharge thresholds (3.6 ppm for Tolcide PS20A and 3 ppm for AN-400), were established by Ecology and relayed to Stantec in the telephone conversation between Mr. Valenti and Ms. Tran on October 13, 2014.

5.1 BACKGROUND

The MPE remediation system utilizes carbon filtration to remove petroleum hydrocarbon concentrations from extracted groundwater. Since system startup in 2012, bio-fouling has significantly limited the treatment flow rate at Unit 1. To improve system operation, Stantec recommends chemical injection of a biocide (Tolcide PS20A) and sequestering agent (AN-400) prior to filtration and granular activated carbon treatment.

The active ingredient of the proposed biocide (Tolcide PS20A) is 20% Tetrakis-Hydroxymethyl Phosphonium Sulfate (THPS), which displays rapid control of a broad spectrum of microorganisms. THPS has a benign environmental toxicity profile and degrades rapidly. AN-400 is a sequestering agent specifically formulated with active ingredients that are environmentally safe, and do not promote bio-fouling. Material Safety Data Sheets (MSDS) and product information for Tolcide PS20A and AN-400 are included as **Appendix C**.

5.2 PILOT TESTING

Stantec conducted the Tolcide/AN-400 pilot test on November 5, 2014. The pilot test was conducted for approximately six hours and consisted of 3 phases of monitoring: pre-injection (background), chemical injection, and post-injection. During pilot testing, system effluent water was routed and stored inside a 630-gallon tote.

During each phase of monitoring, water samples were collected from inside the oil-water separator (influent) and from a sample port following treatment in the granulated activated carbon drums (effluent). Each sample was collected using a 40-milliliter (mL) vial, included with the THPS and AN-400 titration test kits. A syringe was then used to precisely remove sample volume until the exact quantity required was obtained within the sample vial (10 mL). The sample was then titrated in accordance with the test kit instructions, including addition of specific chemical agents provided in the THPS and AN-400 test kits. A color change indicated the concentration of THPS within 2 parts per million (ppm) accuracy and AN-400 within 0.4 ppm accuracy. The sample vial and syringe were

triple rinsed with Alconox® and distilled water between each sample. Titration test kit information is included as **Appendix C**.

Using the titration test kits, background measurements were recorded for two hours prior to the addition of Tolcide and AN-400 in the OWS. The background measurements were used to determine the amount of chemical interference caused by naturally occurring chemical species, such as phosponates, present in extracted groundwater that would cause color changes using the titration test kits. Average background concentrations representing naturally occurring chemical species were 10 ppm and 1.0 ppm as measured by the THPS and AN-400 test kits, respectively.

After average background concentrations were established, Tolcide and AN-400 were added to the OWS for approximately 3-hours. During the first two hours of chemical injection, approximately 70 ppm of THPS and 10 ppm of AN-400 were added in batches to the OWS. During the last hour of injection, approximately 210 ppm of THPS and 30 ppm of AN-400 (three times the recommended dosage rate) were added to the OWS. The dosage was increased during the latter part of the test to provide a conservative evaluation of potential breakthrough from the carbon treatment drums. Influent and effluent concentrations were regularly monitored during the test. Based on the system water flow rate (approximately 0.7 gallons per minute), sufficient time (4 hours) was allowed for test agents to pass through the three 55-gallon carbon drums for the evaluation of breakthrough. Stantec's field notes and photographs taken during the pilot test are provided in **Appendix D**.

5.3 PILOT TEST RESULTS

THPS and AN-400 species were not observed in system effluent water based on comparison of the average background values with the average THPS and AN-400 concentrations collected during injection or post-injection monitoring. Color changes noted in the background samples were consistent with (i.e., at the same concentration as) injection and post-injection readings, indicating that no breakthrough of the THPS or AN-400 species occurred during the pilot test. When compared with the average background concentrations, the average effluent concentration of THPS and AN-400 was 0 ppm. Effluent concentrations were also below Ecology's site-specific discharge thresholds (3.6 ppm for THPS and 3 ppm for AN-400).

Following post-injection monitoring, Stantec discharged approximately 250-gallons of water collected during pilot testing to the Unit 1 discharge location. Treated water was discharged based on Ecology's allowable discharge thresholds. Field photographs and notes, including the background, injection and post-injection readings and average values, are provided in **Appendix D**.

5.4 INJECTION IMPLEMENTATION

Based on the pilot test results, Stantec intends to implement injections of Tolcide and AN-400 at Unit 1 as long as the remediation system is operating, beginning in the first quarter of 2015. Approximately 55-gallons of Tolcide and AN-400 will be stored within a single drum located in the OWS secondary containment tray. A chemical metering pump will be secured on top of the drum lid and used to inject Tolcide (70 ppm) and AN-400 (10 ppm) into influent system water. The metering pump will be electrically connected to the system, and will only operate during

groundwater extraction (the metering pump will not operate during a system shutdown) to prevent overdosing of the system. The metering pump will be manually adjustable and the injection rate will be checked routinely and periodically adjusted, as necessary, based on the system influent groundwater flow rate. In the event of a spill/leak, a float switch in the OWS secondary containment tray will shut down the system and chemical metering pump.

Stantec proposes to monitor the concentrations of THPS and AN-400 using titration field test kits on a quarterly basis from the effluent sample ports of the first carbon drum and third carbon drum. More frequent monitoring will be conducted if required by Ecology. In the event breakthrough is observed above discharge thresholds, Stantec will replace the spent carbon drum with new granular activated carbon.

6.0 SYSTEM OPTIMIZATION & FUTURE RECOMMENDATIONS

The following is a summary of the **Fourth Quarter 2014** system optimization and future recommendations for each of the MPE systems.

The MPE remediation systems will continue to operate until the terms and conditions of the AO have been satisfied in accordance with Section IX (Satisfaction of Order), or until the work to be performed has been amended in accordance with Section VIII.L (Amendment of Order). Specifically, "the provisions of [the Agreed] Order shall be deemed satisfied upon TOC's receipt of written notification from Ecology that TOC has completed the remedial activity required by [the Agreed] Order, as amended by any modifications, and that TOC has complied with all other provisions of [the Agreed] Order."

Operational activities during this quarter continued to focus on dewatering the formation to optimize recovery of dissolved phase hydrocarbons and hydrocarbon vapors. System optimization activities during this reporting period focused on balancing the flow of water through the OWS. These activities, any system modifications, and observations are summarized below.

- Field personnel continued to optimize the system flows to balance the flow rate of the OWS. System adjustments were made to minimize high level conditions, which triggered the systems to shut down. Generally, the program adjustments stopped the flow of water to the OWS for a brief period of time while the OWS transfer pumps discharged water to the GAC canisters.
- The remaining steel GAC containers were changed to stainless steel containers. This included the change out of three drums at Unit 1, one drum at Unit 2, and three drums at Unit 3.
- The blower units at all units need to be serviced, including inspection of belts. This is especially necessary for the blower unit at Unit 2, which has developed a small oil leak on the blower motor.
- Sand, silt and biological byproducts continued to accumulate within the lead GAC canisters. This buildup of materials restricts the discharge of wastewater from the OWS and eventually causes the systems to shut down. The majority of this loading has been observed at the TOC Property (Unit 1) system. This loading was also observed at the Drake Property system (Unit 3) during previous quarters but has been reduced following installation of a bag filter in 2013. An additional bag filter may need to be installed in Unit 1 in the future. In addition as presented in Section 5.0, a biocide pilot test was conducted during the fourth quarter 2014 to increase more effective performance at Unit 1 by reducing the biological byproduct. Full implementation of the biocide treatment at Unit 1 is anticipated to occur in the first quarter of 2015.
- Benzene and GRPH concentrations continue to remain below thresholds for continued operation of the CatOx units. As specified in the PSCAA Order of Approval, if benzene and GRPH concentrations remain below 0.5 and 50 ppmv, respectively, for a period of three consecutive months, then the CatOx may be turned off (bypassed). Currently, the CatOx units have been removed from operation at Units 2 and 3, and continued vapor sampling will determine if the CatOx at Unit 1 can be bypassed. It is anticipated that Unit 1 CatOx may be removed in the first quarter of 2015, as sampling has indicated below threshold values for two consecutive events (November and December 2014).

7.0 LIMITATIONS

This document, ***Operations & Maintenance Report***, ***Fourth Quarter 2014,*** was prepared by Stantec Consulting Services Inc. on behalf of TOC Holdings Co. The material presented reflects Stantec's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this document, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Services Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this document.

8.0 REFERENCES

SoundEarth Strategies, Inc. (SES). 2011. *Interim Remedial Action Work Plan (IRAWP), TOC Holdings Co. Facility No. 01-176, 24205 56th Avenue West, Mountlake Terrace, Washington 98043*. July 28.

SoundEarth Strategies, Inc. (SES). 2013. *Draft Remedial Investigation Report*, TOC Holdings Co. *No. 01-176, 24205 56th Avenue West, Mountlake Terrace, Washington 98043*. November 27.

Valenti, Adam (Stantec Consulting Services Inc.). 2014. Email to Jean Tran (Washington State Department of Ecology). September 4.

Washington State Department of Ecology (Ecology). 2011. *Agreed Order No. DE 8661, TOC Facility No. 01-176*. October 28.

Tables

Table 1-1: Summary of System Performance – Unit 1

Table 1-2: Vapor Stream - System Performance Monitoring Data – Unit 1

Table 1-3: Liquid Stream - System Performance Monitoring Data – Unit 1

Table 1-4: Vapor Stream Analytical Results – Unit 1

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Table 2-1: Summary of System Performance – Unit 2

Table 2-2: Vapor Stream - System Performance Monitoring Data – Unit 2

Table 2-3: Liquid Stream - System Performance Monitoring Data – Unit 2

Table 2-4: Vapor Stream Analytical Results – Unit 2

Table 2-5: Liquid Stream Analytical Results – Unit 2

Table 3-1: Summary of System Performance – Unit 3

Table 3-2: Vapor Stream - System Performance Monitoring Data – Unit 3

Table 3-3: Liquid Stream - System Performance Monitoring Data – Unit 3

Table 3-4: Vapor Stream Analytical Results – Unit 3

Table 3-5: Liquid Stream Analytical Results – Unit 3

Unit 1: TOC Property (24205)

Table 1-1
Unit 1 - TOC Property (24205)
Summary of System Performance
TOC Holdings Facility No. 01-176

Reporting Period		Duration of Reporting Period (days)	System Run Time (days)	System Run Time (%)	Volume of Groundwater Discharged (gallons)	Average Groundwater Recovered Flow Rate (gallons/day)	GRPH Aqueous-Phase Removal (lb)	GRPH Vapor-Phase Removal (lb)
Start Date	End Date							
10/02/12	12/05/12	64	30	46%	35,204.9	550.1	2.522	917.8
12/05/12	03/04/13	89	36	40%	7,655.9	86.0	0.918	42.1
03/04/13	06/05/13	93	29	31%	4,915.8	52.9	0.609	6.0
06/05/13	09/04/13	91	69	76%	83,540.3	918.0	3.121	138.0
09/04/13	12/03/13	90	90	100%	75,825.2	842.5	0.836	698.5
12/03/13	01/31/14	59	26	44%	1,166.2	19.8	0.064	151.7
01/31/14	03/19/14	47	29	63%	29,991.7	638.1	1.235	28.2
03/19/14	06/16/14	89	70	78%	101,082.0	1,135.8	2.984	5.4
06/16/14	09/18/14	94	87	92%	101,780.0	1,082.8	0.648	51.2
09/18/14	12/09/14	82	69	84%	53,355.0	650.7	0.022	132.0
Average System Run Time				**67%**				
Totals for Quarter		**82**	**69**	**84%**	**53,355**	**650.7**	**0.022**	**132.0**

NOTES:

shaded cells = data for reporting quarter

DEFINITIONS:

% = percent

gallons/day = gallons per day

GRPH = gasoline-range petroleum hydrocarbons

lb = pound(s)

Table 1-2
Unit 1 - TOC Property (24205)
Vapor Stream - System Performance Monitoring Data
TOC Holdings Facility No. 01-176

Site Visit	Run Time		SVE Parameters		Catalytic Oxidizer		GRPH Removal		
	SVE Hour Meter	Total Time in Operation	SVE Pre-Filter Vacuum	Air Flow Rate[1]	Catalyst Entrance Temp.	Catalyst Exit Temp.	Influent Concentration[2]	Daily Mass Recovery Rate[3] [4]	Cumulative Recovered[5]
Date	(hours)	(days)	(iow)	(scfm)	(°C)	(°C)	(mg/m^3)	(lb/day)	(lb)
10/02/12	5.0	0.21	70	146.8	330	380	1,600	21.1	0.00
10/10/12	70.2	2.93	69	149.2	330	419	2,600	27.9	75.91
10/17/12	237.7	9.90	69	149.2	330	410	3,400	40.2	356.74
10/24/12	406.9	16.95	68	144.4	330	385	2,400	38.3	626.56
11/07/12	638.2	26.59	73	140.7	330	384	1,700	26.3	879.75
12/05/12	714.2	29.76	67	148.0	330	344	150	12.0	917.76
01/08/13	1,482.9	61.79	65	153.8	330	342	35	1.3	957.95
01/17/13	1,533.7	63.90	76	153.0	330	350	--	--	--
02/05/13	1,537.6	64.07	64	148.6	330	342	53	0.60	959.32
03/04/13	1,569.4	65.39	27	173.0	330	342	<10	0.42	959.87
04/03/13	1,587.2	66.13	60	157.4	330	342	14	0.14	959.98
05/08/13	1,595.4	66.48	17	175.2	330	341	22	0.27	960.07
06/05/13	2,267.7	94.49	36	166.0	330	340	<10	0.21	965.87
07/02/13	2,789.8	116.24	39	168.0	330	340	26	0.23	970.93
08/06/13	3,227.4	134.48	47	162.1	330	341	31	0.42	978.64
08/09/13	3,302.8	137.62	64	157.1	330	345	--	--	--
09/04/13	3,924.4	163.52	66	152.0	330	351	580	4.31	1,103.91
10/07/13	4,715.2	196.47	66	153.1	330	356	710	8.85	1,395.37
10/14/13	4,888.3	203.68	72	155.4	330	354	--	--	--
10/15/13	4,913.7	204.74	70	154.7	330	355	--	--	--
10/16/13	4,936.9	205.70	66	154.4	330	364	--	--	--
11/06/13	5,434.8	226.45	45	173.7	330	349	240	6.98	1,604.58
11/07/13	5,460.5	227.52	45	168.1	330	346	--	--	--
12/03/13	6,084.2	253.51	74	158.2	330	355	740	7.31	1,802.39
01/13/14	6,710.4	279.60	0	0.0	--	--	--	--	--
01/31/14	6,711.6	279.65	47	174.0	330	342	37	5.80	1,954.04
02/06/14	6,854.2	285.59	47	173.4	330	343	--	--	--
02/07/14	6,877.1	286.55	47	174.9	330	342	110	1.15	1,961.99
3/22/14[6]	7,416.7	309.03	48	174.0 [1]	330	340	<10	0.90	1,982.27
04/18/14	7,919.8	329.99	48	173.1	330	340	<10	0.08	1,983.90
05/19/14	8,420.1	350.84	47	172.8	330	345	<10	0.08	1,985.52
06/16/14	9,088.9	378.70	50	172.2	330	345	<10	0.08	1,987.68
07/09/14	9,571.0	398.79	50	169.8	330	344	<10	0.08	1,989.23
08/12/14	10,287.5	428.65	49	167.4	330	339	19	0.18	1,994.66
09/18/14	11,168.4	465.35	48	170.1	330	341	140	1.21	2,038.92
10/22/14	11,881.3	495.05	48	166.5	330	342	220	2.72	2,119.82
11/17/14	12,301.8	512.58	52	175.0	330	341	63	2.17	2,157.88
12/09/14	12,817.3	534.05	52	171.5	330	340	15	0.61	2,170.93
PSCAA NOC-10384 Restrictions and Conditions				**max. 350**	**min. 240**	**max. 620**			

NOTES:

shaded cells = data for reporting quarter

[1]Air flow rates through 02/07/14 calculated using an averaging flow sensor (Dwyer Model DS). Air flow rates after 02/07/14 calculated from data. Air flow rate from 03/22/14 is assumed value for subsequent calculations.

[2]Influent vapor-phase samples collected from SVE sample port prior to air treatment.

[3]Daily removal rate (lb/day) = ave. concentration (mg/m^3) x ave. flow rate (scfm) x conversion (8.99x10^{-5} lb-m^3-min/mg-ft^3-day)

[4]Nondetectable influent concentrations assumed to be 50% of the laboratory's lower reporting limit.
Removal rates based upon this assumption are shown in *italics* .

[5]Cumulative mass of GRPH removed (lb) = daily removal rate (lb/day) x time in operation (days) + previous cumulative total (lb).

[6]Samples were collected on 3/19/14, while hour readings were from 3/22/14.

DEFINITIONS:

-- = not analyzed, measured, or calculated
< = not detected at concentration above the laboratory reporting limit
° C = degrees Celsius
ave. = average
ft^3 = cubic feet
GRPH = gasoline-range petroleum hydrocarbons
iow = inches of water
lb = pounds
lb/day = pounds per day
m^3 = cubic meter
max. = maximum
mg = milligrams
min. = minimum
NOC = Notice of Construction
PSCAA = Puget Sound Clean Air Agency
scfm = standard cubic feet per meter
SVE = soil vapor extraction
Temp. = temperature

Table 1-3
Unit 1 - TOC Property (24205)
Liquid Stream - System Performance Monitoring Data
TOC Holdings Facility No. 01-176

Site Visit	Extracted Groundwater			Hydrocarbon Recovery - Aqueous-Phase		
Date	Flow Totalizer	Treated Between Visits	Average Flow Rate	Influent GRPH Concentration	GRPH Removed[1] [2] [3]	Cumulative GRPH Removed[3] [4]
	(gallons)	(gallons)	(gallons/day)	(µg/L)	(lb)	(lb)
10/02/12	636.3	0	0	--	--	--
10/10/12	5,761.0	5,124.7	641	18,000	0.770	0.770
10/17/12	14,898.1	9,137.1	1,305	--	--	--
10/24/12	21,888.4	6,990.3	999	--	--	--
11/07/12	31,361.8	9,473.4	677	6,100	1.303	2.073
12/05/12	35,204.9	3,843.1	137	14,000	0.449	2.522
01/08/13	38,076.5	2,871.6	84	19,000	0.455	2.977
01/17/13	40,712.0	2,635.5	293	--	--	--
02/05/13	41,363.4	651.4	34	8,200	0.225	3.202
03/04/13	42,860.8	1,497.4	55	19,000	0.237	3.439
04/03/13	44,190.2	1,329.4	44	11,000	0.122	3.561
05/08/13	46,979.7	2,789.5	80	20,000	0.466	4.027
06/05/13	47,776.6	796.9	28	3,200	0.021	4.048
07/02/13	63,869.9	16,093.3	596	17,000	2.283	6.331
08/06/13	89,987.5	26,117.6	746	<100	0.011	6.342
08/09/13	95,562.8	5,575.3	1,858	--	--	--
09/04/13	131,316.9	35,754.2	1,375	2,400	0.828	7.169
10/07/13	174,445.2	43,128.3	1,307	1,100	0.396	7.565
10/14/13	184,151.7	9,706.5	1,387	--	--	--
10/15/13	184,982.4	830.7	831	--	--	--
10/16/13	185,955.0	972.6	973	--	--	--
11/06/13	187,065.4	1,110.4	53	3,800	0.400	7.965
11/07/13	188,072.0	1,006.6	1,007	--	--	--
12/03/13	207,142.1	19,070.1	733	240	0.040	8.006
01/13/14	208,153.8	1,011.7	25	--	--	--
01/31/14	208,308.3	154.5	9	6,600	0.064	8.070
02/06/14	214,154.3	5,846.0	974	--	--	--
02/07/14	214,840.5	686.2	686	760	0.041	8.111
03/19/14	238,300	23,459.5	586	6,100	1.194	9.305
04/18/14	273,331	35,031	1,168	4,300	1.257	10.562
05/19/14	303,504	30,173	973	2,700	0.680	11.242
06/16/14	339,382	35,878	1,281	3,500	1.048	12.290
07/09/14	367,276	27,894	1,213	2,500	0.582	12.872
08/12/14	399,903	32,627	960	180	0.049	12.921
09/18/14	441,162	41,259	1,115	<100	0.017	12.938
10/22/14	464,280	23,118	680	<100	0.010	12.947
11/17/14	478,016	13,736	528	<100	0.006	12.953
12/09/14	494,517	16,501	750	<100	0.007	12.960
State Waste Discharge Permit Number ST0007384 Maximum Daily Limits			**7,000**			

NOTES:

shaded cells = data for reporting quarter

[1]Influent samples collected prior to discharging to the City of Mountlake Terrace sanitary sewer.

[2] Mass removal weight (lb) = gallons recovered x concentration (µg/L) x conversion factor (8.344E-9 lb-L/µg-gallon).

[3]Nondetectable influent concentrations assumed to be 50% of the laboratory's lower reporting limit.
Removal rates based upon this assumption are shown in *italics* .

[4]Cumulative mass of GRPH removed (lb) = GRPH mass removal between sampling visits (lb) + previous cumulative total (lb).

DEFINITIONS:

-- = not analyzed, measured, or calculated
< = not detected at concentration exceeding the laboratory reporting limit
µg/L = micrograms per liter
µg-gallon = micrograms - gallon conversion
gallons/day = gallons per day
GRPH = gasoline-range petroleum hydrocarbons
lb = pound(s)
lb-L = pounds - liter conversion

Table 1-4
Unit 1 - TOC Property (24205)
Vapor Stream Analytical Results
TOC Holdings Facility No. 01-176

Sample Date	Analytical Results (mg/m^3)										
	Influent Vapor Samples[1]					Effluent Vapor Samples[2]					GRPH DRE [5]
	GRPH[3] (mg/m^3)	Benzene[4] (mg/m^3)	Toluene[4] (mg/m^3)	Ethylbenzene[4] (mg/m^3)	Total Xylenes[4] (mg/m^3)	GRPH[3] (mg/m^3)	Benzene[4] (mg/m^3)	Toluene[4] (mg/m^3)	Ethylbenzene[4] (mg/m^3)	Total Xylenes[4] (mg/m^3)	%
10/02/12	1,600	2.0	10	5.5	26	<10	<0.1	<0.1	<0.1	<0.3	*99.7*
10/10/12	2,600	2.3	13	8.7	37	<10	<0.1	0.20	<0.1	<0.3	*99.8*
10/17/12	3,400	3.0	9.4	11	42	<10	<0.1	<0.1	<0.1	<0.3	*99.9*
10/24/12	2,400	1.5	7.0	9.4	39	<10	<0.1	<0.1	<0.1	<0.3	*99.8*
11/07/12	1,700	<0.5	7.0	7.3	37	<10	<0.1	<0.1	<0.1	<0.3	*99.7*
12/05/12	150	<0.1	0.23	<0.1	3.5	<10	<0.1	<0.1	<0.1	<0.3	*96.7*
01/08/13	35	<0.1	0.19	0.18	0.86	<10	<0.1	0.16	<0.1	<0.3	*85.7*
02/05/13	53	<0.1	0.30	0.13	0.78	<10	<0.1	<0.1	<0.1	<0.3	*90.6*
03/04/13	<10	<0.1	0.10	0.10	0.69	<10	<0.1	<0.1	<0.1	<0.3	--
04/03/13	14	<0.1	0.18	0.14	0.90	<10	<0.1	<0.1	<0.1	<0.3	*64.3*
05/08/13	22	<0.1	0.23	<0.1	0.35	<10	<0.1	<0.1	<0.1	<0.3	*77.3*
06/05/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
07/02/13	26	<0.1	0.24	<0.1	0.48	<10	<0.1	<0.1	<0.1	<0.3	*80.8*
08/06/13	31	<0.1	0.21	0.14	0.79	<10	<0.1	<0.1	<0.1	<0.3	*83.9*
09/04/13	580	<0.1	5.0	<0.1	22	<10	<0.1	<0.1	<0.1	<0.3	*99.1*
10/07/13	710	<0.1	5.7	<0.1	22	<10	<0.1	<0.1	<0.1	<0.3	*99.3*
11/06/13	240	<0.1	1.6	<0.1	6.4	<10	<0.1	<0.1	<0.1	<0.3	*97.9*
12/03/13	740	<0.1	6.3	<0.1	19	<10	<0.1	<0.1	<0.1	<0.3	*99.3*
01/31/14	37	<0.1	0.40	<0.1	0.75	<10	<0.1	<0.1	<0.1	<0.3	*86.5*
02/07/14	110	<0.1	0.77	<0.1	2.2	<10	<0.1	<0.1	<0.1	<0.3	*95.5*
03/19/14	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
04/18/14	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
05/19/14	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
06/16/14	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
07/09/14	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
08/11/14	19	<0.1	0.12	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	*73.7*
09/17/14	140	<0.1	0.23	0.54	1.6	<10	<0.1	<0.1	<0.1	<0.3	*96.4*
10/22/14	220	<0.1	3.0	<0.1	3.3	<10	<0.1	<0.1	<0.1	<0.3	*97.7*
11/18/14	63	<0.1	0.57	<0.1	0.72	<10	<0.1	<0.1	<0.1	<0.3	*92.1*
12/09/14	15	<0.1	0.29	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	*66.7*
PSCAA NOC-10384 Restrictions and Conditions						**min. 214.7 [5]**					**95% [5] [6]**

NOTES:

shaded cells = data for reporting quarter

[1]Influent vapor-phase samples collected from SVE sample port on the pressure side of the blower.

[2]Effluent vapor-phase samples collected from sample port on the effluent stack.

[3]Analyzed by Northwest Total Petroleum Hydrocarbon Method NWTPH-Gx.

[4]Analyzed by U.S. Environmental Protection Agency Method 8021B.

[5]DRE shall be at least 95% unless effluent GRPH vapor leaving the catox does not exceed 50 ppmv (214.7 mg/m^3 assuming a molecular weight of 105).

[6]DRE = (1-[$GRPH_{influent}$/$GRPH_{effluent}$]) x 100; non-detected influent concentrations assumed to be 50% of the laboratory's reporting limit.

DRE % based on this assumption are shown in *italics.*

DEFINITIONS:

-- = not analyzed, measured, or calculated

< = not detected at a concentration exceeding the laboratory reporting limit

% = percent

catox = catalytic oxidizer

DRE = destruction and removal efficiency

GRPH = gasoline-range petroleum hydrocarbons

mg/m^3 = milligrams per cubic meter

min. = minimum

NOC = Notice of Construction

ppmv = part per million volume

PSCAA = Puget Sound Clean Air Agency

SVE = soil vapor extraction

Table 1-5
Unit 1- TOC Property (24205)
Liquid Stream Analytical Results
TOC Holdings Facility No. 01-176

	Groundwater Influent - Pre GAC Treatment (µg/L)					Groundwater Influent - Mid GAC Treatment (µg/L)					Groundwater Effluent - Post GAC Treatment (µg/L)							
	GAC-1 Influent Sample[1]					GAC-2 Influent Sample[2]					Effluent Discharge Sample[3]							
Sample Date	GRPH[4]	Benzene[5]	Toluene[5]	Ethyl-benzene[5]	Total Xylenes[5]	GRPH[4]	Benzene[5]	Toluene[5]	Ethyl-benzene[5]	Total Xylenes[5]	GRPH[4]	Benzene[5]	Toluene[5]	Ethyl-benzene[5]	Total Xylenes[5]	Total BTEX	Total Lead[6]	pH[7]
10/10/12	18,000	25	370	280	4,500	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.59
11/07/12	6,100	8.4	99	24	1,200	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.61
12/05/12	14,000	12	250	200	2,700	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	19.4	7.19
01/08/13	19,000	60	400	520	3,600	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.71
02/05/13	8,200	11	83	61	1,200	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	6.86
03/04/13	19,000	20	200	460	3,900	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.88
04/03/13	11,000	27	83	<40	2,500	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	6.68
05/08/13	20,000	11	450	<10	3,400	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.06
06/05/13	3,200	4.0	35	<1	350	<100	<1	<1	<1	<3	<100	<1	<1	<1	3.1	<6	3.33	6.8
07/02/13	17,000	9.9	290	190	3,200	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	6.74
08/06/13	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	6.89
09/04/13	2,400	1.1	18	<1	230	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	6.41
10/07/13	1,100	1.1	12	<1	86	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	6.89
11/06/13	3,800	27	150	26	810	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	6.94
12/03/13	240	<1	3.7	<1	19	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	7.05	6.98
01/31/14	6,600	19	370	<1	1,000	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	--
02/07/14	760	1.0	6.6	<1	54	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	6.71
03/19/14	6,100	2.9	160	<1	1,100	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	8.49
04/18/14	4,300	<1	100	<1	650	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	6.65
05/19/14	2,700	2.5	62	<1	310	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	6.90
06/16/14	3,500	2.0	86	<1	520	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	1.04	6.59
07/09/14	2,500	1.7	35	<1	350	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.20
08/12/14	180	<1	1.5	<1	15	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.29
09/17/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.25
10/22/14	<100	<1	1.4	<1	4.0	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.19
11/17/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.56
12/09/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	13.3	7.29
State Waste Discharge Permit Number ST0007384 Effluent Limits											**1,000**	**5**				**100**	**1,090**	**6 to 10**

NOTES:

shaded cells = data for reporting quarter

[1]Inffluent samples collected prior to first GAC canister.

[2]Inffluent samples collected prior to second GAC canister.

[3]Effluent samples collected prior to sewer discharge.

[4]Analyzed by Method NWTPH-Gx.

[5]Analyzed by EPA Method 8021B.

[6]Analyzed by EPA Method 200.8.

[7]Field measurement

DEFINITIONS:

-- = not analyzed, measured, or calculated

< = not detected at a concentration exceeding the laboratory reporting limit

µg/L = micrograms per liter

BTEX = benzene, toluene, ethylbenzene and xylenes

EPA = U.S. Environmental Protection Agency

GAC = granular activated carbon

GRPH = gasoline-range petroleum hydrocarbons

NWTPH-Gx = Northwest Total Petroleum Hydrocarbons for gasoline-range organics

Unit 2: TOC/Farmasonis Property (24225)

Table 2-1
Unit 2 - TOC/Farmasonis Property (24225)
Summary of System Performance
TOC Holdings Facility No. 01-176

Reporting Period		Duration of Reporting Period (days)	System Run Time (days)	System Run Time (%)	Volume of Groundwater Discharged (gallons)	Average Groundwater Recovered Flow Rate (gallons/day)	GRPH Aqueous-Phase Removal (lb)	GRPH Vapor-Phase Removal (lb)
Start Date	End Date							
10/03/12	12/05/12	63.0	51.7	82%	12,858	204	0.005	477.4
12/05/12	03/04/13	89	52.5	59%	5,900	66	0.002	9.1
03/04/13	06/05/13	93	67.1	72%	106,670	1,147	0.235	4.9
06/05/13	09/04/13	91	82.2	90%	123,303	1,355	0.051	6.2
09/04/13	12/03/13	90	89.9	100%	89,204	991	0.046	99.6
12/03/13	01/13/14	41	41.1	100%	29,087	709	0.012	54.6
01/13/14	02/07/14	25	18.8	75%	9,854	394	0.004	18.3
02/07/14	06/16/14	129	108.4	84%	187,016	1,450	0.078	31.6
06/16/14	09/18/14	94	91	97%	120,848	1,286	0.050	6.2
09/18/14	12/09/14	82	54	66%	19,301	235.4	0.008	3.3
Average System Run Time				**82%**				
Totals for Quarter		**82**	**54**	**66%**	**19,301**	**235.4**	**0.008**	**3.3**

NOTES:

shaded cells = data for reporting quarter

DEFINITIONS:

% = percent

gallons/day = gallons per day

GRPH = gasoline-range petroleum hydrocarbons

lb = pound(s)

O&M = operations and maintenance

Table 2-2
Unit 2 - TOC/Farmasonis Property (24225)
Vapor Stream - System Performance Monitoring Data
TOC Holdings Facility No. 01-176

Site Visit	Run Time		SVE Parameters		Catalytic Oxidizer		GRPH Removal		
	SVE Hour Meter	Total Time in Operation	SVE Pre-Filter Vacuum	Air Flow Rate[1]	Catalyst Entrance Temp.	Catalyst Exit Temp.	Influent Concentration[2]	Daily Mass Recovery Rate[3] [4]	Cumulative Recovered[5]
Date	(hours)	(days)	(iow)	(scfm)	(°C)	(°C)	(mg/m^3)	(lb/day)	(lb)
10/03/12	15.6	0.7	68	149.1	330	350	340	4.56	0.00
10/10/12	73.7	3.1	86	134.1	330	363	1,300	*10.44*	25.26
10/17/12	242.0	10.1	76	135.8	330	376	1,300	*15.77*	135.86
10/24/12	410.7	17.1	72	137.2	330	355	1,100	*14.73*	239.37
10/25/12	434.7	18.1	73	139.2	330	354	--	--	--
11/06/12	722.8	30.1	74	137.8	330	358	--	--	--
11/07/12	748.2	31.2	74	138.6	330	352	660	*10.91*	392.78
12/05/12	1,257.4	52.4	74	124.3	330	338	15	*3.99*	477.40
12/06/12	1,266.4	52.8	75	135.6	--	--	--	--	--
01/08/13	1,989.7	82.9	27	164.7	330	344	15	0.19	483.35
01/09/13	2,012.1	83.8	32	163.5	330	336	--	--	--
01/17/13	2,037.9	84.9	27	166.5	331	336	--	--	--
02/05/13	2,490.2	103.8	33	159.5	330	335	<10	*0.15*	486.39
02/06/13	2,514.5	104.8	38	157.5	330	335	--	--	--
03/04/13	2,517.2	104.9	31	162.9	330	335	<10	*0.07*	486.47
03/12/13	2,705.4	112.7	32	161.7	330	335	--	--	--
04/03/13	3,230.7	134.6	33	166.8	330	335	<10	*0.07*	488.67
05/08/13	3,454.7	143.9	33	164.5	330	338	<10	*0.07*	489.37
06/05/13	4,127.1	172.0	36	158.9	330	335	<10	*0.07*	491.40
06/19/13	4,438.7	184.9	34	166.7	330	335	--	--	--
07/02/13	4,746.1	197.8	32	164.2	330	335	<10	*0.07*	493.28
08/06/13	5,403.6	225.2	10	175.5	330	335	<10	*0.08*	495.37
08/09/13	5,475.4	228.1	20	168.6	330	335	--	--	--
09/04/13	6,098.7	254.1	20	170.1	330	335	<10	*0.08*	497.62
10/07/13	6,890.0	287.1	34	163.9	330	336	41	*0.35*	509.00
10/14/13	7,062.9	294.3	35	165.2	330	336	--	--	--
10/15/13	7,088.0	295.3	74	146.5	330	342	--	--	--
10/16/13	7,111.3	296.3	67	147.6	330	340	--	--	--
11/06/13	7,610.8	317.1	73	150.7	330	338	140	*1.28*	547.44
11/07/13	7,635.3	318.1	65	148.2	330	338	--	--	--
12/03/13	8,257.0	344.0	65	154.2	330	337	130	*1.85*	597.26
12/04/13	8,287.9	345.3	66	154.2	330	337	--	--	--
01/13/14	9,242.4	385.1	71	147.8	330	336	66	*1.33*	651.88
01/23/14	9,485.7	395.2	69	--	--	--	--	--	--
01/31/14	9,675.8	403.2	68	147.3	330	335	--	--	--
02/07/14	9,694.4	403.9	74	144.7	330	335	82	*0.97*	670.20
03/18/14	--	--	74	--	330	334	26	--	--
04/17/14	10,859.0	452.5	68	146.6	330	336	<10	*0.57*	697.84
05/20/14	11,645.2	485.2	72	146.9	330	338	<10	*0.07*	700.00
06/16/14	12,296.4	512.4	62	152.4	330	338	<10	*0.07*	701.83
07/10/14	12,799.7	533.3	62	150.2	330	338	<10	*0.07*	703.25
08/12/14	13,588.2	566.2	61	149.4	330	338	<10	*0.07*	705.47
09/18/14	14,474.1	603.1	48	158.3	--	--	--	*0.07*	708.02
10/22/14	14,721.8	613.4	45	72.7	--	--	--	*0.05*	708.55
11/17/14	15,242.7	635.1	47	166.6	--	--	--	*0.05*	709.72
12/09/14	15,767.5	657.0	49	156.5	--	--	--	*0.07*	711.31
PSCAA NOC-10384 Restrictions and Conditions				**max. 350**	**min. 240**	**max. 620**			

NOTES:
shaded cells = data for reporting quarter
[1]Air flow rates through 02/07/14 calculated using an averaging flow sensor (Dwyer Model DS).
Air flow rates after 02/07/14 calculated from data.
[2]Influent vapor-phase samples collected from SVE sample port prior to air treatment.
[3]Daily removal rate (lb/day) = ave. concentration (mg/m^3) x ave. flow rate (scfm) x conversion ($8.99x10^{-5}$ lb-m^3-min/mg-ft^3-day)
[4]Nondetectable influent concentrations assumed to be 50% of the laboratory's lower reporting limit.
Removal rates based upon this assumption are shown in *italics* .
[5]Cumulative mass of GRPH removed (lb) = daily removal rate (lb/day) x time in operation (days) + previous cumulative total (lb).

DEFINITIONS:
-- = not analyzed, measured, or calculated
< = not detected at concentration above the laboratory reporting limit
° C = degrees Celsius
ave. = average
ft^3 = cubic feet
GRPH = gasoline-range petroleum hydrocarbons
iow = inches of water
lb = pounds
lb/day = pounds per day
m^3 = cubic meter
max. = maximum
mg = milligrams
min. = minimum
NOC = Notice of Construction
PSCAA = Puget Sound Clean Air Agency
scfm = standard cubic feet per meter
SVE = soil vapor extraction
Temp. = temperature

Table 2-3
Unit 2 - TOC/Farmasonis Property (24225)
Liquid Stream - System Performance Monitoring Data
TOC Holdings Facility No. 01-176

Site Visit	Extracted Groundwater			Hydrocarbon Recovery - Aqueous-Phase		
Date	Flow Totalizer	Treated Between Visits	Average Flow Rate	Influent GRPH Concentration	GRPH Removed[1] [2] [3]	Cumulative GRPH Removed[3] [4]
	(gallons)	(gallons)	(gallons/day)	(µg/L)	(lb)	(lb)
10/03/12	397.8	0	0	--	--	--
10/10/12	562.6	164.8	24	<100	0.000	0.000
10/17/12	5,392.6	4,830.0	690	--	--	--
10/24/12	8,170.9	2,778.3	397	--	--	--
10/25/12	8,580.4	409.5	410	--	--	--
11/06/12	10,624.2	2,043.8	170	--	--	--
11/07/12	10,630.5	6.3	6	<100	0.004	0.004
12/05/12	12,858.4	2,227.9	80	<100	0.001	0.005
12/06/12	14,221.5	1,363.1	1,363	--	--	--
01/08/13	18,643.2	4,421.7	134	<100	*0.002*	0.008
01/09/13	18,651.6	8.4	8	--	--	--
01/17/13	18,753.9	102.3	13	--	--	--
02/05/13	18,753.9	0.0	0	<100	*0.000*	0.008
03/12/13	18,758.0	4.1	0	1,100	*0.000*	0.008
03/13/14	18,758.0	0.0	0	--	--	--
04/03/13	24,667.4	5,909.4	-17	740	*0.036*	0.044
05/08/13	90,733.6	66,066.2	1,888	<100	*0.028*	0.072
06/05/13	125,427.8	34,694.2	1,239	590	*0.171*	0.243
06/19/13	131,990.5	6,562.7	469	--	--	--
07/02/13	172,454.5	40,464.0	3,113	<100	*0.020*	0.262
08/06/13	223,496.3	51,041.8	1,458	<100	*0.021*	0.283
08/09/13	226,651.9	3,155.6	1,052	--	--	--
09/04/13	248,730.9	22,079.0	849	<100	*0.011*	0.294
10/07/13	269,136.3	20,405.4	618	<100	*0.018*	0.312
10/14/13	273,636.3	4,500.0	643	--	--	--
10/15/13	275,837.1	2,200.8	2,201	--	--	--
10/16/13	277,480.5	1,643.4	1,643	--	--	--
11/06/13	308,993.4	31,512.9	1,501	<100	*0.017*	0.328
11/07/13	310,249.2	1,255.8	1,256	--	--	--
12/03/13	337,935.2	27,686.0	1,065	<100	*0.012*	0.340
12/04/13	339,243.0	1,307.8	1,308	--	--	--
01/13/14	367,022.0	27,779.0	694	<100	*0.012*	0.353
01/23/14	--	--	--	--	--	--
01/31/14	376,637.4	9,615.4	534	--	--	--
02/07/14	376,875.7	238.4	34	<100	*0.004*	0.357
03/18/14	396,600	19,724.3	506	<100	*0.008*	0.365
04/17/14	424,646	28,046	935	<100	*0.012*	0.377
05/20/14	497,115	72,469	2,196	<100	*0.030*	0.407
06/16/14	563,892	66,777	2,473	<100	*0.028*	0.435
7/10/2014	603616	39,724	1,655	<100	*0.017*	0.451
8/12/2014	652922	49,306	1,494	<100	*0.021*	0.472
9/18/2014	684740	31,818	860	<100	*0.013*	0.485
10/22/2014	687370	2,630	77	<100	*0.001*	0.486
11/17/2014	695157	7,787	300	<100	*0.003*	0.489
12/9/2014	704041	8,884	404	<100	*0.004*	0.493
State Waste Discharge Permit Number ST0007384 Maximum Daily Limits			**7,000**			

NOTES:

shaded cells = data for reporting quarter

[1] Effluent samples collected prior to discharging to the City of Mountlake Terrace sanitary sewer.

[2] Mass removal weight (lb) = gallons recovered x concentration (µg/L) x conversion factor (8.344E-9 lb-L/µg-gallon).

[3] Nondetectable influent concentrations assumed to be 50% of the laboratory's lower reporting limit.
Removal rates based upon this assumption are shown in *italics* .

[4] Cumulative mass of GRPH removed (lb) = GRPH mass removal between sampling visits (lb) + previous cumulative total (lb).

DEFINITIONS:

-- = not analyzed, measured, or calculated
< = not detected at concentration exceeding the laboratory reporting limit
µg/L = micrograms per liter
µg-gallon = micrograms - gallon conversion
GRPH = gasoline-range petroleum hydrocarbons
gallons/day = gallons per day
lb = pound(s)
lb-L = pounds - liter conversion

Table 2-4
Unit 2 - TOC/Farmasonis Property (24225)
Vapor Stream Analytical Results
TOC Holdings Facility No. 01-176

	Analytical Results (mg/m^3)										
	Influent Vapor Samples[1]					Effluent Vapor Samples[2]					GRPH
	GRPH[3]	Benzene[4]	Toluene[4]	Ethylbenzene[4]	Total Xylenes[4]	GRPH[3]	Benzene[4]	Toluene[4]	Ethylbenzene[4]	Total Xylenes[4]	DRE[5]
Sample Date	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	%
10/03/12	340	0.44	1.6	0.96	1.7	<10	<0.1	0.17	<0.1	<0.3	*98.5*
10/10/12	1,300	0.77	<0.5	4.0	9.6	<10	<0.1	0.21	<0.1	<0.3	*99.6*
10/17/12	1,300	0.55	<0.5	3.7	7.9	<10	<0.1	<0.1	<0.1	<0.3	*99.6*
10/24/12	1,100	0.50	3.1	<0.1	11	<10	<0.1	<0.1	<0.1	<0.3	*99.5*
11/07/12	660	<0.1	2.7	<0.1	7.1	<10	<0.1	<0.1	<0.1	<0.3	*99.2*
12/05/12	15	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	*66.7*
01/08/13	15	<0.1	<0.1	<0.1	<0.3	<10	<0.1	0.10	<0.1	<0.3	*66.7*
02/05/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
03/04/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
04/03/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
05/08/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
06/05/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
07/02/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
08/06/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
09/04/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
09/04/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
10/07/13	41	<0.1	0.19	<0.1	0.4	<10	<0.1	<0.1	<0.1	<0.3	*87.8*
11/06/13	140	<0.1	0.52	<0.1	1.4	<10	<0.1	<0.1	<0.1	<0.3	*96.4*
12/03/13	130	<0.1	0.44	0.73	1.3	<10	<0.1	<0.1	<0.1	<0.3	*96.2*
01/13/14	66	<0.1	0.31	0.38	0.51	<10	<0.1	<0.1	<0.1	<0.3	*92.4*
02/07/14	82	<0.1	<0.1	0.73	0.65	<10	<0.1	<0.1	<0.1	<0.3	*93.9*
03/18/14	26	<0.1	<0.1	0.20	<0.3	<10	<0.1	<0.1	0.15	<0.3	*80.8*
04/17/14	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
05/20/14	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
06/16/14	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
07/09/14	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
08/11/14	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
09/17/14	--	--	--	--	--	<10	<0.1	<0.1	<0.1	<0.3	--
10/22/14	--	--	--	--	--	<10	<0.1	<0.1	<0.1	<0.3	--
11/18/14	--	--	--	--	--	<10	<0.1	<0.1	<0.1	<0.3	--
12/09/14	--	--	--	--	--	<10	<0.1	<0.1	<0.1	<0.3	--
PSCAA NOC-10384 Restrictions and Conditions						**min. 214.7 [5]**					**95% [5] [6]**

NOTES:

shaded cells = data for reporting quarter

[1] Influent vapor-phase samples collected from SVE sample port on the pressure side of the blower.

[2] Effluent vapor-phase samples collected from sample port on the effluent stack.

[3] Analyzed by Northwest Total Petroleum Hydrocarbon Method NWTPH-Gx.

[4] Analyzed by U.S. Environmental Protection Agency Method 8021B.

[5] DRE shall be at least 95% unless effluent GRPH vapor leaving the catox does not exceed 50 ppmv (214.7 mg/m^3 assuming a molecular weight of 105).

[6] DRE = (1-[$GRPH_{influent}$/$GRPH_{effluent}$]) x 100; non-detected influent concentrations assumed to be 50% of the laboratory's reporting limit.

DRE % based on this assumption are shown in *italics.*

DEFINITIONS:

-- = not analyzed, measured, or calculated

< = not detected at a concentration exceeding the laboratory reporting limit

% = percent

catox = catalytic oxidizer

DRE = destruction and removal efficiency

GRPH = gasoline-range petroleum hydrocarbons

mg/m^3 = milligrams per cubic meter

min. = minimum

NOC = Notice of Construction

ppmv = part per million volume

PSCAA = Puget Sound Clean Air Agency

SVE = soil vapor extraction

Table 2-5
Unit 2 - TOC/Farmasonis Property (24225)
Liquid Stream Analytical Results
TOC Holdings Facility No. 01-176

	Groundwater Influent - Pre GAC Treatment (µg/L)					Groundwater Influent - Mid GAC Treatment (µg/L)					Groundwater Effluent - Post GAC Treatment (µg/L)							
	GAC-1 Influent Sample[1]					GAC-2 Influent Sample[2]					Effluent Discharge Sample[3]							
Sample Date	GRPH[4]	Benzene[5]	Toluene[5]	Ethyl-benzene[5]	Total Xylenes[5]	GRPH[4]	Benzene[5]	Toluene[5]	Ethyl-benzene[5]	Total Xylenes[5]	GRPH[4]	Benzene[5]	Toluene[5]	Ethyl-benzene[5]	Total Xylenes[5]	Total BTEX	Total Lead[6]	pH[7]
10/10/12	<100	<1	<1	<1	3.1	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.59
11/07/12	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.71
12/05/12	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	76.5	8.05
01/08/13	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.29
02/05/13	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.31
03/13/13	1,100	2.9	<1	14	27	--	--	--	--	--	<100	<1	<1	<1	<3	<6	--	7.59
04/03/13	740	<1	<1	<1	7.9	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.08
05/08/13	<100	<1	<1	<1	5.1	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.51
06/05/13	590	2.0	1.8	14	120	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	4.51	6.68
07/02/13	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	6.97
08/06/13	<100	<1	<1	<1	5.2	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.10
09/04/13	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	6.96
10/07/13	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.17
11/06/13	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	6.92
12/03/13	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	1.59	7.04
01/13/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.13
02/07/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.45
03/18/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.86
04/17/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	6.87
05/20/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.18
06/16/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	<1	6.91
07/09/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	6.82
08/12/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.12
09/17/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.04
10/22/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	5.92
11/17/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.83
12/09/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	<1	7.29
State Waste Discharge Permit Number ST0007384 Effluent Limits											**1,000**	**5**				**100**	**1,090**	**6 to 10**

NOTES:

shaded cells = data for reporting quarter

[1]Inffluent samples collected prior to first GAC canister.

[2]Inffluent samples collected prior to second GAC canister.

[3]Effluent samples collected prior to sewer discharge.

[4]Analyzed by Method NWTPH-Gx.

[5]Analyzed by EPA Method 8021B.

[6]Analyzed by EPA Method 200.8.

[7]Field measurement

DEFINITIONS:

-- = not analyzed, measured, or calculated

< = not detected at a concentration exceeding the laboratory reporting limit

µg/L = micrograms per liter

BTEX = benzene, toluene, ethylbenzene and xylenes

EPA = U.S. Environmental Protection Agency

GAC = granular activated carbon

GRPH = gasoline-range petroleum hydrocarbons

NWTPH-Gx = Northwest Total Petroleum Hydrocarbons for gasoline-range organics

Unit 3: Drake Property (24309)

Table 3-1
Unit 3 - Drake Property (24309)
Summary of System Performance
TOC Holdings Facility No. 01-176

Reporting Period		Duration of Reporting Period (days)	System Run Time (days)	System Run Time (%)	Volume of Groundwater Discharged (gallons)	Average Groundwater Recovered Flow Rate (gallons/day)	GRPH Aqueous-Phase Removal (lb)	GRPH Vapor-Phase Removal (lb)
Start Date	End Date							
10/02/12	12/05/12	64	58.6	92%	71,160	1,111.9	0.029	31.5
12/05/12	03/04/13	89	73.3	82%	30,268.8	340.1	0.258	37.6
03/04/13	06/05/13	93	39.6	43%	74,015.9	795.9	0.491	2.7
06/05/13	09/04/13	91	58.1	64%	68,178.7	749.2	0.158	4.6
09/04/13	12/03/13	90	75.8	84%	211,042.8	2,344.9	0.088	6.3
12/03/13	01/13/14	41	41.0	100%	40,409.7	985.6	0.017	3.4
01/13/14	03/18/14	64	58.0	91%	132,723.9	2,073.8	0.055	50.4
03/18/14	06/16/14	90	71.3	79%	206,572.0	2,295.2	0.086	5.9
06/16/14	09/18/14	94	85.2	91%	225,458.0	2,398.5	0.129	7.0
09/18/14	12/09/14	82	70.8	86%	203,925.0	2,486.9	0.085	5.9
Average System Run Time				**79%**				
Totals for Quarter		**82**	**70.8**	**86%**	**203,925**	**2,486.9**	**0.085**	**5.9**

NOTES:
shaded cells = data for reporting quarter

DEFINITIONS:
% = percent
gallons/day = gallons per day
GRPH = gasoline-range petroleum hydrocarbons
lb = pound(s)

Table 3-2
Unit 3 - Drake Property (24309)
Vapor Stream - System Performance Monitoring Data
TOC Holdings Facility No. 01-176

Site Visit	Run Time		SVE Parameters		Catalytic Oxidizer		GRPH Removal		
	SVE Hour Meter	Total Time in Operation	SVE Pre-Filter Vacuum	Air Flow Rate[1]	Catalyst Entrance Temp.	Catalyst Exit Temp.	Influent Concentration[2]	Daily Mass Recovery Rate[3] [4]	Cumulative Recovered[5]
Date	(hours)	(days)	(iow)	(scfm)	(°C)	(°C)	(mg/m^3)	(lb/day)	(lb)
10/02/12	11.2	0.47	70.0	143.8	330	340	13	*0.2*	0.00
10/10/12	75.7	3.15	73.0	140.4	330	338	12	*0.2*	0.43
10/17/12	243.7	10.15	74.0	141.7	330	337	<10	*0.1*	1.18
10/24/12	411.9	17.16	74.0	139.9	330	338	<10	*0.1*	1.63
10/25/12	436.7	18.20	74.0	142.8	330	338	--	--	--
11/06/12	724.8	30.20	77.0	137.6	330	337	--	--	--
11/07/12	750.3	31.3	76	139.1	330	338	<10	*0.1*	2.51
12/05/12	1,417.6	59.1	76	141.9	330	340	160	*1.0*	31.48
01/08/13	2,231.8	93.0	83	137.3	330	337	<10	*1.0*	66.61
02/05/13	2,731.0	113.8	70	144.2	330	337	<10	*0.1*	67.93
03/04/13	3,177.5	132.4	71	144.6	330	338	<10	*0.1*	69.13
04/03/13	3,894.4	162.3	64	152.4	330	338	<10	*0.1*	71.13
05/15/13	4,059.7	169.2	27	173.5	330.0	301.0	<10	*0.1*	71.63
06/05/13	4,126.8	172.0	27	172.9	330.0	338.0	<10	*0.1*	71.85
07/02/13	4,400.3	183.3	17	171.7	330	338	<10	*0.1*	72.73
08/06/13	5,055.3	210.6	10	182.6	330	338	<10	*0.1*	74.91
09/04/13	5,520.0	230.0	13	181.6	330	338	<10	*0.1*	76.49
10/07/13	6,311.3	263.0	13	183.7	330	337	<10	*0.1*	79.20
10/14/13	6,484.1	270.2	14	185.6	330	337	--	--	--
10/15/13	6,509.2	271.2	15	184.9	330	337	--	--	--
11/06/13	7,031.9	293.0	18	185.6	330	338	<10	*0.1*	81.69
11/07/13	7,056.6	294.0	18	172.7	330	337	--	--	--
12/03/13	7,339.5	305.8	20	186.4	330	338	<10	*0.1*	82.76
12/04/13	7,368.7	307.0	25	185.1	330	338	--	--	--
01/13/14	8,323.6	346.8	24	186.6	330	337	<10	*0.1*	86.20
01/31/14	8,620.1	359.2	26	186.1	330	338	--	--	--
02/06/14	8,786.4	366.1	20	186.0	330	340	--	--	--
02/07/14	8,766.0	365.3	20	188.9	330	340	98	*0.9*	102.22
03/18/14	9,715.1	404.8	24	187.0	330	338	<10	*0.9*	136.63
04/18/14	10,370.2	432.1	27	183.5	330	340	<10	*0.1*	138.91
05/19/14	10,942.5	455.9	22	184.9	330	342	<10	*0.1*	140.88
06/16/14	11,425.1	476.0	26	181.8	330	342	<10	*0.1*	142.54
07/10/14	11,846.3	493.6	24	182.7	330	341	<10	*0.1*	143.98
08/13/14	12,607.6	525.3	26	181.7	330	337	<10	*0.1*	146.57
09/18/14	13,470.3	561.3	17	185.0	--	--	--	*0.1*	149.54
10/22/14	14,047.2	585.3	18	185.2	--	--	--	*0.1*	151.54
11/17/14	14,646.6	610.3	19	189.1	--	--	--	*0.1*	153.64
12/09/14	15,168.6	632.0	19	185.6	--	--	--	*0.1*	155.47
PSCAA NOC-10384 Restrictions and Conditions				**max. 350**	**min. 240**	**max. 620**			

NOTES:

shaded cells = data for reporting quarter

[1]Air flow rates through 02/07/14 calculated using an averaging flow sensor (Dwyer Model DS). Air flow rates after 02/07/14 calculated from data. Air flow rate from 03/18/14 is assumed value for subsequent calculations.

[2]Influent vapor-phase samples collected from SVE sample port prior to air treatment.

[3]Daily removal rate (lb/day) = ave. concentration (mg/m^3) x ave. flow rate (scfm) x conversion (8.99x10^{-5} lb-m^3-min/mg-ft^3-day)

[4]Nondetectable influent concentrations assumed to be 50% of the laboratory's lower reporting limit. Removal rates based upon this assumption are shown in *italics* .

[5]Cumulative mass of GRPH removed (lb) = daily removal rate (lb/day) x time in operation (days) + previous cumulative total (lb).

DEFINITIONS:

-- = not analyzed, measured, or calculated
< = not detected at concentration above the laboratory reporting limit
° C = degrees Celsius
ave. = average
ft^3 = cubic feet
GRPH = gasoline-range petroleum hydrocarbons
iow = inches of water
lb = pounds
lb/day = pounds per day
m^3 = cubic meter
max. = maximum
mg = milligrams
min. = minimum
NOC = Notice of Construction
PSCAA = Puget Sound Clean Air Agency
scfm = standard cubic feet per meter
SVE = soil vapor extraction
Temp. = temperature

Table 3-3
Unit 3 - Drake Property (24309)
Liquid Stream - System Performance Monitoring Data
TOC Holdings Facility No. 01-176

Site Visit	Extracted Groundwater			Hydrocarbon Recovery - Aqueous-Phase		
Date	Flow Totalizer (gallons)	Treated Between Visits (gallons)	Average Flow Rate (gallons/day)	Influent GRPH Concentration (µg/L)	GRPH Removed[1] [2] [3] (lb)	Cumulative GRPH Removed[3] [4] (lb)
10/02/12	1,178.0	--	--	--	--	--
10/10/12	5,075.9	3,897.9	487	<100	*0.002*	*0.002*
10/17/12	15,755.8	10,679.9	1,526	--	--	--
10/24/12	27,288.0	11,532.2	1,647	--	--	--
10/25/12	28,809.6	1,521.6	1,522	--	--	--
11/06/12	36,398.8	7,589.2	632	--	--	--
11/07/12	38,565.1	2,166.3	2,166	<100	*0.014*	*0.016*
12/05/12	71,160.2	32,595.1	1,164	<100	*0.014*	*0.029*
01/08/13	71,627.1	466.9	14	<100	*0.000*	*0.029*
02/06/13	84,429.4	12,802.4	441	160	0.017	0.046
03/04/13	101,429.0	16,999.6	654	1,700	0.241	0.288
04/03/13	119,013.8	17,584.8	586	<100	*0.007*	*0.295*
05/08/13	157,058.4	38,044.6	1,087	1,500	*0.476*	*0.771*
06/05/13	175,444.9	18,386.5	657	<100	*0.008*	*0.779*
07/02/13	175,445.7	0.8	0	--	--	--
08/06/13	181,799.7	6,354.0	182	2,500	*0.133*	*0.911*
09/04/13	243,623.6	61,823.9	2,132	<100	*0.026*	*0.937*
10/07/13	333,942.9	90,319.3	2,737	<100	*0.038*	*0.975*
10/14/13	355,115.5	21,172.6	3,025	--	--	--
10/15/13	358,033.9	2,918.4	2,918	--	--	--
11/06/13	420,282.1	62,248.2	2,829	<100	*0.036*	*1.011*
11/07/13	423,365.1	3,083.0	3,083	--	--	--
12/03/13	454,666.4	31,301.3	1,204	<100	*0.014*	*1.025*
12/04/13	458,180.0	3,513.6	3,514	--	--	--
01/13/14	495,076.1	36,896.1	922	<100	*0.017*	*1.042*
01/31/14	506,528.6	11,452.5	636	--	--	--
02/07/14	523,790.1	17,261.5	2,466	<100	*0.012*	*1.054*
03/18/14	627,800	104,010	2,667	<100	*0.043*	*1.097*
04/18/14	722,961	95,161	3,070	<100	*0.040*	*1.137*
05/19/14	791,030	68,069	2,196	<100	*0.028*	*1.166*
06/16/14	834,372	43,342	1,548	<100	*0.018*	*1.184*
07/10/14	887,218	52,846	2,202	130	*0.057*	*1.241*
08/13/14	964,443	77,225	2,271	<100	*0.032*	*1.273*
09/18/14	1,059,830	95,387	2,650	<100	*0.040*	*1.313*
10/22/14	1,142,560	82,730	2,433	<100	*0.035*	*1.347*
11/17/14	1,205,945	63,385	2,438	<100	*0.026*	*1.374*
12/09/14	1,263,755	57,810	2,628	<100	*0.024*	*1.398*
State Waste Discharge Permit Number ST0007384 Maximum Daily Limits			**7,000**			

NOTES:

shaded cells = data for reporting quarter

[1] Effluent samples collected prior to discharging to the City of Mountlake Terrace sanitary sewer.

[2] Mass removal weight (lb) = gallons recovered x concentration (µg/L) x conversion factor (8.344E-9 lb-L/µg-gallon).

[3] Nondetectable influent concentrations assumed to be 50% of the laboratory's lower reporting limit.
Removal rates based upon this assumption are shown in *italics* .

[4] Cumulative mass of GRPH removed (lb) = GRPH mass removal between sampling visits (lb) + previous cumulative total (lb).

DEFINITIONS:

-- = not analyzed, measured, or calculated
< = not detected at concentration exceeding the laboratory reporting limit
µg/L = micrograms per liter
µg-gallon = micrograms - gallon conversion
gallons/day = gallons per day
GRPH = gasoline-range petroleum hydrocarbons
lb = pound(s)
lb-L = pounds - liter conversion

Table 3-4
Unit 3 - Drake Property (24309)
Vapor Stream Analytical Results
TOC Holdings Facility No. 01-176

	Analytical Results (mg/m^3)										
	Influent Vapor Samples[1]					Effluent Vapor Samples[2]					GRPH
	GRPH[3]	Benzene[4]	Toluene[4]	Ethylbenzene[4]	Total Xylenes[4]	GRPH[3]	Benzene[4]	Toluene[4]	Ethylbenzene[4]	Total Xylenes[4]	DRE [5]
Sample Date	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	%
10/02/12	13	<0.1	0.13	0.12	0.35	<10	<0.1	<0.1	<0.1	<0.3	*61.5*
10/10/12	12	<0.1	0.10	<0.1	<0.3	<10	<0.1	0.18	<0.1	<0.3	*58.3*
10/17/12	<10	<0.1	0.17	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
10/24/12	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
11/07/12	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
12/05/12	160	<0.1	<0.1	1.50	0.99	<10	<0.1	<0.1	<0.1	<0.3	*96.9*
01/08/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	0.12	<0.1	<0.3	--
02/05/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
03/04/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
04/03/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
05/15/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
06/05/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
07/02/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
08/06/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
09/04/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
10/07/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
11/06/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
12/03/13	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
01/13/14	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
02/07/14	98	<0.1	<0.1	0.34	0.65	<10	<0.1	<0.1	<0.1	<0.3	*94.9*
03/18/14	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
04/18/14	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
05/19/14	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
06/16/14	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
07/09/14	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
08/11/14	<10	<0.1	<0.1	<0.1	<0.3	<10	<0.1	<0.1	<0.1	<0.3	--
09/17/14	--	--	--	--	--	<10	<0.1	<0.1	<0.1	<0.3	--
10/22/14	--	--	--	--	--	<10	<0.1	<0.1	<0.1	<0.3	--
11/18/14	--	--	--	--	--	<10	<0.1	<0.1	<0.1	<0.3	--
12/09/14	--	--	--	--	--	<10	<0.1	<0.1	<0.1	<0.3	--
PSCAA NOC-10384 Restrictions and Conditions						**min. 214.7** [5]					**95%** [5] [6]

NOTES:

shaded cells = data for reporting quarter

[1] Influent vapor-phase samples collected from SVE sample port on the pressure side of the blower.

[2] Effluent vapor-phase samples collected from sample port on the effluent stack.

[3] Analyzed by Northwest Total Petroleum Hydrocarbon Method NWTPH-Gx.

[4] Analyzed by U.S. Environmental Protection Agency Method 8021B.

[5] DRE shall be at least 95% unless effluent GRPH vapor leaving the catox does not exceed 50 ppmv (214.7 mg/m^3 assuming a molecular weight of 105).

[6] DRE = (1-[$GRPH_{influent}$/$GRPH_{effluent}$]) x 100; non-detected influent concentrations assumed to be 50% of the laboratory's reporting limit.

DRE % based on this assumption are shown in *italics* .

DEFINITIONS:

-- = not analyzed, measured, or calculated

< = not detected at a concentration exceeding the laboratory reporting limit

% = percent

catox = catalytic oxidizer

DRE = destruction and removal efficiency

GRPH = gasoline-range petroleum hydrocarbons

mg/m^4 = milligrams per cubic meter

min. = minimum

NOC = Notice of Construction

ppmv = part per million volume

PSCAA = Puget Sound Clean Air Agency

SVE = soil vapor extraction

Table 3-5
Unit 3 - Drake Property (24309)
Liquid Stream Analytical Results
TOC Holdings Facility No. 01-176

Sample Date	Groundwater Influent - Pre GAC Treatment (µg/L)					Groundwater Influent - Mid GAC Treatment (µg/L)					Groundwater Effluent - Post GAC Treatment (µg/L)							
	GAC-1 Influent Sample[1]					GAC-2 Influent Sample[2]					Effluent Discharge Sample[3]							
	GRPH[4]	Benzene[5]	Toluene[5]	Ethyl-benzene[5]	Total Xylenes[5]	GRPH[4]	Benzene[5]	Toluene[5]	Ethyl-benzene[5]	Total Xylenes[5]	GRPH[4]	Benzene[5]	Toluene[5]	Ethyl-benzene[5]	Total Xylenes[5]	Total BTEX	Total Lead[6]	pH[7]
10/10/12	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.87
11/07/12	<100	1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.83
12/05/12	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	4.05	7.84
01/08/13	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.06
02/05/13	160	<1	<1	1.8	5.8	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.02
03/04/13	1,700	<1	1.4	24	160	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.64
04/03/13	<100	<1	<1	<1	3.7	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	6.89
05/08/13	1,500	<1	<1	16	120	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.41
06/05/13	<100	<1	<1	<1	4.0	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	2.99	7.05
07/02/13	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	<100	<1	<1	<1	<3	<6	--	6.35
08/06/13	2,500	1	2.3	40	260	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	8.07
09/04/13	<100	<1	<1	<1	3.6	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.03
10/07/13	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.09
11/06/13	<100	<1	<1	<1	5.7	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	6.94
12/03/13	<100	<1	<1	<1	5.7	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	1.9	7.35
01/13/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	--
02/07/14	<100	<1	<1	<1	3.3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.36
03/18/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	8.38
04/18/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.40
05/19/14	<100	<1	<1	<1	5.6	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.25
06/16/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	1.05	5.94
07/09/14	130	<1	<1	<1	3.8	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	6.67
08/13/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.59
09/17/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.10
10/22/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	5.97
11/17/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	--	7.66
12/09/14	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<100	<1	<1	<1	<3	<6	1.09	6.89
State Waste Discharge Permit Number ST0007384 Effluent Limits											**1,000**	**5**				**100**	**1,090**	**6 to 10**

NOTES:

shaded cells = data for reporting quarter

[1]Inffluent samples collected prior to first GAC canister.

[2]Inffluent samples collected prior to second GAC canister.

[3]Effluent samples collected prior to sewer discharge.

[4]Analyzed by Method NWTPH-Gx.

[5]Analyzed by EPA Method 8021B.

[6]Analyzed by EPA Method 200.8.

[7]Field measurement

DEFINITIONS:

-- = not analyzed, measured, or calculated

< = not detected at a concentration exceeding the laboratory reporting limit

µg/L = micrograms per liter

BTEX = benzene, toluene, ethylbenzene and xylenes

EPA = U.S. Environmental Protection Agency

GAC = granular activated carbon

GRPH = gasoline-range petroleum hydrocarbons

NWTPH-Gx = Northwest Total Petroleum Hydrocarbons for gasoline-range organics

Figures

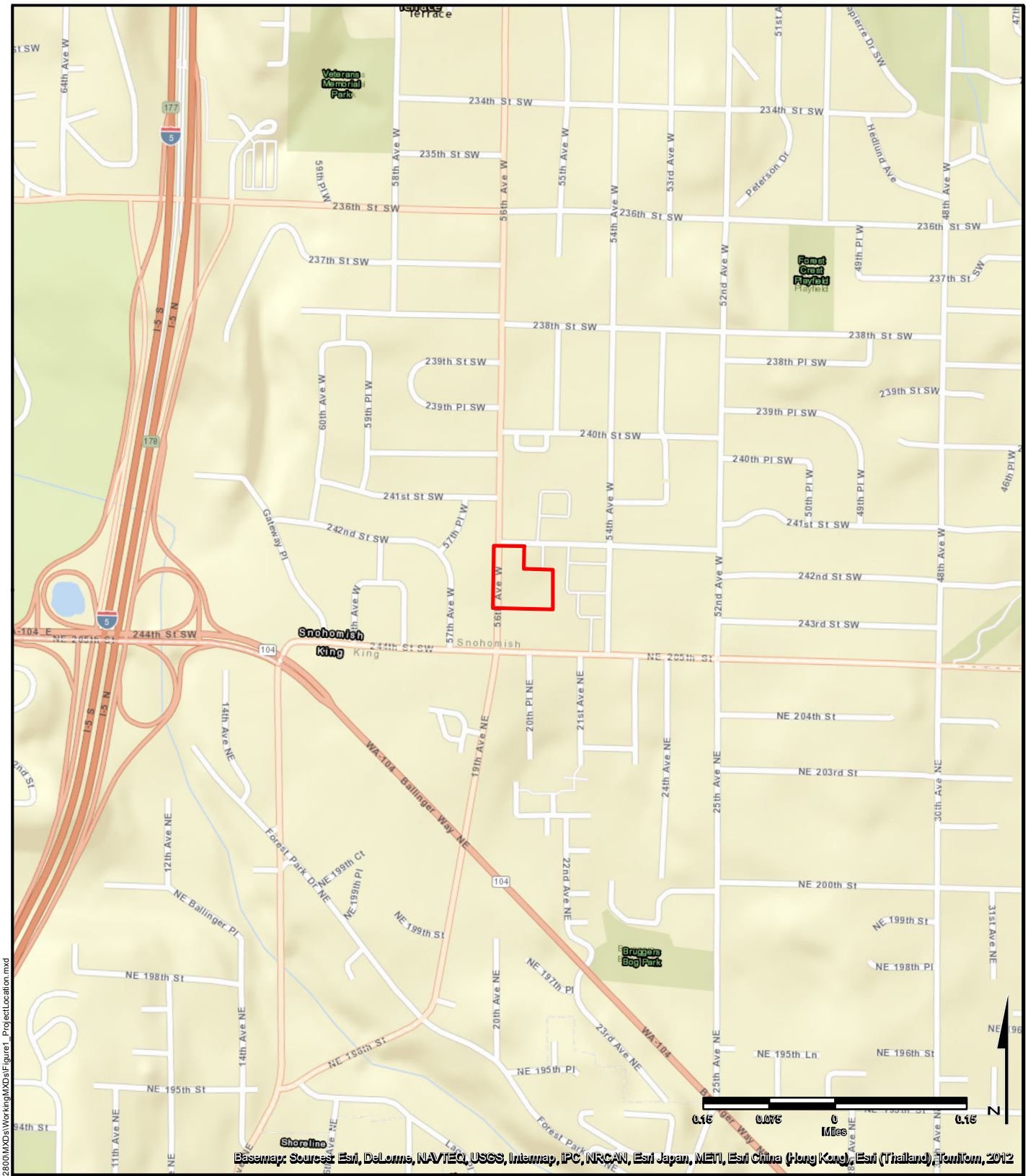
Figure 1: **Project Location Map**

Figure 2: **Site Map**

Figure 3: **Remediation Systems and Site Details Map**

Figure 4: **Piping and Instrumentation Diagram**

Figure 5: **Outfall Sampling Locations**



Basemap: Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2012

Legend

Site Boundary

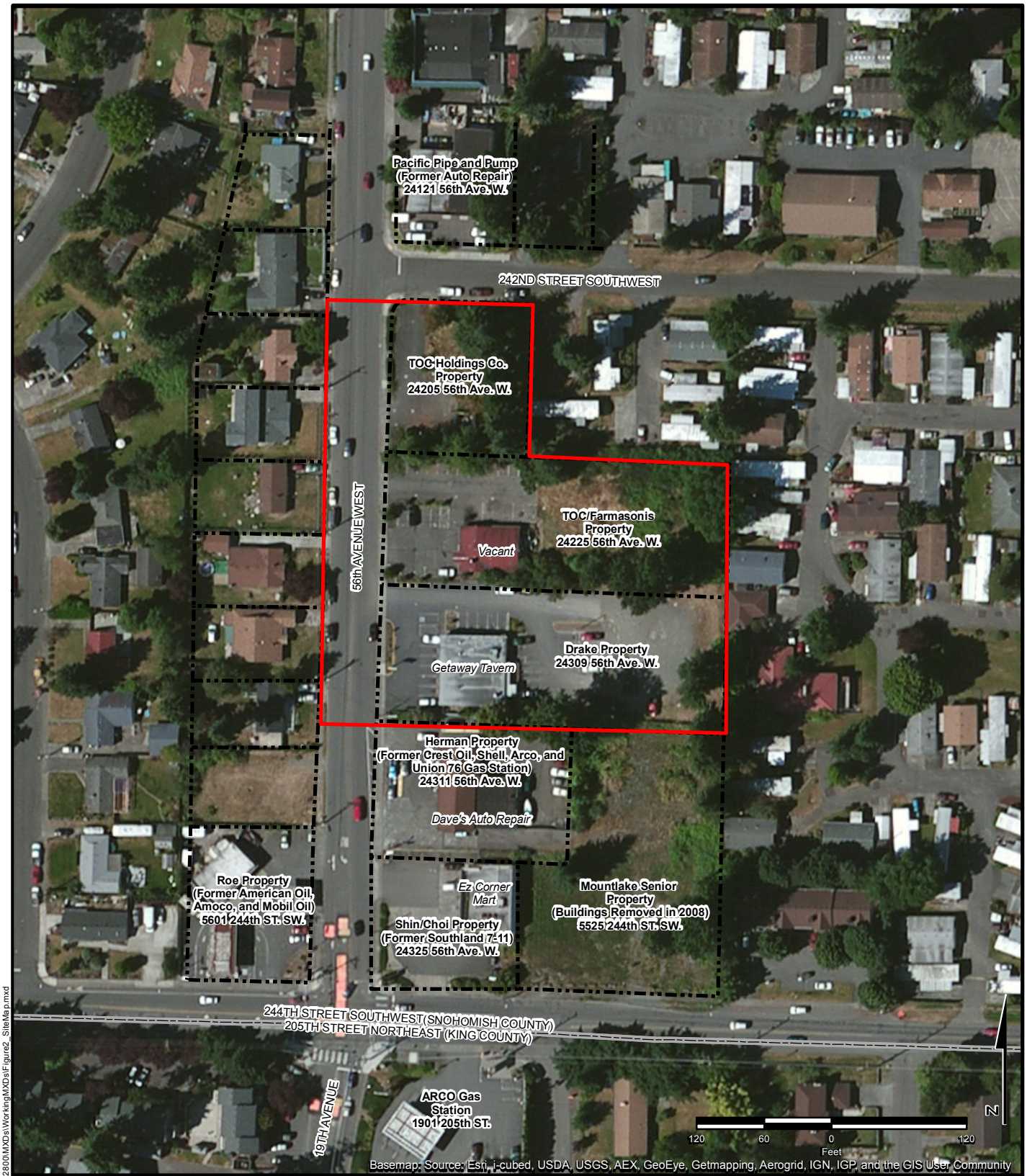
TOC Holdings Co. Facility 01-176
24205 56th Avenue West
Mountlake Terrace, Washington

FIGURE 1: PROJECT LOCATION

Stantec

DRAWN BY	D.H.	DATE DRAWN	1/21/2015
SCALE	1 in = 0.16 miles		
PROJECT	203714085		

X:\WA\Clients\Time_Oil\TOC-MountlakeTerrace_BA1402800\MXDs\WorkingMXDs\Figure1_ProjectLocation.mxd



Legend

Site Boundary

PARCELS

TOC Holdings Co. Facility 01-176
24205 56th Avenue West
Mountlake Terrace, Washington

FIGURE 2: SITE MAP

Stantec

DRAWN BY	D.H.	DATE DRAWN	1/21/2015
SCALE	1 in = 120 feet		
PROJECT	203714085		

X:\WA\Clients\Time_Oil\TOC-MountlakeTerrace_BA1402800\MXDs\WorkingMXDs\Figure2_SiteMap.mxd

LEGEND

- MW77 — GROUNDWATER REMEDIATION WELL (INTERMEDIATE SCREEN)
- CATCH BASIN
- SURVEY BENCHMARK
- PROPERTY BOUNDARY
- FO — FIBER OPTIC
- GAS — NATURAL GAS
- SI — STORM SEWER INFILTRATION PIPE
- SD — STORM SEWER DRAIN
- SS — SANITARY SEWER
- W — WATER
- OP — OVERHEAD POWER
- E1 — PRIMARY ELECTRICAL
- E2 — SECONDARY ELECTRICAL
- SANITARY SEWER MANHOLE
- OX — CATALYTIC OXIDIZER
- ELECTRICAL JUNCTION BOX
- ELECTRICAL VAULT
- PAD-MOUNTED TRANSFORMER
- C.O. — SANITARY SEWER CLEAN OUT
- UST — UNDERGROUND STORAGE TANK

DATUM/BASIS OF BEARINGS
HELD A BEARING OF N00°03'34"E ALONG THE MONUMENTED CENTERLINE OF 56TH AVE W BETWEEN 244TH ST SW AND 240TH ST SW PER PLAT OF LAKE FOREST CREST V.10 / P.107

BASIS OF POSITION: CITY OF MONTLAKE TERRACE CONTROL POINT DESIGNATION MTLK127.

ORIGINATING BENCHMARK:
TOP OF MAG NAIL IN CURB AT NORTHWEST CORNER OF SITE PER SITE PLAN BY CPS ENGINEERING PROVIDED TO AXIS BY CLIENT

COORDINATE SYSTEM: NAD 1983 STATEPLANE WASHINGTON NORTH FIPS 4601 (US FEET)

VERTICAL DATUM: NAVD '88

ELEVATION: 363.62'

TEMPORARY BENCHMARKS:

TBM 'A' SET 'X' ON NORTH BONNETT BOLT FOR FIRE HYDRANT.

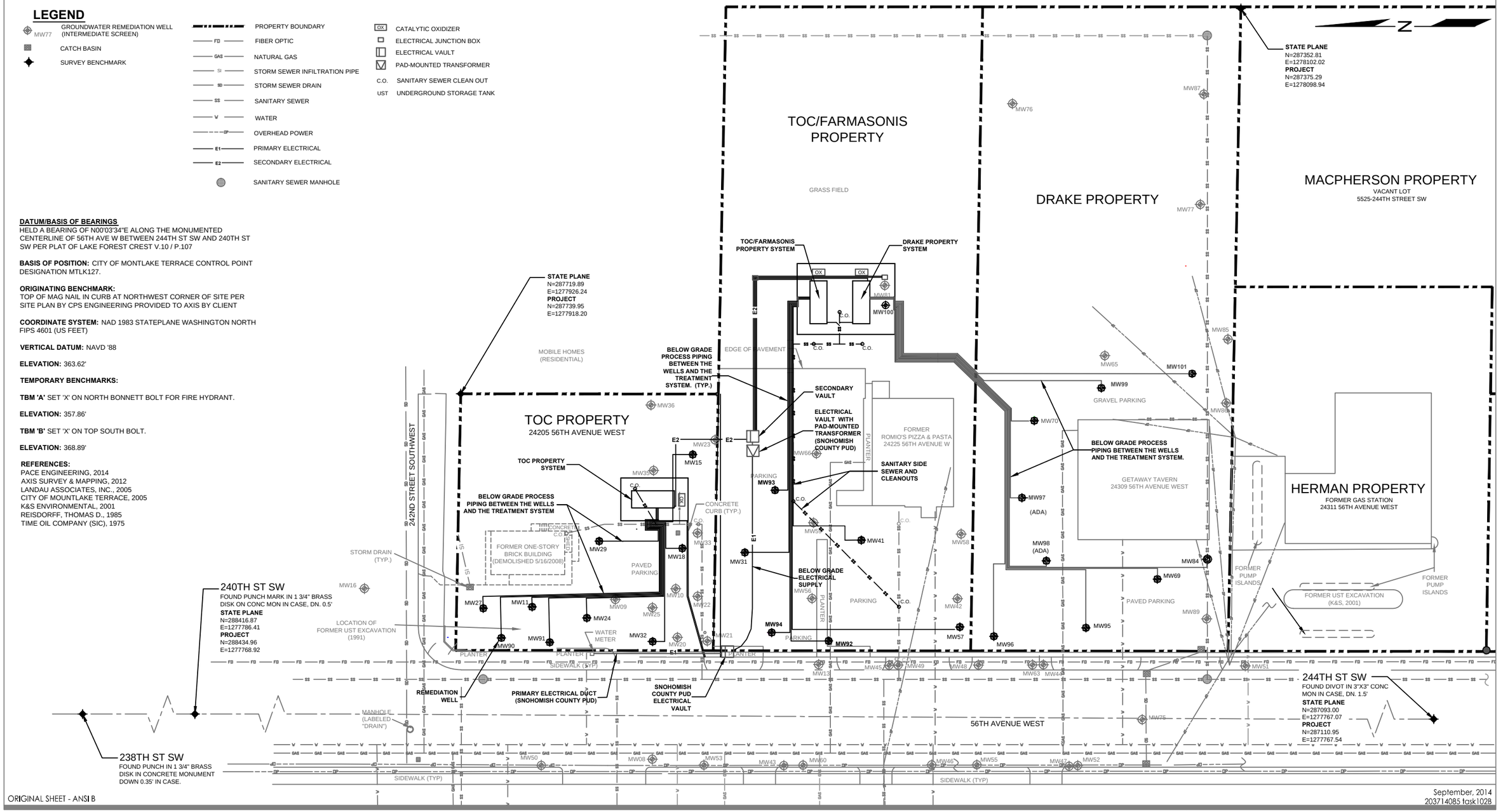
ELEVATION: 357.86'

TBM 'B' SET 'X' ON TOP SOUTH BOLT.

ELEVATION: 368.89'

REFERENCES:

PACE ENGINEERING, 2014
AXIS SURVEY & MAPPING, 2012
LANDAU ASSOCIATES, INC., 2005
CITY OF MOUNTLAKE TERRACE, 2005
K&S ENVIRONMENTAL, 2001
REISDORFF, THOMAS D., 1985
TIME OIL COMPANY (SIC), 1975



ORIGINAL SHEET - ANSI B

September, 2014
203714085 task102B

Z:\WA\TOC_Holdings_Co 203714085\Figure 3 Remediation Systems And Site Details Map.dwg
2014/10/16 10:07 AM By: Pixton, Connie

Stantec

10101 36th Ave. W, Ste. 203
Lynnwood, Washington 98036

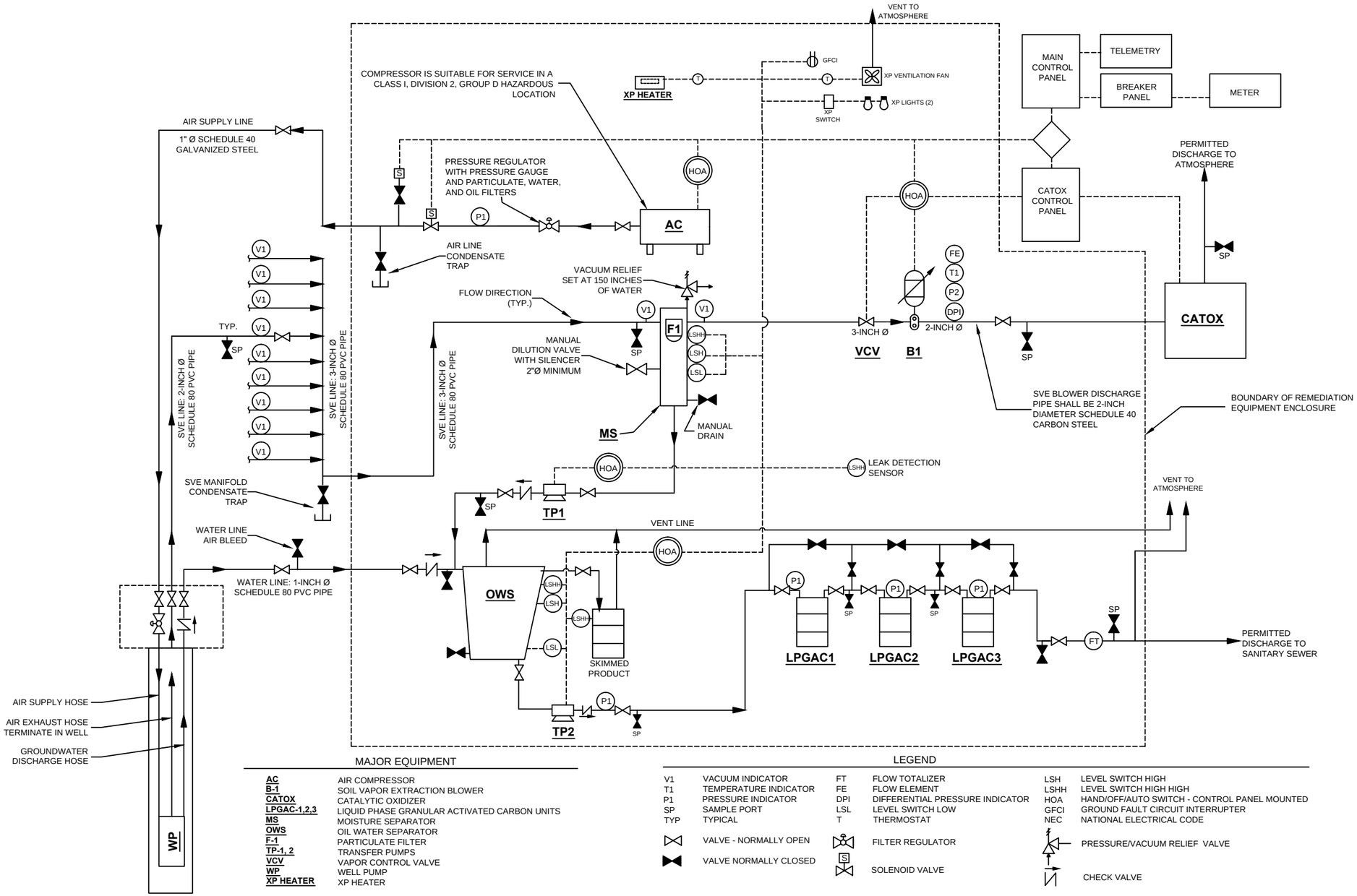
Notes

SOURCE:
SOUNDEARTH STRATEGIES, 2013
(WWW.SOUNDEARTHINC.COM)
Date: 09/30/2013
Drawn By: BLR
Checked By: DHG/TSM
CadFile: 01-176_2012Q4_O&MI_FIG01

Client/Project
TOC HOLDINGS COMPANY
Facility 01-176
Mountlake Terrace, Washington

Figure No.
3

Title
Remediation Systems and Site Details Map



MAJOR EQUIPMENT

AC	AIR COMPRESSOR
B-1	SOIL VAPOR EXTRACTION BLOWER
CATOX	CATALYTIC OXIDIZER
LPGAC-1,2,3	LIQUID PHASE GRANULAR ACTIVATED CARBON UNITS
MS	MOISTURE SEPARATOR
OWS	OIL WATER SEPARATOR
F-1	PARTICULATE FILTER
TP-1, 2	TRANSFER PUMPS
VCV	VAPOR CONTROL VALVE
WP	WELL PUMP
XP HEATER	XP HEATER

LEGEND

V1	VACUUM INDICATOR	FT	FLOW TOTALIZER	LSH	LEVEL SWITCH HIGH
T1	TEMPERATURE INDICATOR	FE	FLOW ELEMENT	LSHH	LEVEL SWITCH HIGH HIGH
P1	PRESSURE INDICATOR	DPI	DIFFERENTIAL PRESSURE INDICATOR	HOA	HAND/OFF/AUTO SWITCH - CONTROL PANEL MOUNTED
SP	SAMPLE PORT	LSL	LEVEL SWITCH LOW	GFCI	GROUND FAULT CIRCUIT INTERRUPTER
TYP	TYPICAL	T	THERMOSTAT	NEC	NATIONAL ELECTRICAL CODE
	VALVE - NORMALLY OPEN		FILTER REGULATOR		PRESSURE/VACUUM RELIEF VALVE
	VALVE NORMALLY CLOSED	S	SOLENOID VALVE		CHECK VALVE

September, 2014
203714085 task102B

Z:\WA\TOC_Holdings_Co 203714085\Figure 4 Piping And Instrumentation Diagram.dwg
2014/10/16 10:11 AM By: Pixton, Connie

Stantec
10101 36th Ave. W, Ste. 203
Lynnwood, Washington 98036

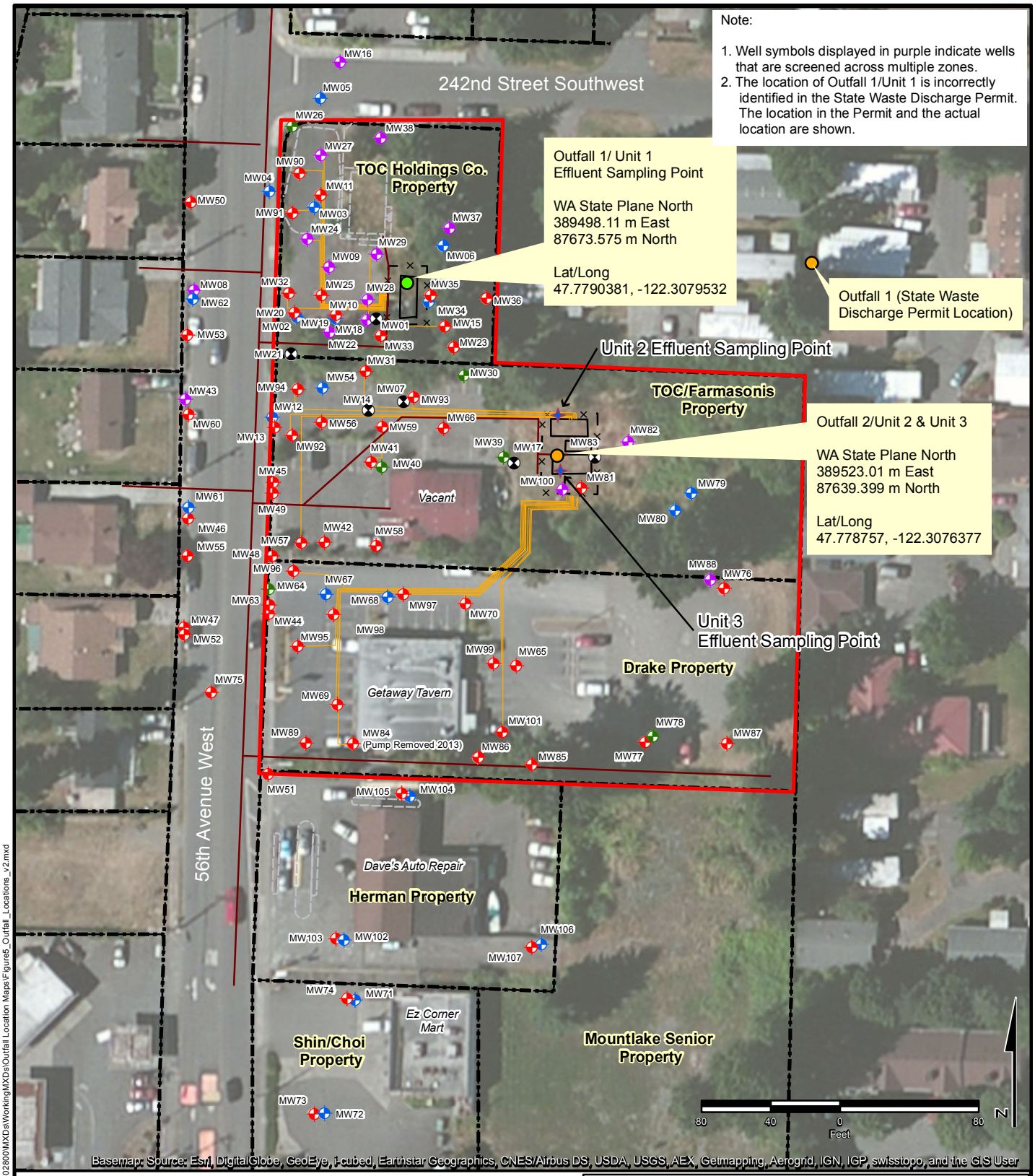
Notes

SOURCE:
SOUNDEARTH STRATEGIES, 2013
(WWW.SOUNDEARTHINC.COM)
Date: 12/03/2012
Drawn By: EAM/BLR
Checked By: MES/TSM
CadFile: 01-176_2013Q3_PID

Client/Project
TOC HOLDINGS COMPANY
Facility 01-176
Mountlake Terrace, Washington

Figure No.
4

Title
Piping and Instrumentation Diagram



Legend

- Site Boundary
- Discharge Permit Outfall Locations
- Corrected Outfall Location
- Effluent Sampling Point
- Abandoned Well
- Deep Well
- Intermediate Well
- Shallow Well
- Mixed Zone Well
- System Piping
- Compound Fence
- Parcels
- Sewer Line
- System Compound

TOC Holdings Co. Facility 01-176
24205 56th Avenue West
Mountlake Terrace, Washington

FIGURE 5: STATE WASTE DISCHARGE PERMIT ST0007384-
OUTFALL SAMPLING LOCATIONS

Stantec

DRAWN BY	D.H.	DATE DRAWN	3/12/2015
SCALE	1 in = 80 feet		
PROJECT	203714085		

X:\WA\Clients\Time_OII\TOC-MountlakeTerrace_BA1402800\MXDs\WorkingMXDs\Outfall Location Maps\Figure5_Outfall_Locations_v2.mxd

Appendix A

Laboratory Analytical Reports – Vapor

Unit 1: TOC Property Wells (24205)

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

October 28, 2014

Rebekah Brooks, Project Manager
Stantec
19101 36th Ave W, Suite 203
Lynnwood, WA 98036

Dear Ms. Brooks:

Included are the results from the testing of material submitted on October 23, 2014 from the TOC_01-176, WORFDB8 F&BI 410424 project. There are 4 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Kim Vik
STN1028R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on October 23, 2014 by Friedman & Bruya, Inc. from the Stantec TOC_01-176, WORFDB8 F&BI 410424 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Stantec
410424 -01	1VINF
410424 -02	1VEFF

All quality control requirements were acceptable.

Date of Report: 10/28/14
Date Received: 10/23/14
Project: TOC_01-176, WORFDB8 F&BI 410424
Date Extracted: 10/24/14
Date Analyzed: 10/24/14

RESULTS FROM THE ANALYSIS OF VAPOR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING MODIFIED METHODS 8021B AND NWTPH-Gx

Results Reported as mg/m^3

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
1VINF 410424-01	<0.1	3.0	<0.1	3.3	220	100
1VEFF 410424-02	<0.1	<0.1	<0.1	<0.3	<10	94
Method Blank 04-2122 MB	<0.1	<0.1	<0.1	<0.3	<10	97

Date of Report: 10/28/14
Date Received: 10/23/14
Project: TOC_01-176, WORFDB8 F&BI 410424

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF VAPOR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING MODIFIED EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 410354-01 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	mg/m^3	<0.1	<0.1	nm
Toluene	mg/m^3	0.10	0.12	15
Ethylbenzene	mg/m^3	<0.1	<0.1	nm
Xylenes	mg/m^3	<0.3	<0.3	nm
Gasoline	mg/m^3	<10	<10	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	mg/m^3	5.0	89	70-130
Toluene	mg/m^3	5.0	90	70-130
Ethylbenzene	mg/m^3	5.0	93	70-130
Xylenes	mg/m^3	15	91	70-130
Gasoline	mg/m^3	100	102	70-130

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

410424

SAMPLE CHAIN OF CUSTODY

ME 10-23-14

Send Report To Rebekah Brooks

Company Stantec

Address 19101 W 36th Ave # 203

City, State, ZIP Lynnwood WA 98036

Phone # 425-977-4994 Fax #

SAMPLERS (signature) Adam Valet

PROJECT NAME/NO. TOC-MLT

PO#

REMARKS

Page # _____ of _____

TURNAROUND TIME
- [x] Standard (2 Weeks)
- [ ] RUSH _____

Rush charges authorized by _____

SAMPLE DISPOSAL
- [x] Dispose after 30 days
- [ ] Return samples
- [ ] Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	ANALYSES REQUESTED: TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS							Notes
1VINF	01A-B	10/22/14	1445	Air	2		X	X										
1VEFF	02T	10/22/14	1455	Air	2		X	X										
																		Samples received at 20 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Nathan G. Magnuson	Stantec	10/23	1220
Received by:		FBK	10/23	1220
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

November 25, 2014

Rebekah Brooks, Project Manager
Stantec
19101 36th Ave W, Suite 203
Lynnwood, WA 98036

Dear Ms. Brooks:

Included are the results from the testing of material submitted on November 18, 2014 from the TOC_01-176, WORFDB8 F&BI 411305 project. There are 4 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Kim Vik
STN1125R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on November 18, 2014 by Friedman & Bruya, Inc. from the Stantec TOC_01-176, WORFDB8 F&BI 411305 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Stantec
411305 -01	1 V INF
411305 -02	1 V EFF

All quality control requirements were acceptable.

Date of Report: 11/25/14
Date Received: 11/18/14
Project: TOC_01-176, WORFDB8 F&BI 411305
Date Extracted: 11/20/14
Date Analyzed: 11/20/14

RESULTS FROM THE ANALYSIS OF VAPOR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING MODIFIED METHODS 8021B AND NWTPH-Gx

Results Reported as mg/m^3

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
1 V INF 411305-01	<0.1	0.57	<0.1	0.72	63	89
1 V EFF 411305-02	<0.1	<0.1	<0.1	<0.3	<10	77
Method Blank 04-2359 MB	<0.1	<0.1	<0.1	<0.3	<10	88

Date of Report: 11/25/14
Date Received: 11/18/14
Project: TOC_01-176, WORFDB8 F&BI 411305

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF VAPOR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING MODIFIED EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 411305-01 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	mg/m^3	<0.1	<0.1	nm
Toluene	mg/m^3	0.57	0.55	4
Ethylbenzene	mg/m^3	<0.1	<0.1	nm
Xylenes	mg/m^3	0.72	0.80	11
Gasoline	mg/m^3	63	75	17

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	mg/m^3	5.0	82	70-130
Toluene	mg/m^3	5.0	82	70-130
Ethylbenzene	mg/m^3	5.0	87	70-130
Xylenes	mg/m^3	15	86	70-130
Gasoline	mg/m^3	100	114	70-130

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

411305

SAMPLE CHAIN OF CUSTODY

ME 11-18-14

Page # 1 of 1

Send Report To Rebekah Brooks
Company Stantec
Address 19101 W 36th Ave #203
City, State, ZIP Lynnwood WA 98036
Phone # 425-977-4994 Fax #

SAMPLERS (signature) A Vadon

PROJECT NAME/NO. TOC MLT / 203700102

PO#

REMARKS Unit 1

TURNAROUND TIME
☒ Standard (2 Weeks)
☐ RUSH
Rush charges authorized by

SAMPLE DISPOSAL
☒ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS							Notes
1V INF	01 A-B	11-18	0800	air	2		X	X										
1V EFF	02 A-B	↓	0805	↓	2		X	X										
													Samples received at 18 °C					

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: A Vadon	Antonello Vadon	Stantec	11-18-14	2:00 pm
Received by:	VIAH	FBI	11-18/14	2:00 pm
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

December 15, 2014

Rebekah Brooks, Project Manager
Stantec
19101 36th Ave W, Suite 203
Lynnwood, WA 98036

Dear Ms. Brooks:

Included are the results from the testing of material submitted on December 10, 2014 from the TOC_01-176, WORFDB8 F&BI 412182 project. There are 4 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Kim Vik
STN1215R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on December 10, 2014 by Friedman & Bruya, Inc. from the Stantec TOC_01-176, WORFDB8 F&BI 412182 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Stantec
412182 -01	1VINF
412182 -02	1VEFF

All quality control requirements were acceptable.

Date of Report: 12/15/14
Date Received: 12/10/14
Project: TOC_01-176, WORFDB8 F&BI 412182
Date Extracted: 12/11/14
Date Analyzed: 12/11/14

RESULTS FROM THE ANALYSIS OF VAPOR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING MODIFIED METHODS 8021B AND NWTPH-Gx

Results Reported as mg/m^3

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
1VINF 412182-01	<0.1	0.29	<0.1	<0.3	15	78
1VEFF 412182-02	<0.1	<0.1	<0.1	<0.3	<10	79
Method Blank 04-2479 MB	<0.1	<0.1	<0.1	<0.3	<10	80

Date of Report: 12/15/14
Date Received: 12/10/14
Project: TOC_01-176, WORFDB8 F&BI 412182

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF VAPOR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING MODIFIED EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 412177-01 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	mg/m^3	<0.1	<0.1	nm
Toluene	mg/m^3	<0.1	<0.1	nm
Ethylbenzene	mg/m^3	<0.1	<0.1	nm
Xylenes	mg/m^3	<0.3	<0.3	nm
Gasoline	mg/m^3	<10	<10	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	mg/m^3	5.0	81	70-130
Toluene	mg/m^3	5.0	78	70-130
Ethylbenzene	mg/m^3	5.0	80	70-130
Xylenes	mg/m^3	15	79	70-130
Gasoline	mg/m^3	100	103	70-130

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

412182

SAMPLE CHAIN OF CUSTODY

ME 12/10/14

Page # 1 of 1

Send Report To Rebekah Brooks
Company Stantec
Address 1910 W 36th Ave. #203
City, State, ZIP Lynnwood WA 98036
Phone # 425-977-4994 Fax #

SAMPLERS (signature) AVadon

PROJECT NAME/NO. TOC MLI / 203700102

PO#

REMARKS

TURNAROUND TIME
☒ Standard (2 Weeks)
☐ RUSH
Rush charges authorized by

SAMPLE DISPOSAL
☒ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS							Notes
1 VINF	-01 A B	12-9-14	1355	Air	2		X	X										
1 VEFF	-02 A B	12-9-14	1350	Air	2		X	X										

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

FORMS\COC\COC.DOC

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: AVadon	Antonello Vadon	Stantec	12-10-14	1400
Received by:	Stephanie Thorn	FBI	12/10/14	1400
Relinquished by:				
Received by:		Samples received at 14 °C		

Unit 2: TOC/Farmasonis Property Wells (24225)

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

October 28, 2014

Rebekah Brooks, Project Manager
Stantec
19101 36th Ave W, Suite 203
Lynnwood, WA 98036

Dear Ms. Brooks:

Included are the results from the testing of material submitted on October 23, 2014 from the TOC_01-176, WORFDB8 F&BI 410425 project. There are 4 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Kim Vik
STN1028R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on October 23, 2014 by Friedman & Bruya, Inc. from the Stantec TOC_01-176, WORFDB8 F&BI 410425 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Stantec
410425 -01	2VEFF

All quality control requirements were acceptable.

Date of Report: 10/28/14
Date Received: 10/23/14
Project: TOC_01-176, WORFDB8 F&BI 410425
Date Extracted: 10/24/14
Date Analyzed: 10/24/14

RESULTS FROM THE ANALYSIS OF VAPOR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING MODIFIED METHODS 8021B AND NWTPH-Gx

Results Reported as mg/m^3

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
2VEFF 410425-01	<0.1	<0.1	<0.1	<0.3	<10	96
Method Blank 04-2122 MB	<0.1	<0.1	<0.1	<0.3	<10	97

Date of Report: 10/28/14
Date Received: 10/23/14
Project: TOC_01-176, WORFDB8 F&BI 410425

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF VAPOR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING MODIFIED EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 410354-01 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	mg/m^3	<0.1	<0.1	nm
Toluene	mg/m^3	0.10	0.12	15
Ethylbenzene	mg/m^3	<0.1	<0.1	nm
Xylenes	mg/m^3	<0.3	<0.3	nm
Gasoline	mg/m^3	<10	<10	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	mg/m^3	5.0	89	70-130
Toluene	mg/m^3	5.0	90	70-130
Ethylbenzene	mg/m^3	5.0	93	70-130
Xylenes	mg/m^3	15	91	70-130
Gasoline	mg/m^3	100	102	70-130

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

410425

SAMPLE CHAIN OF CUSTODY ME 10-23-14

Send Report To Rebekah Brooks

Company Stantec

Address 19101 36th Ave W #203

City, State, ZIP Lynnwood WA

Phone # 425-977-4994 Fax #

SAMPLERS *(signature)*

PROJECT NAME/NO. | PO#

REMARKS

Page # _____ of _____

TURNAROUND TIME
- ☐ Standard (2 Weeks)
- ☐ RUSH
- Rush charges authorized by

SAMPLE DISPOSAL
- ☐ Dispose after 30 days
- ☐ Return samples
- ☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	ANALYSES REQUESTED: TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS							Notes
2VEFF	01 K-B	10/22/14	1515	Air	2		X	X										

Samples received at 20 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Nathan C. Mossess	Stantec	10/23	1220
Received by:	Matt Goodman	F-B	10/23	1220
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

November 25, 2014

Rebekah Brooks, Project Manager
Stantec
19101 36th Ave W, Suite 203
Lynnwood, WA 98036

Dear Ms. Brooks:

Included are the results from the testing of material submitted on November 18, 2014 from the TOC_01-176, WORFDB8 F&BI 411306 project. There are 4 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Kim Vik
STN1125R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on November 18, 2014 by Friedman & Bruya, Inc. from the Stantec TOC_01-176, WORFDB8 F&BI 411306 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Stantec
411306 -01	2 V EFF

All quality control requirements were acceptable.

Date of Report: 11/25/14
Date Received: 11/18/14
Project: TOC_01-176, WORFDB8 F&BI 411306
Date Extracted: 11/20/14
Date Analyzed: 11/20/14

RESULTS FROM THE ANALYSIS OF VAPOR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING MODIFIED METHODS 8021B AND NWTPH-Gx

Results Reported as mg/m^3

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
2 V EFF 411306-01	<0.1	<0.1	<0.1	<0.3	<10	81
Method Blank 04-2359 MB2	<0.1	<0.1	<0.1	<0.3	<10	81

Date of Report: 11/25/14
Date Received: 11/18/14
Project: TOC_01-176, WORFDB8 F&BI 411306

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF VAPOR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING MODIFIED EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 411305-01 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	mg/m^3	<0.1	<0.1	nm
Toluene	mg/m^3	0.57	0.55	4
Ethylbenzene	mg/m^3	<0.1	<0.1	nm
Xylenes	mg/m^3	0.72	0.80	11
Gasoline	mg/m^3	63	75	17

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	mg/m^3	5.0	82	70-130
Toluene	mg/m^3	5.0	82	70-130
Ethylbenzene	mg/m^3	5.0	87	70-130
Xylenes	mg/m^3	15	86	70-130
Gasoline	mg/m^3	100	114	70-130

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

411306

SAMPLE CHAIN OF CUSTODY

ME 11-18-14

Page # 1 of 1

Send Report To R. Brooks

Company Stantec

Address 19101 W 36th Ave #203

City, State, ZIP Lynnwood WA 98036

Phone # 425-977-4994 Fax #

SAMPLERS (signature) A Vaadon

PROJECT NAME/NO. TOC-MLT / 203700102

PO#

REMARKS Unit 2

TURNAROUND TIME
- [x] Standard (2 Weeks)
- [ ] RUSH
- Rush charges authorized by

SAMPLE DISPOSAL
- [x] Dispose after 30 days
- [ ] Return samples
- [ ] Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS							Notes
2NEFF	01 AJB	11-18	0745	air	2		X	X										
																		Samples received at 18 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: A Vaadon	Antonela Vaadon	Stantec	11-18-14	2:00 pm
Received by:	VINH	FBI	11/18/14	2:00 pm
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

December 15, 2014

Rebekah Brooks, Project Manager
Stantec
19101 36th Ave W, Suite 203
Lynnwood, WA 98036

Dear Ms. Brooks:

Included are the results from the testing of material submitted on December 10, 2014 from the TOC_01-176, WORFDB8 F&BI 412183 project. There are 4 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Kim Vik
STN1215R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on December 10, 2014 by Friedman & Bruya, Inc. from the Stantec TOC_01-176, WORFDB8 F&BI 412183 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Stantec
412183 -01	2VEFF

All quality control requirements were acceptable.

Date of Report: 12/15/14
Date Received: 12/10/14
Project: TOC_01-176, WORFDB8 F&BI 412183
Date Extracted: 12/11/14
Date Analyzed: 12/11/14

RESULTS FROM THE ANALYSIS OF VAPOR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING MODIFIED METHODS 8021B AND NWTPH-Gx

Results Reported as mg/m^3

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
2VEFF 412183-01	<0.1	<0.1	<0.1	<0.3	<10	74
Method Blank 04-2479 MB	<0.1	<0.1	<0.1	<0.3	<10	80

Date of Report: 12/15/14
Date Received: 12/10/14
Project: TOC_01-176, WORFDB8 F&BI 412183

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF VAPOR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING MODIFIED EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 412177-01 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	mg/m^3	<0.1	<0.1	nm
Toluene	mg/m^3	<0.1	<0.1	nm
Ethylbenzene	mg/m^3	<0.1	<0.1	nm
Xylenes	mg/m^3	<0.3	<0.3	nm
Gasoline	mg/m^3	<10	<10	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	mg/m^3	5.0	81	70-130
Toluene	mg/m^3	5.0	78	70-130
Ethylbenzene	mg/m^3	5.0	80	70-130
Xylenes	mg/m^3	15	79	70-130
Gasoline	mg/m^3	100	103	70-130

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

412 183

SAMPLE CHAIN OF CUSTODY

ME 12/10/14

Page # 1 of 1

Send Report To Rebekah Brooks
Company Stantec
Address 19101 W 36th Ave, Suite 203
City, State, ZIP Lynnwood WA 98036
Phone # 425-977-4914 Fax #

SAMPLERS (signature) A Vadon
PROJECT NAME/NO. TOC MLT 1203700102
PO#
REMARKS

TURNAROUND TIME
☒ Standard (2 Weeks)
☐ RUSH
Rush charges authorized by

SAMPLE DISPOSAL
☒ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	ANALYSES REQUESTED: TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS							Notes
2VEFF	01 AB	12-9-14	1230	Air	2		X	X										

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: A Vadon	Antonela Vadon	Stantec	~~12~~ 12/10/14	1400
Received by:	Stephanie Tham	FBI	12/10/14	1400
Relinquished by:				
Received by:		Samples received at 14 °C		

FORMS\COC\COC.DOC

Unit 3: Drake Property Wells (24309)

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

October 28, 2014

Rebekah Brooks, Project Manager
Stantec
19101 36th Ave W, Suite 203
Lynnwood, WA 98036

Dear Ms. Brooks:

Included are the results from the testing of material submitted on October 23, 2014 from the TOC_01-176, WORFDB8 F&BI 410423 project. There are 4 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Kim Vik
STN1028R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on October 23, 2014 by Friedman & Bruya, Inc. from the Stantec TOC_01-176, WORFDB8 F&BI 410423 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Stantec
410423 -01	3VEFF

All quality control requirements were acceptable.

Date of Report: 10/28/14
Date Received: 10/23/14
Project: TOC_01-176, WORFDB8 F&BI 410423
Date Extracted: 10/24/14
Date Analyzed: 10/24/14

RESULTS FROM THE ANALYSIS OF VAPOR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING MODIFIED METHODS 8021B AND NWTPH-Gx

Results Reported as mg/m^3

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
3VEFF 410423-01	<0.1	<0.1	<0.1	<0.3	<10	96
Method Blank 04-2122 MB	<0.1	<0.1	<0.1	<0.3	<10	97

Date of Report: 10/28/14
Date Received: 10/23/14
Project: TOC_01-176, WORFDB8 F&BI 410423

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF VAPOR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING MODIFIED EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 410354-01 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	mg/m^3	<0.1	<0.1	nm
Toluene	mg/m^3	0.10	0.12	15
Ethylbenzene	mg/m^3	<0.1	<0.1	nm
Xylenes	mg/m^3	<0.3	<0.3	nm
Gasoline	mg/m^3	<10	<10	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	mg/m^3	5.0	89	70-130
Toluene	mg/m^3	5.0	90	70-130
Ethylbenzene	mg/m^3	5.0	93	70-130
Xylenes	mg/m^3	15	91	70-130
Gasoline	mg/m^3	100	102	70-130

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

410423

SAMPLE CHAIN OF CUSTODY

ME 10-23-14

Page # ______ of ______

Send Report To Rebekah Brooks

Company Stantec

Address 19101 36th Ave W. # 203

City, State, ZIP Lynnwood WA

Phone # 425-977-4994 Fax # ______

SAMPLERS (*signature*) Adam Valt

PROJECT NAME/NO. TOC-MLT

PO#

REMARKS

TURNAROUND TIME
☒ Standard (2 Weeks)
☐ RUSH ______
Rush charges authorized by ______

SAMPLE DISPOSAL
☒ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS							Notes
3VEFF	01A-B	10/22/14	1525	Air	2		X	X										

Samples received at 20 °C

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	[signature]	Nathan C Mgn...	Stantec	10/23	1220
Received by:	[signature]	[illegible]	FBI	10/23	1220
Relinquished by:					
Received by:					

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

FORMS\COC\COC.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

November 25, 2014

Rebekah Brooks, Project Manager
Stantec
19101 36th Ave W, Suite 203
Lynnwood, WA 98036

Dear Ms. Brooks:

Included are the results from the testing of material submitted on November 18, 2014 from the TOC_01-176, WORFDB8 F&BI 411307 project. There are 4 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Kim Vik
STN1125R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on November 18, 2014 by Friedman & Bruya, Inc. from the Stantec TOC_01-176, WORFDB8 F&BI 411307 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Stantec
411307 -01	3 V EFF

All quality control requirements were acceptable.

Date of Report: 11/25/14
Date Received: 11/18/14
Project: TOC_01-176, WORFDB8 F&BI 411307
Date Extracted: 11/20/14
Date Analyzed: 11/20/14

RESULTS FROM THE ANALYSIS OF VAPOR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING MODIFIED METHODS 8021B AND NWTPH-Gx

Results Reported as mg/m^3

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
3 V EFF 411307-01	<0.1	<0.1	<0.1	<0.3	<10	86
Method Blank 04-2359 MB2	<0.1	<0.1	<0.1	<0.3	<10	81

Date of Report: 11/25/14
Date Received: 11/18/14
Project: TOC_01-176, WORFDB8 F&BI 411307

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF VAPOR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING MODIFIED EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 411305-01 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	mg/m^3	<0.1	<0.1	nm
Toluene	mg/m^3	0.57	0.55	4
Ethylbenzene	mg/m^3	<0.1	<0.1	nm
Xylenes	mg/m^3	0.72	0.80	11
Gasoline	mg/m^3	63	75	17

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	mg/m^3	5.0	82	70-130
Toluene	mg/m^3	5.0	82	70-130
Ethylbenzene	mg/m^3	5.0	87	70-130
Xylenes	mg/m^3	15	86	70-130
Gasoline	mg/m^3	100	114	70-130

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

411307

SAMPLE CHAIN OF CUSTODY

ME 11-18-14

Page # 1 of 1

Send Report To R. Brooks

Company Stantec

Address 19101 W 36th Ave. #203

City, State, ZIP Lynnwood WA 98036

Phone # 425-977-4994 Fax #

SAMPLERS (signature) AVadon

PROJECT NAME/NO. TOCMLT /2037 00102

PO#

REMARKS Unit 3

TURNAROUND TIME
- [x] Standard (2 Weeks)
- [ ] RUSH
- Rush charges authorized by

SAMPLE DISPOSAL
- [x] Dispose after 30 days
- [ ] Return samples
- [ ] Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS							Notes
3V EFF	01 ATB	11-18	0750	air	2		X	X										
DUP																		
																		Samples received at 18 °C

ANALYSES REQUESTED

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: AVadon	Antonello Vadon	Stantec	11-18-14	2:00 pm
Received by: Alun	VINH	FBI	11/18/14	2:00 pm
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

FORMS\COC\COC.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

December 15, 2014

Rebekah Brooks, Project Manager
Stantec
19101 36th Ave W, Suite 203
Lynnwood, WA 98036

Dear Ms. Brooks:

Included are the results from the testing of material submitted on December 10, 2014 from the TOC_01-176, WORFDB8 F&BI 412184 project. There are 4 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Kim Vik
STN1215R.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

CASE NARRATIVE

This case narrative encompasses samples received on December 10, 2014 by Friedman & Bruya, Inc. from the Stantec TOC_01-176, WORFDB8 F&BI 412184 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Stantec
412184 -01	3VEFF

All quality control requirements were acceptable.

Date of Report: 12/15/14
Date Received: 12/10/14
Project: TOC_01-176, WORFDB8 F&BI 412184
Date Extracted: 12/11/14
Date Analyzed: 12/11/14

RESULTS FROM THE ANALYSIS OF VAPOR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING MODIFIED METHODS 8021B AND NWTPH-Gx

Results Reported as mg/m^3

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
3VEFF 412184-01	<0.1	<0.1	<0.1	<0.3	<10	77
Method Blank 04-2479 MB	<0.1	<0.1	<0.1	<0.3	<10	80

Date of Report: 12/15/14
Date Received: 12/10/14
Project: TOC_01-176, WORFDB8 F&BI 412184

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF VAPOR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING MODIFIED EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 412177-01 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	mg/m^3	<0.1	<0.1	nm
Toluene	mg/m^3	<0.1	<0.1	nm
Ethylbenzene	mg/m^3	<0.1	<0.1	nm
Xylenes	mg/m^3	<0.3	<0.3	nm
Gasoline	mg/m^3	<10	<10	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	mg/m^3	5.0	81	70-130
Toluene	mg/m^3	5.0	78	70-130
Ethylbenzene	mg/m^3	5.0	80	70-130
Xylenes	mg/m^3	15	79	70-130
Gasoline	mg/m^3	100	103	70-130

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

SAMPLE CHAIN OF CUSTODY

412184

Send Report To Rebekah Brooks

Company Stantec

Address 19101 W 36th Ave. #203

City, State, ZIP Lynnwood WA 98036

Phone # 425-977-4994 Fax #

SAMPLERS (signature) ME 12/10/14 AVadon

PROJECT NAME/NO. TOC MLT / 203700102

PO#

REMARKS

Page # 1 of 1

TURNAROUND TIME
- ☑ Standard (2 Weeks)
- ☐ RUSH
- Rush charges authorized by

SAMPLE DISPOSAL
- ☑ Dispose after 30 days
- ☐ Return samples
- ☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	ANALYSES REQUESTED: TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS							Notes
3V EFF	01AB	12-9-14	1245	air	2		X	X										

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: AVadon	Antonelo Vadon	Stantec	12-10-14	1400
Received by:	Stephanie Pha	FBI	12/10/14	1400
Relinquished by:				
Received by:		Samples received at	14°C	

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

Appendix B

Laboratory Analytical Reports – Water

Unit 1: TOC Property Wells (24205)

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

October 28, 2014

Rebekah Brooks, Project Manager
Stantec
19101 36th Ave W, Suite 203
Lynnwood, WA 98036

Dear Ms. Brooks:

Included are the results from the testing of material submitted on October 23, 2014 from the TOC_01-176, WORFDB8 F&BI 410426 project. There are 4 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Kim Vik
STN1028R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on October 23, 2014 by Friedman & Bruya, Inc. from the Stantec TOC_01-176, WORFDB8 F&BI 410426 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Stantec
410426 -01	1WINF
410426 -02	1WEFF
410426 -03	1GAC1
410426 -04	1GAC2
410426 -05	TB-102214

All quality control requirements were acceptable.

Date of Report: 10/28/14
Date Received: 10/23/14
Project: TOC_01-176, WORFDB8 F&BI 410426
Date Extracted: 10/23/14 and 10/24/14
Date Analyzed: 10/23/14 and 10/24/14

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING METHODS 8021B AND NWTPH-Gx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 52-124)
1WINF 410426-01	<1	1.4	<1	4.0	<100	97
1WEFF 410426-02	<1	<1	<1	<3	<100	96
1GAC1 410426-03	<1	<1	<1	<3	<100	95
1GAC2 410426-04	<1	<1	<1	<3	<100	94
TB-102214 410426-05	<1	<1	<1	<3	<100	98
Method Blank 04-2165 MB	<1	<1	<1	<3	<100	95

Date of Report: 10/28/14
Date Received: 10/23/14
Project: TOC_01-176, WORFDB8 F&BI 410426

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING METHOD 8021B AND NWTPH-Gx

Laboratory Code: 410426-02 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	ug/L (ppb)	<1	<1	nm
Toluene	ug/L (ppb)	<1	<1	nm
Ethylbenzene	ug/L (ppb)	<1	<1	nm
Xylenes	ug/L (ppb)	<3	<3	nm
Gasoline	ug/L (ppb)	<100	<100	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/L (ppb)	50	97	65-118
Toluene	ug/L (ppb)	50	97	72-122
Ethylbenzene	ug/L (ppb)	50	102	73-126
Xylenes	ug/L (ppb)	150	96	74-118
Gasoline	ug/L (ppb)	1,000	94	69-134

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

410426

SAMPLE CHAIN OF CUSTODY ME 10-23-14

V2

Send Report To: Rebekah Brooks
Company: Stantec
Address: 19101 W 36th Ave #203
City, State, ZIP: Lynnwood WA 98036
Phone #: 425-977-4994 Fax #:

SAMPLERS (*signature*): [illegible]
PROJECT NAME/NO.: TOC - MLT
PO#:
REMARKS:

Page # ____ of ____

TURNAROUND TIME
☒ Standard (2 Weeks)
☐ RUSH
Rush charges authorized by

SAMPLE DISPOSAL
☒ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS							Notes
1WINF	01A-L	10/22/14	1410	Water	3		X	X										
1WEFF	02	10/22/14	1420	↓	3		X	X										
1GAC1	03	10/22/14	1412	↓	3		X	X										
1GAC2	04	10/22/14	1416	↓	3		X	X										
TB-102214	05	10/22/14	1430	Water	1		X	X										

Samples received at 2 °C

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	[illegible]	Nathan C. Magnusson	Stantec	10/23	1200
Received by:	[illegible]	[illegible]	FBI [illegible]	10/23	1220
Relinquished by:					
Received by:					

FORMS\COC\COC.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

November 24, 2014

Rebekah Brooks, Project Manager
Stantec
19101 36th Ave W, Suite 203
Lynnwood, WA 98036

Dear Ms. Brooks:

Included are the results from the testing of material submitted on November 18, 2014 from the TOC_01-176, WORFDB8 F&BI 411308 project. There are 4 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Kim Vik
STN1124R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on November 18, 2014 by Friedman & Bruya, Inc. from the Stantec TOC_01-176, WORFDB8 F&BI 411308 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Stantec
411308 -01	1 W INF
411308 -02	1 W EFF
411308 -03	1 GAC1
411308 -04	1 GAC2
411308 -05	TB-111814

All quality control requirements were acceptable.

Date of Report: 11/24/14
Date Received: 11/18/14
Project: TOC_01-176, WORFDB8 F&BI 411308
Date Extracted: 11/19/14
Date Analyzed: 11/19/14

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING METHODS 8021B AND NWTPH-Gx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 52-124)
1 W INF 411308-01	<1	<1	<1	<3	<100	83
1 W EFF 411308-02	<1	<1	<1	<3	<100	85
1 GAC1 411308-03	<1	<1	<1	<3	<100	78
1 GAC2 411308-04	<1	<1	<1	<3	<100	82
TB-111814 411308-05	<1	<1	<1	<3	<100	80
Method Blank 04-2335 MB	<1	<1	<1	<3	<100	79

Date of Report: 11/24/14
Date Received: 11/18/14
Project: TOC_01-176, WORFDB8 F&BI 411308

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 411277-01 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	ug/L (ppb)	<1	<1	nm
Toluene	ug/L (ppb)	<1	<1	nm
Ethylbenzene	ug/L (ppb)	<1	<1	nm
Xylenes	ug/L (ppb)	<3	<3	nm
Gasoline	ug/L (ppb)	<100	<100	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/L (ppb)	50	90	65-118
Toluene	ug/L (ppb)	50	91	72-122
Ethylbenzene	ug/L (ppb)	50	94	73-126
Xylenes	ug/L (ppb)	150	90	74-118
Gasoline	ug/L (ppb)	1,000	89	69-134

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

411308

SAMPLE CHAIN OF CUSTODY

ME 11-18-14 V3

Page # 1 of 1

Send Report To R. Brooks

Company Stantec

Address 19101 W 36th Ave #203

City, State, ZIP Lynnwood WA 98036

Phone # 4259774994 Fax #

SAMPLERS (signature) AVadon

PROJECT NAME/NO. TOC MLT / 203700102

PO#

REMARKS Unit 1

TURNAROUND TIME
☒ Standard (2 Weeks)
☐ RUSH
Rush charges authorized by

SAMPLE DISPOSAL
☒ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS							Notes
1 W INF	01 A-C	11-17	1200	water	3		X	X										
1 W EFF	02	↓	1205	↓	3		X	X										
1 GAC 1	03	↓	1210	↓	3		X	X										
1 GAC 2	04	↓	1215	↓	3		X	X										
TB - 111814	05			↓	1		X	X										

ANALYSES REQUESTED

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: AVadon	Antonelo Vadon	Stantec	11-18-14	2:00 pm
Received by:	VINH	FBI	11/18/14	2:00 pm
Relinquished by:				
Received by:		Samples received at 3 °C		

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

December 15, 2014

Rebekah Brooks, Project Manager
Stantec
19101 36th Ave W, Suite 203
Lynnwood, WA 98036

Dear Ms. Brooks:

Included are the results from the testing of material submitted on December 10, 2014 from the TOC_01-176, WORFDB8 F&BI 412185 project. There are 7 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Kim Vik
STN1215R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on December 10, 2014 by Friedman & Bruya, Inc. from the Stantec TOC_01-176, WORFDB8 F&BI 412185 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Stantec
412185 -01	1WEFF
412185 -02	1WGAC2
412185 -03	1WGAC1
412185 -04	1WINF

All quality control requirements were acceptable.

Date of Report: 12/15/14
Date Received: 12/10/14
Project: TOC_01-176, WORFDB8 F&BI 412185
Date Extracted: 12/11/14
Date Analyzed: 12/11/14

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING METHODS 8021B AND NWTPH-Gx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 52-124)
1WEFF 412185-01	<1	<1	<1	<3	<100	78
1WGAC2 412185-02	<1	<1	<1	<3	<100	79
1WGAC1 412185-03	<1	<1	<1	<3	<100	75
1WINF 412185-04	<1	<1	<1	<3	<100	80
Method Blank 04-2438 MB	<1	<1	<1	<3	<100	76

Analysis For Total Metals By EPA Method 200.8

Client ID:	1WEFF	Client:	Stantec
Date Received:	12/10/14	Project:	TOC_01-176, WORFDB8 F&BI 412185
Date Extracted:	12/11/14	Lab ID:	412185-01
Date Analyzed:	12/11/14	Data File:	412185-01.027
Matrix:	Water	Instrument:	ICPMS1
Units:	ug/L (ppb)	Operator:	AP

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Holmium	69	60	125

Analyte:	Concentration ug/L (ppb)
Lead	13.3

Analysis For Total Metals By EPA Method 200.8

Client ID:	Method Blank	Client:	Stantec
Date Received:	NA	Project:	TOC_01-176, WORFDB8 F&BI 412185
Date Extracted:	12/11/14	Lab ID:	I4-793 mb
Date Analyzed:	12/11/14	Data File:	I4-793 mb.019
Matrix:	Water	Instrument:	ICPMS1
Units:	ug/L (ppb)	Operator:	AP

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Holmium	100	60	125

Analyte:	Concentration ug/L (ppb)
Lead	<1

Date of Report: 12/15/14
Date Received: 12/10/14
Project: TOC_01-176, WORFDB8 F&BI 412185

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 412178-02 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	ug/L (ppb)	<1	<1	nm
Toluene	ug/L (ppb)	<1	<1	nm
Ethylbenzene	ug/L (ppb)	<1	<1	nm
Xylenes	ug/L (ppb)	<3	<3	nm
Gasoline	ug/L (ppb)	<100	<100	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/L (ppb)	50	89	65-118
Toluene	ug/L (ppb)	50	87	72-122
Ethylbenzene	ug/L (ppb)	50	89	73-126
Xylenes	ug/L (ppb)	150	85	74-118
Gasoline	ug/L (ppb)	1,000	91	69-134

Date of Report: 12/15/14
Date Received: 12/10/14
Project: TOC_01-176, WORFDB8 F&BI 412185

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: 412157-05 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Lead	ug/L (ppb)	10	<1	111	106	79-121	5

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Lead	ug/L (ppb)	10	113	83-115

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

412185

SAMPLE CHAIN OF CUSTODY ME 12/10/14

VI/AI2

Page # 1 of 1

Send Report To Rebekah Brooks
Company Stantec
Address 19101 W 36th Ave #203
City, State, ZIP Lynnwood WA 98036
Phone # 425-977-4994 Fax #

SAMPLERS (signature) Avadon

PROJECT NAME/NO. TOC MLT/203700102 PO#

REMARKS

TURNAROUND TIME
☐ Standard (2 Weeks)
☑ RUSH
Rush charges authorized by

SAMPLE DISPOSAL
☒ Dispose after 30 days
☑ Return samples
☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS	TOTAL HG						Notes
1WEFF	01 A-D	12-9-14	1400	water	4		X	X				X						
1WGAC2	02 A-C	↓	1405	↓	3		X	X										
1WGAC1	03		1410		3		X	X										
1WINF	04	↓	1415	↓	3		X	X										
																		Samples received at °C

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Avadon	Antoneb Vadon	Stantec	12-10-14	1400
Received by: Thao Molsness	Thao Molsness	FB BI	12/10/14	14:00
Relinquished by:				
Received by:		Samples received at °C		

FORMS\COC\COC.DOC

Unit 2: TOC/Farmasonis Property Wells (24225)

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

October 28, 2014

Rebekah Brooks, Project Manager
Stantec
19101 36th Ave W, Suite 203
Lynnwood, WA 98036

Dear Ms. Brooks:

Included are the results from the testing of material submitted on October 23, 2014 from the TOC_01-176, WORFDB8 F&BI 410427 project. There are 4 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Kim Vik
STN1028R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on October 23, 2014 by Friedman & Bruya, Inc. from the Stantec TOC_01-176, WORFDB8 F&BI 410427 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Stantec
410427 -01	2WEFF
410427 -02	2GAC1
410427 -03	2WINF
410427 -04	2GAC2

All quality control requirements were acceptable.

Date of Report: 10/28/14
Date Received: 10/23/14
Project: TOC_01-176, WORFDB8 F&BI 410427
Date Extracted: 10/23/14
Date Analyzed: 10/23/14

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING METHODS 8021B AND NWTPH-Gx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
2WEFF 410427-01	<1	<1	<1	<3	<100	97
2GAC1 410427-02	<1	<1	<1	<3	<100	98
2WINF 410427-03	<1	<1	<1	<3	<100	95
2GAC2 410427-04	<1	<1	<1	<3	<100	97
Method Blank 04-2165 MB	<1	<1	<1	<3	<100	95

Date of Report: 10/28/14
Date Received: 10/23/14
Project: TOC_01-176, WORFDB8 F&BI 410427

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 410426-02 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	ug/L (ppb)	<1	<1	nm
Toluene	ug/L (ppb)	<1	<1	nm
Ethylbenzene	ug/L (ppb)	<1	<1	nm
Xylenes	ug/L (ppb)	<3	<3	nm
Gasoline	ug/L (ppb)	<100	<100	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/L (ppb)	50	97	65-118
Toluene	ug/L (ppb)	50	97	72-122
Ethylbenzene	ug/L (ppb)	50	102	73-126
Xylenes	ug/L (ppb)	150	96	74-118
Gasoline	ug/L (ppb)	1,000	94	69-134

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

410427

SAMPLE CHAIN OF CUSTODY ME 10-23-14

V2

Page # ________ of ________

Send Report To Rebekah Brooks

Company Stantec

Address 1901 36th Ave W #203

City, State, ZIP Lynnwood WA 98036

Phone # 425-977-4994 Fax # ____

SAMPLERS (signature) Adam Valt

PROJECT NAME/NO. TOC-MLT

PO#

REMARKS

TURNAROUND TIME
- ☒ Standard (2 Weeks)
- ☐ RUSH ____
- Rush charges authorized by ____

SAMPLE DISPOSAL
- ☒ Dispose after 30 days
- ☐ Return samples
- ☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS							Notes
~~2WINF~~		~~10/22/14~~	~~1510~~	Water	~~3~~		~~X~~	~~X~~										
2WEFF	01 A-C	10/22/14	1515	↓	3		X	X										
2GAC1	02 T	10/22/14	1520	↓	3		X	X										
~~2GAC2~~		~~10/22/14~~	~~1525~~	Water	~~3~~		~~X~~	~~X~~										
2WINF	03 A-C	10/23/14	0945	Water	3		X	X										
2GAC2	04 T	10/23/14	0950	Water	3		X	X										
																		Samples received at 2 °C

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	[signature]	Nathan C. Magnussen	Stantec	10/23	1220
Received by:	[signature]	Keith Gjerstad	FBI	10/22	1220
Relinquished by:					
Received by:					

FORMS\COC\COC.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

November 24, 2014

Rebekah Brooks, Project Manager
Stantec
19101 36th Ave W, Suite 203
Lynnwood, WA 98036

Dear Ms. Brooks:

Included are the results from the testing of material submitted on November 18, 2014 from the TOC_01-176, WORFDB8 F&BI 411309 project. There are 4 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Kim Vik
STN1124R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on November 18, 2014 by Friedman & Bruya, Inc. from the Stantec TOC_01-176, WORFDB8 F&BI 411309 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Stantec
411309 -01	2 W INF
411309 -02	2 W EFF
411309 -03	2 GAC1

All quality control requirements were acceptable.

Date of Report: 11/24/14
Date Received: 11/18/14
Project: TOC_01-176, WORFDB8 F&BI 411309
Date Extracted: 11/19/14
Date Analyzed: 11/19/14

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING METHODS 8021B AND NWTPH-Gx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 52-124)
2 W INF 411309-01	<1	<1	<1	<3	<100	86
2 W EFF 411309-02	<1	<1	<1	<3	<100	86
2 GAC1 411309-03	<1	<1	<1	<3	<100	87
Method Blank 04-2335 MB	<1	<1	<1	<3	<100	79

Date of Report: 11/24/14
Date Received: 11/18/14
Project: TOC_01-176, WORFDB8 F&BI 411309

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 411277-01 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	ug/L (ppb)	<1	<1	nm
Toluene	ug/L (ppb)	<1	<1	nm
Ethylbenzene	ug/L (ppb)	<1	<1	nm
Xylenes	ug/L (ppb)	<3	<3	nm
Gasoline	ug/L (ppb)	<100	<100	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/L (ppb)	50	90	65-118
Toluene	ug/L (ppb)	50	91	72-122
Ethylbenzene	ug/L (ppb)	50	94	73-126
Xylenes	ug/L (ppb)	150	90	74-118
Gasoline	ug/L (ppb)	1,000	89	69-134

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

411309

SAMPLE CHAIN OF CUSTODY

ME 11-18-14

Page # 1 of 1 V3

Send Report To R. Brooks

Company Stantec

Address 19101 W 36th Ave. #203

City, State, ZIP Lynnwood WA 98036

Phone # 425-977-4994 Fax #

SAMPLERS (signature) A Vadon

PROJECT NAME/NO. TOC MLT/203700102

PO#

REMARKS Unit 2

TURNAROUND TIME
- [x] Standard (2 Weeks)
- [ ] RUSH
- Rush charges authorized by

SAMPLE DISPOSAL
- [x] Dispose after 30 days
- [ ] Return samples
- [ ] Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS							Notes
						ANALYSES REQUESTED												
2WINF	01	11-17	1115	water	3		X	X										
2WEFF	02	↓	1120	↓	3		X	X										
2GAC1	03	↓	1125	↓	3		X	X										

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: A Vadon	Antonelo Vadon	Stantec	11-18-14	2:00 pm
Received by:	VINH	EBI	11/18/14	2:00 pm
Relinquished by:				
Received by:		Samples received at 3 °C		

FORMS\COC\COC.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

December 15, 2014

Rebekah Brooks, Project Manager
Stantec
19101 36th Ave W, Suite 203
Lynnwood, WA 98036

Dear Ms. Brooks:

Included are the results from the testing of material submitted on December 10, 2014 from the TOC_01-176, WORFDB8 F&BI 412186 project. There are 7 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Kim Vik
STN1215R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on December 10, 2014 by Friedman & Bruya, Inc. from the Stantec TOC_01-176, WORFDB8 F&BI 412186 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Stantec
412186 -01	2WEFF
412186 -02	2WGAC2
412186 -03	2WGAC1
412186 -04	2WINF

All quality control requirements were acceptable.

Date of Report: 12/15/14
Date Received: 12/10/14
Project: TOC_01-176, WORFDB8 F&BI 412186
Date Extracted: 12/11/14
Date Analyzed: 12/11/14

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING METHODS 8021B AND NWTPH-Gx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 52-124)
2WEFF 412186-01	<1	<1	<1	<3	<100	76
2WGAC2 412186-02	<1	<1	<1	<3	<100	72
2WGAC1 412186-03	<1	<1	<1	<3	<100	72
2WINF 412186-04	<1	<1	<1	<3	<100	75
Method Blank 04-2438 MB	<1	<1	<1	<3	<100	76

Analysis For Total Metals By EPA Method 200.8

Client ID:	2WEFF	Client:	Stantec
Date Received:	12/10/14	Project:	TOC_01-176, WORFDB8 F&BI 412186
Date Extracted:	12/11/14	Lab ID:	412186-01
Date Analyzed:	12/11/14	Data File:	412186-01.028
Matrix:	Water	Instrument:	ICPMS1
Units:	ug/L (ppb)	Operator:	AP

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Holmium	65	60	125

Analyte:	Concentration ug/L (ppb)
Lead	<1

Analysis For Total Metals By EPA Method 200.8

Client ID:	Method Blank	Client:	Stantec
Date Received:	NA	Project:	TOC_01-176, WORFDB8 F&BI 412186
Date Extracted:	12/11/14	Lab ID:	I4-793 mb
Date Analyzed:	12/11/14	Data File:	I4-793 mb.019
Matrix:	Water	Instrument:	ICPMS1
Units:	ug/L (ppb)	Operator:	AP

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Holmium	100	60	125

Analyte:	Concentration ug/L (ppb)
Lead	<1

Date of Report: 12/15/14
Date Received: 12/10/14
Project: TOC_01-176, WORFDB8 F&BI 412186

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 412178-02 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	ug/L (ppb)	<1	<1	nm
Toluene	ug/L (ppb)	<1	<1	nm
Ethylbenzene	ug/L (ppb)	<1	<1	nm
Xylenes	ug/L (ppb)	<3	<3	nm
Gasoline	ug/L (ppb)	<100	<100	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/L (ppb)	50	89	65-118
Toluene	ug/L (ppb)	50	87	72-122
Ethylbenzene	ug/L (ppb)	50	89	73-126
Xylenes	ug/L (ppb)	150	85	74-118
Gasoline	ug/L (ppb)	1,000	91	69-134

Date of Report: 12/15/14
Date Received: 12/10/14
Project: TOC_01-176, WORFDB8 F&BI 412186

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: 412157-05 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Lead	ug/L (ppb)	10	<1	111	106	79-121	5

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Lead	ug/L (ppb)	10	113	83-115

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

412186

V1 1AI2

SAMPLE CHAIN OF CUSTODY ME 12/10/14

Page # 1 of 1

Send Report To Rebekah Brooks
Company Stantec
Address 19101 W 36th Ave #203
City, State, ZIP Lynnwood WA 98036
Phone # 425-977-4494 Fax #

SAMPLERS (signature) Antonio Vadon
PROJECT NAME/NO. TOC MCT / 203700102
PO#
REMARKS

TURNAROUND TIME
☒ Standard (2 Weeks)
☐ RUSH
Rush charges authorized by

SAMPLE DISPOSAL
☒ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS	TOTAL #AD					Notes
2W EFF	01AD	12-9-14	1315	Water	4	X	X	X				X					
2W GAC2	02A-C	12-9-14	1320	"	3		X	X									
2W GAC1	03A-C	12-9-14	1325	"	3		X	X									
2W INF	04AC	12-9-14	1330	↓	3		X	X									

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Vadon	Antonio Vadon	Stantec	12/10/14	14:00
Received by:	MW Molsness	Thao Molsness	F&BI	12/10/14	14:00
Relinquished by:					
Received by:			Samples received at 0 °C		

FORMS\COC\COC.DOC

Unit 3: Drake Property Wells (24309)

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

October 28, 2014

Rebekah Brooks, Project Manager
Stantec
19101 36th Ave W, Suite 203
Lynnwood, WA 98036

Dear Ms. Brooks:

Included are the results from the testing of material submitted on October 23, 2014 from the TOC_01-176, WORFDB8 F&BI 410428 project. There are 4 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Kim Vik
STN1028R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on October 23, 2014 by Friedman & Bruya, Inc. from the Stantec TOC_01-176, WORFDB8 F&BI 410428 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Stantec
410428 -01	3WINF
410428 -02	3GAC2
410428 -03	3WEFF

All quality control requirements were acceptable.

Date of Report: 10/28/14
Date Received: 10/23/14
Project: TOC_01-176, WORFDB8 F&BI 410428
Date Extracted: 10/23/14
Date Analyzed: 10/23/14

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING METHODS 8021B AND NWTPH-Gx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
3WINF 410428-01	<1	<1	<1	<3	<100	98
3GAC2 410428-02	<1	<1	<1	<3	<100	97
3WEFF 410428-03	<1	<1	<1	<3	<100	97
Method Blank 04-2165 MB	<1	<1	<1	<3	<100	95

Date of Report: 10/28/14
Date Received: 10/23/14
Project: TOC_01-176, WORFDB8 F&BI 410428

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 410426-02 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	ug/L (ppb)	<1	<1	nm
Toluene	ug/L (ppb)	<1	<1	nm
Ethylbenzene	ug/L (ppb)	<1	<1	nm
Xylenes	ug/L (ppb)	<3	<3	nm
Gasoline	ug/L (ppb)	<100	<100	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/L (ppb)	50	97	65-118
Toluene	ug/L (ppb)	50	97	72-122
Ethylbenzene	ug/L (ppb)	50	102	73-126
Xylenes	ug/L (ppb)	150	96	74-118
Gasoline	ug/L (ppb)	1,000	94	69-134

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

410428

SAMPLE CHAIN OF CUSTODY

ME 10-23-14

V2

Send Report To Rebekah Brooks

Company Stantec

Address 19101 36th Ave W, # 203

City, State, ZIP Lynnwood WA

Phone # 425-977-4994 Fax #

SAMPLERS *(signature)* Adam Valk

PROJECT NAME/NO. TOC-MLT

PO#

REMARKS

Page # _____ of _____

TURNAROUND TIME
- [x] Standard (2 Weeks)
- [ ] RUSH _____

Rush charges authorized by _____

SAMPLE DISPOSAL
- [x] Dispose after 30 days
- [ ] Return samples
- [ ] Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS							Notes
3WINF	01 A-C	10/22/14	1540	Water	3		X	X										
3GAC2	02	10/22/14	1550	Water	3		X	X										
3WEFF	03	10/22/14	1545	Water	3		X	X										
																		Samples received at 2 °C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Nathan C. Myrose	Stantec	10/23	1210
Received by:	Matt Hagen	F Bruya	10/23	1220
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

November 24, 2014

Rebekah Brooks, Project Manager
Stantec
19101 36th Ave W, Suite 203
Lynnwood, WA 98036

Dear Ms. Brooks:

Included are the results from the testing of material submitted on November 18, 2014 from the TOC_01-176, WORFDB8 F&BI 411310 project. There are 4 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Kim Vik
STN1124R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on November 18, 2014 by Friedman & Bruya, Inc. from the Stantec TOC_01-176, WORFDB8 F&BI 411310 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Stantec
411310 -01	3 W INF
411310 -02	3 W EFF
411310 -03	3 GAC1
411310 -04	3 GAC2

All quality control requirements were acceptable.

Date of Report: 11/24/14
Date Received: 11/18/14
Project: TOC_01-176, WORFDB8 F&BI 411310
Date Extracted: 11/19/14
Date Analyzed: 11/19/14

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING METHODS 8021B AND NWTPH-Gx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 52-124)
3 W INF 411310-01	<1	<1	<1	<3	<100	78
3 W EFF 411310-02	<1	<1	<1	<3	<100	84
3 GAC1 411310-03	<1	<1	<1	<3	<100	82
3 GAC2 411310-04	<1	<1	<1	<3	<100	81
Method Blank 04-2335 MB	<1	<1	<1	<3	<100	79

Date of Report: 11/24/14
Date Received: 11/18/14
Project: TOC_01-176, WORFDB8 F&BI 411310

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 411277-01 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	ug/L (ppb)	<1	<1	nm
Toluene	ug/L (ppb)	<1	<1	nm
Ethylbenzene	ug/L (ppb)	<1	<1	nm
Xylenes	ug/L (ppb)	<3	<3	nm
Gasoline	ug/L (ppb)	<100	<100	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/L (ppb)	50	90	65-118
Toluene	ug/L (ppb)	50	91	72-122
Ethylbenzene	ug/L (ppb)	50	94	73-126
Xylenes	ug/L (ppb)	150	90	74-118
Gasoline	ug/L (ppb)	1,000	89	69-134

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

411310

SAMPLE CHAIN OF CUSTODY

ME 11-18-14

Page # 1 of 1 V3

Send Report To R. Brooks
Company Stantec
Address 19101 W 36th Ave.
City, State, ZIP Lynnwood WA 98036
Phone # 425-977-4994 Fax #

SAMPLERS (signature) A Vaalon
PROJECT NAME/NO. TOC-MLT / 203700102
PO#
REMARKS Unit 3

TURNAROUND TIME
☒ Standard (2 Weeks)
☐ RUSH
Rush charges authorized by

SAMPLE DISPOSAL
☒ Dispose after 30 days
☐ Return samples
☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	ANALYSES REQUESTED: TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS							Notes
3WINF	01 A-C	11-17	1030	water	3		X	X										
3WEFF	02		1035				X	X										
3GAC1	03		1040				X	X										
3GAC2	04		1045				X	X										

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: A Vaalon	Antonela Vaalon	Stantec	11-18-14	2:00 pm
Received by:	VINH	FBI	11/18/14	2:00 PM
Relinquished by:				
Received by:		Samples received at 3 °C		

FORMS\COC\COC.DOC

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

December 15, 2014

Rebekah Brooks, Project Manager
Stantec
19101 36th Ave W, Suite 203
Lynnwood, WA 98036

Dear Ms. Brooks:

Included are the results from the testing of material submitted on December 10, 2014 from the TOC_01-176, WORFDB8 F&BI 412190 project. There are 7 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Kim Vik
STN1215R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on December 10, 2014 by Friedman & Bruya, Inc. from the Stantec TOC_01-176, WORFDB8 F&BI 412190 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Stantec
412190 -01	3WEFF
412190 -02	3WGAC1
412190 -03	3WINF

All quality control requirements were acceptable.

Date of Report: 12/15/14
Date Received: 12/10/14
Project: TOC_01-176, WORFDB8 F&BI 412190
Date Extracted: 12/11/14
Date Analyzed: 12/11/14

RESULTS FROM THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING METHODS 8021B AND NWTPH-Gx

Results Reported as ug/L (ppb)

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
3WEFF 412190-01	<1	<1	<1	<3	<100	94
3WGAC1 412190-02	<1	<1	<1	<3	<100	90
3WINF 412190-03	<1	<1	<1	<3	<100	92
Method Blank 04-2438 MB	<1	<1	<1	<3	<100	76

Analysis For Total Metals By EPA Method 200.8

Client ID:	3WEFF	Client:	Stantec
Date Received:	12/10/14	Project:	TOC_01-176, WORFDB8 F&BI 412190
Date Extracted:	12/11/14	Lab ID:	412190-01
Date Analyzed:	12/11/14	Data File:	412190-01.029
Matrix:	Water	Instrument:	ICPMS1
Units:	ug/L (ppb)	Operator:	AP

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Holmium	66	60	125

Analyte:	Concentration ug/L (ppb)
Lead	1.09

Analysis For Total Metals By EPA Method 200.8

Client ID:	Method Blank	Client:	Stantec
Date Received:	NA	Project:	TOC_01-176, WORFDB8 F&BI 412190
Date Extracted:	12/11/14	Lab ID:	I4-793 mb
Date Analyzed:	12/11/14	Data File:	I4-793 mb.019
Matrix:	Water	Instrument:	ICPMS1
Units:	ug/L (ppb)	Operator:	AP

Internal Standard:	% Recovery:	Lower Limit:	Upper Limit:
Holmium	100	60	125

Analyte:	Concentration ug/L (ppb)
Lead	<1

Date of Report: 12/15/14
Date Received: 12/10/14
Project: TOC_01-176, WORFDB8 F&BI 412190

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 412178-02 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	ug/L (ppb)	<1	<1	nm
Toluene	ug/L (ppb)	<1	<1	nm
Ethylbenzene	ug/L (ppb)	<1	<1	nm
Xylenes	ug/L (ppb)	<3	<3	nm
Gasoline	ug/L (ppb)	<100	<100	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/L (ppb)	50	89	65-118
Toluene	ug/L (ppb)	50	87	72-122
Ethylbenzene	ug/L (ppb)	50	89	73-126
Xylenes	ug/L (ppb)	150	85	74-118
Gasoline	ug/L (ppb)	1,000	91	69-134

Date of Report: 12/15/14
Date Received: 12/10/14
Project: TOC_01-176, WORFDB8 F&BI 412190

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR TOTAL METALS USING EPA METHOD 200.8

Laboratory Code: 412157-05 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Lead	ug/L (ppb)	10	<1	111	106	79-121	5

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Lead	ug/L (ppb)	10	113	83-115

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

NP ~~117189~~ 412190

SAMPLE CHAIN OF CUSTODY

ME 12/10/14

v1 AI2

Page # 1 of 1

Send Report To Rebekah Brooks

Company Stantec

Address 19101 W 36th Ave #203

City, State, ZIP Lynnwood WA 98036

Phone # 425 977 4994 Fax #

SAMPLERS (signature) AVadan

PROJECT NAME/NO. TOC MCT / 203700102

PO#

REMARKS

TURNAROUND TIME
- ☒ Standard (2 Weeks)
- ☐ RUSH
- Rush charges authorized by

SAMPLE DISPOSAL
- ☒ Dispose after 30 days
- ☐ Return samples
- ☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS	TOTAL LEAD						Notes
						ANALYSES REQUESTED												
3WEFF	01A-D	12.9.14	1245	Water	4		X	X				X						
3WGAC1	02A-C		1250	↓	3		X	X										
3WINF	03A-C		1255	↓	3		X	X										

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

	SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	AVadan	Antonela Vadan	Stantec	12-10-14	1400
Received by:	Thao Molness	Thao Molness	FHBI	12/10/14	14:00
Relinquished by:					
Received by:			Samples received at 0 °C		

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Appendix C

Tolcide & AN-400 Information

Tolcide & AN-400 MSDS & Product Information

Stantec

ANALYTIX TECHNOLOGIES, LLC.

Anlytix AN-400

Hardness Salts Scale-Control Additive

DESCRIPTION:

AN-400 scale-control additives is a highly concentrated, proprietary aqueous solution of water treatment chemicals specifically formulated to inhibit scaling by hardness salts and metal oxides, such as Fe and Mn, in groundwater remediation systems. It will also help clean and remove existing inorganic deposits when used continuously.

AN-400 is formulated with active ingredients that are environmentally safe, and do not promote biofouling. The active ingredients in AN-400 have been approved by US FDA per 21CFR173.310 for use in NSF ANSI 60 drinking water and other food grade applications.

APPLICATION:

AN-400 is specifically designed for use in systems with low to moderate levels of hardness salts, and dissolved metal oxides.

Typical starting dosage for most systems operating with air strippers ranges from 2 to 25 mg/l, as product.

TYPICAL PROPERTIES:

Active Components:

- **Organic Scale Inhibitor/Sequestrant**

Appearance:	**Clear to Yellow**
pH	**<2**
Density (60°F)	**~ 10.9 lbs/gallon**
Specific Gravity	**~ 1.3**
Viscosity (77°F)	**40 cps**
Water Solubility	**Complete**

SAFETY AND HANDLING:

AN-400 scale-control additive is readily pumpable at temperatures above 32°F. It is stable over long periods of time.

This is an industrial chemical. It should be handled with the same precautions used with water treatment chemicals, alkalis and acids. Skin and eye contact should be avoided, and contaminated areas should be washed with plenty of water. Please refer to MSDS for more specific information regarding proper storage, handling, and disposal of the product.

PACKAGING:

AN-400 is available in 275 gallon PE tote; 55, 30, 15 and 5 gallon PE containers.

Rev. 01/2012 NT

Analytix Technologies LLC.
P.O. Box 590466, Houston, TX 77259-0466 Tel: (281)286-7562, Fax: (305) 847-0963
www.analytixtechnologies.com email: analytix@earthlink.net

Analytix Technologies, LLC.

P.O. Box 590466, Houston, TX 77259-0466, Tel: (281) 286-7562

Date Prepared: 06/01/2002
Last Revision: 05/01/2013

1. CHEMICAL IDENTIFICATION

Trade Name.....AN-400
Product Use .....Scale Control in Remediation of Groundwater
Emergency Number.....Infotrac 1-800-535-5053
Customer Service Hotline.....281-286-7562 (8 AM to 5 PM CST)

2. COMPOSITION INFORMATION ON INGREDIENTS

Chemical Name	CAS No.
Organic Phosphorus Compound	2809-21-4
Water	7732-18-5

3. HAZARD IDENTIFICATION

Appearance: Pale yellow liquid with slight odor
Primary Routes of Exposure: Eye, Skin
Potential Health Effects - The product causes eye burns. It is slightly irritating to skin, and irritating to respiratory and gastrointestinal membranes. It is no more than slightly toxic if swallowed, i.e. significant adverse health effects are not expected if less than a mouthful is swallowed.

4. FIRST AID

Eyes.....Immediately flush with water for at least 15 minutes, lifting the upper and lower
..... eyelids intermittently. See a medical doctor or ophthalmologist immediately.

Skin.....Immediate first aid is not likely to be required. Wash with plenty of soap and water.
.....Get medical attention if irritation occurs and persists.

Ingestion.....Immediate first aid is not likely to be required. Rinse mouth with water. Dilute by
.....giving 2 glasses of water. Do not induce vomiting. Never give anything by
.....mouth to an unconscious person. A physician can be contacted for advice.

Inhalation.....Immediate first aid is not likely to be required. Remove to fresh air. If breathing
.....difficulty or discomfort occurs and persists, contact a medical doctor.

NOTES TO MEDICAL DOCTOR: The product is corrosive to the eyes and is expected to be irritating to the mucous membranes of the respiratory and gastrointestinal tracts. Treatment is controlled removal of exposure with symptomatic and supportive care.

5. FIRE FIGHTING MEASURES

Flash Point and Method.....Not applicable
Flammable Limits.....Not applicable
Autoignition Temperature .....Not applicable
Extinguishing Media .....Not applicable (aqueous solution)
Sensitivity to Static Discharge.....No data available
Sensitivity to Impact.....No data available

6. ACCIDENTAL RELEASE MEASURES

Release Notes - Keep spilled concentrated material out of drains and water courses. Absorb with sand or other absorbent material. Dispose of as solid waste in accordance with local regulations (e.g. incinerate). Flush the spill area with plenty of water.

7. HANDLING AND STORAGE

Handling – Avoid contact with eyes, skin and clothing.

Storage: Store at > 32 °F, away from nitrites, sulphites and alkaline materials. Do not store in mild steel or Aluminum. Suitable materials are: PVC, polypropylene, polyethylene and glass-reinforced plastics. Keep containers tightly closed when not in use and when in transit.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Personal Protective Equipment- Wear safety glasses or goggles
Protective Clothing- Wearing protective PVC gloves, overalls or apron is recommended.
Avoid breathing vapor or mist.

Facilities storing or utilizing this material should be equipped with an eyewash and shower facility.

9. PHYSICAL AND CHEMICAL PROPERTIES

Odor	Slight
pH	Acidic < 2
Vapor Density	Not applicable
Freezing Point	- 25^{0}C
Specific Gravity	1.20 – 1.31 @ 20^{0}C
Appearance	Pale yellow liquid
Vapor Pressure	17.5 mm Hg @ 20^{0}C
Boiling Point	101^{0}C to 103^{0}C
Solubility in Water	Complete

Note: The above physical data are typical values. They should not be construed as specification for the product.

10. STABILITY AND REACTIVITY

Stability	Stable
Polymerization	Will not occur
Hazardous Decomposition Products	None

11. TOXICOLOGICAL INFORMATION

Eye Irritation	Irritant (rabbit)
Skin Irritation	Non-irritant (rabbit)
Dermal LD_{50}	> 7940 mg/kg (rabbit)
Oral LD_{50}	2400 mg/kg (rat)
Inhalation LC_{50}	No data available for this product

Acute Effects from Overexposure- The product is corrosive to the eyes and is irritating to the mucous membranes of the respiratory and gastrointestinal tracts.

Carcinogenicity - Not listed with IARC, NTP, OSHA, ACGIH

12. ECOLOGICAL INFORMATION

Algae	(Selenastrum Capricornutum), 96 Hour EC50:		3.0	mg/l
	NOEC:.....		1.3	mg/l
Fish	Bluegill Sunfish (Lepomis macrochirus), 96 Hour LC50	>	800	mg/l
	NOEC:.....		529	mg/l
	Rainbow Trout (Salmo gairdneri), 96 Hour LC50:.....	>	350	mg/l
	NOEC:.....		151	mg/l
	Sheephead Minnow, 96 Hour LC50:.....	>	2100	mg/l
	NOEC:.....		104	mg/l
	Channel Catfish, 96 Hour, 96 Hour LC50.....	>	650	mg/l
	NOEC:.....		529	mg/l
Invertebrates	Daphnia Magna, 48 Hour EC50:	>	500	mg/l
	NOEC:.....		400	mg/l
	Grass Shrimp (Palaemonetes Pugio), 96 Hour EC50:.....	>	1700	mg/l
	NOEC:.....		104	mg/l

According to the criteria adopted by the European Economic Community (EEC) for aquatic organism toxicity this product is practically non-toxic to fish and invertebrates. Algal growth inhibition is due to ability of the product to complex materials and not to toxicity per se.

Chemical Fate Information – This product has slow to intermediate biodegradation classification, and is not expected to bioaccumulate.

13. DISPOSAL CONSIDERATION

Disposal Method : Absorb spillage onto sand or other absorbent material and dispose of as solid waste as per local regulations (e.g. incineration). Surplus product can be incinerated.

If the product was supplied in a single use container, care should be taken to dispose of the container in a responsible manner and in accordance with applicable regulations. Label precautions should be followed for any residual material in the container. Whenever possible, our company encourages recycling of containers.

14. TRANSPORT INFORMATION

U.S. DOT (Department of Transportation)
Proper Shipping Name – Corrosive liquid, acidic, organic, N.O.S.
(Contains 1-Hydroxyethylidine-1, 1-Diphosphonic Acid)
Primary hazard Class/Division - 8 (Corrosive)
UN/NA Number – UN 3265
Packing Group – III
Placards – Corrosive
Label – Corrosive
Other Shipping Information – DOT Marking – Not applicable
Hazardous Substance/RQ – Not applicable
49 STCC Number – Not applicable

CANADA Transport of Dangerous Goods
Proper Shipping Name – Corrosive Liquid N.O.S. (Phosphonic Acid)
Primary Hazard Class/Division – 8 (Corrosive)
Secondary Hazard Class/Division – 9.2
UN/NA Number – UN3265
Packing Group – III

Keep container tightly closed. Protect against physical damage. No rail shipments of this product.

15. REGULATORY INFORMATION

UNITED STATES

SARA TITLE 3 (Superfund Amendments and Reauthorization Act) – Not listed
Section 302 Extremely Hazardous Substances (40 CFR 355) – Not listed
Section 311 Hazard Category (40 CFR 370) – Immediate (Acute) Health Hazard
Section 312 Threshold Planning Quantity (40 CFR 370) – 10,000 lbs
Section 313 Reportable Ingredients (40 CFR 372) – Not listed

CERCLA (Comprehensive Environmental Response Compensation and Liability Act) (40 CFR 302.4)-Not listed.

TSCA (Toxic Substance Control Act) (40 CFR 710) – Listed

FDA regulations (21 CFR 173.315(a)(5)), permit the use of this product at concentrations not to exceed 4.6 - 4.8 ppm in water to wash fresh fruits and vegetables.

STATE REGULATIONS: (California Proposition 65) This product does not contain any substances which are defined by the State of California to cause cancer, birth defects, or other reproductive effects.

CANADA

WHMIS (Workplace hazardous Materials Information System)
Ingredients Disclosure List – Not listed
Hazard Classification – Toxic, Corrosive, D.2.B, E
Product Identification No. – Not available
Domestic Substance List - Listed

16. OTHER INFORMATION

HMIS Ratings -	Health - 3	Flammability - 0	Reactivity - 1	Protection - D
NFPA Rating	Health - 3	Flammability - 0	Reactivity - 1	Special - None

HMIS Rating notes - Protection D= Face shield, gloves, chemical apron

ANALYTIX TECHNOLOGIES, LLC.
P. O. BOX 590466
HOUSTON, TX 77259-0466
PHONE (281) 286-7562 FAX (305) 847-0963
E-MAIL: analytix@earthlink.net

PRODUCT BULLETIN

Tolcide PS-20A

Microbiocide

Introduction:

Tolcide PS- is a low viscosity aqueous biocide formulation containing 20% w/w THPS (Tetrakis-Hydroxymethyl Phosphonium Sulfate). THPS displays rapid activity against a broad spectrum of microorganisms, and is particularly effective against Iron Related and Sulfate Reducing Bacteria (IRB, SRB). THPS has also been shown to provide effective control of both Legionella and algae in cooling water systems.

THPS has an unusually benign environmental toxicity profile for an industrial biocide, and degrades rapidly upon discharge to non-toxic compounds. These properties result in safer handling and reduced environmental impact; two important factors influencing biocide selection. THPS has received the U.S. Presidential Green Chemistry Award, which was designed by EPA to promote the use of chemicals with reduced environmental risks.

Tolcide PS- is miscible with all types of water and is compatible with water treatment and paper process chemicals. Tolcide PS- is stable and effective over a pH range of 3 to 10.

Typical Properties:

Active Content	20% THPS
Appearance	Clear to slightly hazy liquid
Specific Gravity (25 ^{0}C)	1.20 – 1.25
Viscosity	~ 2 cps
Flash point	Non-flammable
pH	4 - 5
Solubility in water	Miscible with all water types
Odor	Pungent

Application:

In industrial water treatment, the benefits of using Tolcide PS-20A are ease of handling, rapid and broad spectrum activity, and effective slime control. Tolcide PS-20A is extremely effective against Legionella, and can also be used for control of algae in cooling towers.

In the oilfield industry, formulations containing THPS display excellent activity against problem microorganisms, particularly Sulfate Reducing Bacteria (SRB), a major source of hydrogen sulfide reservoir souring and pipeline corrosion. THPS has also been shown to dissolve iron sulfide and reduce formation souring. Tolcide PS-20A can be used in applications where microbiological contamination is present, including injection water, topside systems, pipeline protection, drilling fluids, and well stimulation fluids.

Continued on page 2

Key Product Features:

- Fast acting, broad spectrum biocide
- Low foaming
- Miscible with water and compatible with a wide range of water treatment additives
- Easy, on-site analysis
- Excellent environmental profile

Safety and Handling:

Improper handling of this product can be injurious to workers. Observe all safety precautions shown on the label and in the Material Safety Data Sheet.

1997 Designing Safer Chemicals Award

Albright & Wilson Americas

THPS Biocides: A New Class of Antimicrobial Chemistry

Conventional biocides, used to control the growth of bacteria, algae, and fungi in industrial cooling systems, oil fields, and process applications, are highly toxic to humans and aquatic life and often persist in the environment, leading to long-term damage. To address this problem, a new and relatively benign biocide, tetrakis(hydroxymethyl)phosphonium sulfate (THPS), has been discovered by Albright & Wilson Americas. THPS biocides represent a completely new class of antimicrobial chemistry that combines superior antimicrobial activity with a relatively benign toxicology profile. THPS's benefits include low toxicity, low recommended treatment level, rapid breakdown in the environment, and no bioaccumulation. When substituted for more toxic biocides, THPS biocides provide reduced risks to both human health and the environment.

THPS is so effective as a biocide that, in most cases, the recommended treatment level is below that which would be toxic to fish. In addition, THPS rapidly breaks down in the environment through hydrolysis, oxidation, photodegradation, and biodegradation. In many cases, it substantially breaks down before the treated water enters the environment. The degradation products have been shown to possess a relatively benign toxicology profile. Furthermore, THPS does not bioaccumulate and, therefore, offers a much reduced risk to higher life forms.

THPS biocides are aqueous solutions and do not contain volatile organic compounds. Because THPS is halogen-free, it does not contribute to dioxin or AOX formation. Because of its low overall toxicity and easier handling when compared to alternative products, THPS provides an opportunity to reduce the risk of health and safety incidents.

THPS has been applied to a range of industrial water systems for the successful control of microorganisms. The U.S. industrial water treatment market for nonoxidizing biocides alone is 42 million pounds per year and growing at 6 to 8 percent annually. There are over 500,000 individual use sites in this industry category. Because of its excellent environmental profile, THPS has already been approved for use in environmentally sensitive areas around the world and is being used as a replacement for the higher risk alternatives.

Note: Disclaimer

Read on about the 1997 Small Business Award.

Return to Past Awards page.

Last updated on Friday, January 3rd, 2003
URL: http://www.epa.gov/docs/gcc/dsca97.html

Material Safety Data Sheet
TOLCIDE PS20A

Date Prepared: 2/01/07 **Supersedes Date: 11/01/06**

1. PRODUCT AND COMPANY DESCRIPTION

Product Name: Tolcide PS20A

Supplied By:

Analytix Technologies, LLC.
P.O. Box 590466
Houston, TX 77259-0466
(281)-286-7562

Manufactured by:

RHODIA INC.
RHODIA NOVECARE
CN7500
8 Cedar Brook Drive
Cranbury NJ 08512-7500

Emergency Phone Numbers:
FOR EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT CONTACT: CHEMTREC (800-424-9300 within the United States or 703-527-3887 for international collect calls) or Rhodia CAERS (Communication and Emergency Response System) at 800-916-3232.

For Product Information: (888) 776-7337

EPA FIFRA Registration Number: 4564-18

Chemical Name or Synonym: TETRAKIS(HYDROXYMETHYL) PHOSPHONIUM SULFATE; THPS

Molecular Formula: $_2(C_4H_{12}O_4P)\cdot O_4S$

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS Reg Number	OSHA Hazard	Percentage
TETRAKIS(HYDROXYMETHYL) PHOSPHONIUM SULFATE	55566-30-8	Y	~ 18 - 22

Material Safety Data Sheet
TOLCIDE PS20A

3. HAZARDS IDENTIFICATION

A. EMERGENCY OVERVIEW:

Physical Appearance and Odor: colorless / liquid, characteristic odor.

Warning Statements: DANGER! RISK OF SERIOUS DAMAGE TO EYES. HARMFUL IF INHALED. HARMFUL IF SWALLOWED. MAY CAUSE ALLERGIC SKIN REACTION.

3. HAZARDS IDENTIFICATION (continued)

B. POTENTIAL HEALTH EFFECTS:

Acute Eye: Expected to cause significant irritation to the eyes. Can cause tearing, pain, burns, permanent damage to the cornea.
Acute Skin: May cause irritation upon prolonged contact. May cause sensitization.
Acute Inhalation: Harmful if inhaled. May cause coughing, shortness of breath, chest pain.
Acute Ingestion: Harmful if ingested. May cause nausea, vomiting.
Chronic Effects: (See Section 11-Chronic for a discussion of animal studies.) Repeated, prolonged ingestion may cause liver damage.

4. FIRST AID MEASURES

FIRST AID MEASURES FOR ACCIDENTAL:
Eye Exposure: Hold eyelids open and flush with a steady, gentle stream of water for at least 15 minutes. Seek immediate medical attention.
Skin Exposure: In case of contact, immediately wash with plenty of soap and water for at least 15 minutes. Seek medical attention. Remove contaminated clothing and shoes while washing. Clean contaminated clothing and shoes before re-use or discard if they cannot be thoroughly cleaned.
Inhalation: Remove victim from immediate source of exposure and assure that the victim is breathing. If breathing is difficult, administer oxygen, if available. If victim is not breathing, administer CPR (cardio-pulmonary resuscitation). Seek medical attention.
Ingestion: Wash out mouth with water and keep at rest. Seek immediate medical attention. Do not induce vomiting unless instructed to do so by a physician.
MEDICAL CONDITIONS POSSIBLY AGGRAVATED BY EXPOSURE: Skin contact may aggravate existing skin disease.
NOTES TO PHYSICIAN: All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

Treat symptomatically. No specific antidote available.

Material Safety Data Sheet
TOLCIDE PS20A

5. FIRE FIGHTING MEASURES

FIRE HAZARD DATA:

Flash Point: Not Applicable

Extinguishing Media:
Recommended: water fog, carbon dioxide, dry chemical, foam.

Special Fire Fighting Procedures:
Firefighters should wear NIOSH/MSHA approved self-contained breathing apparatus and full protective clothing. Keep unnecessary people away, isolate hazard area and deny entry. Stay upwind; keep out of low areas. Evacuate residents who are downwind of fire.

Unusual Fire and Explosion Hazards:
Containers may explode (due to the build-up of pressure) when exposed to extreme heat.

Hazardous Decomposition Materials (Under Fire Conditions):
oxides of sulfur
oxides of phosphorus
oxides of carbon

6. ACCIDENTAL RELEASE MEASURES

Evacuation Procedures and Safety:
Ventilate closed spaces before entering. Personnel handling this material should be thoroughly trained to handle spills and releases. Wear appropriate protective gear for the situation. See Personal Protection information in Section 8. Evacuate and isolate spill area.

Containment of Spill:
Stop leak if it can be done without risk. Dike spill using absorbent or impervious materials such as earth, sand or clay. Dike area to prevent runoff. Collect and contain contaminated absorbent and dike material for disposal.

Cleanup and Disposal of Spill:
Recover material, if possible. DO NOT RETURN MATERIAL TO ITS ORIGINAL CONTAINER. Absorb with an inert absorbent. Shovel up into an appropriate closed container (see Section 7: Handling and Storage). Clean up residual material by washing area with water. Collect washings for disposal. The material should be properly packaged and disposed of in compliance with applicable regulations. Decontaminate tools and equipment following cleanup.

Environmental and Regulatory Reporting:
Do not flush to drain. Runoff from fire control or dilution water may cause pollution. Prevent material from entering public sewer system or any waterways. Spills may be reportable to the National Response Center (800-424-8802) and to state and/or local agencies.

Material Safety Data Sheet
TOLCIDE PS20A

7. HANDLING AND STORAGE

Minimum/Maximum Storage Temperatures:
Not Available

Handling:
Personnel handling this product should be thoroughly trained as to its hazards. Do not get on skin or in eyes. Do not breathe vapors and mists. Avoid direct or prolonged contact with skin and eyes. Use only as directed.

** HAZARD WARNING: This product belongs to a chemical family that HAS BEEN TESTED in combination with Trimethylolpropane , Trimethylolpropane derived products or their corresponding Trimethylolpropane homologs for toxicity of the thermal decomposition products in the absence of flame. Products in this chemical family PRODUCED NO SIGNIFICANT ADVERSE HEALTH EFFECTS in laboratory animals. However, there is a possibility that this thermal decomposition may produce bicyclic phosphates and/or phosphites in combination with certain other phosphorus compounds. Bicyclic phosphates and phosphites have acute neurotoxic properties and may cause convulsive seizures in laboratory test animals. Follow all precautionary measures outlined in this Material Safety Data Sheet and/or contact Rhodia Inc.

Storage:
Store in an area that is clean, cool, dry, well-ventilated, Store away from; bases, oxidizers, reducing agents, Store in tightly closed containers. Container material to avoid: ordinary steel, Recommended container material: high density, high molecular weight polyethylene containers. Store in original container.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Introductory Remarks:
These recommendations provide general guidance for handling this product. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. While developing safe handling procedures, do not overlook the need to clean equipment and piping systems for maintenance and repairs. Waste resulting from these procedures should be handled in accordance with Section 13: Disposal Considerations.

Assistance with selection, use and maintenance of worker protection equipment is generally available from equipment manufacturers.

Exposure Guidelines:
Exposure limits represent regulated or recommended worker breathing zone concentrations measured by validated sampling and analytical methods, meeting the regulatory requirements. The following limits apply to this material, where, if indicated, S=skin and C=ceiling limit:

Material Safety Data Sheet
TOLCIDE PS20A

8. EXPOSURE CONTROLS/PERSONAL PROTECTION (continued)

TETRAKIS(HYDROXYMETHYL) PHOSPHONIUM SULFATE

	Notes	TWA	STEL
ACGIH		2 mg/cu m	

Engineering Controls:

Where engineering controls are indicated by use conditions or a potential for excessive exposure exists, the following traditional exposure control techniques may be used to effectively minimize employee exposures: general area dilution/exhaust ventilation.

Respiratory Protection:

When respirators are required, select NIOSH/MSHA approved equipment based on actual or potential airborne concentrations and in accordance with the appropriate regulatory standards and/or industrial recommendations.

Eye/Face Protection:

Eye and face protection requirements will vary dependent upon work environment conditions and material handling practices. Appropriate ANSI Z87 approved equipment should be selected for the particular use intended for this material.

Eye contact should be prevented through use of chemical safety glasses with side shields or splash proof goggles. An emergency eye wash must be readily accessible to the work area. Face contact should be prevented through use of a face shield.

Skin Protection:
Skin contact should be prevented through use of suitable protective clothing, gloves and footwear, selected with regard for use conditions and exposure potential. Consideration must be given both to durability as well as permeation resistance.

Work Practice Controls:

Personal hygiene is an important work practice exposure control measure and the following general measures should be taken when working with or handling this material:

(1) Do not store, use, and/or consume foods, beverages, tobacco products, or cosmetics in areas where this material is stored.
(2) Wash hands and face carefully before eating, drinking, using tobacco, applying cosmetics, or using the toilet.
(3) Wash exposed skin promptly to remove accidental splashes or contact with this material.

Material Safety Data Sheet
TOLCIDE PS20A

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical and Chemical properties here represent typical properties of this product.

Physical Appearance: colorless / liquid.

Odor: characteristic odor.

pH: ~ 3 to 6 at 100 wt/wt%.

Specific Gravity: 0.95 to 1.15 at 20 C (68 F).

Density: 1.09 g/ml at 20 C (68 F).

Water Solubility: soluble

Melting Point Range: Not Available

Freezing Point Range: ~ -3 C (27 F)

Boiling Point Range: 108 c (226 F) at 759 mmHg

Vapor Pressure: Not Available

Vapor Density: Not Available

Viscosity: viscosity (centistokes) : ~ 22 cs at 24 C (75 F).

Molecular Weight: 406.3

10. STABILITY AND REACTIVITY

Chemical Stability:
This material is stable under normal handling and storage conditions described in Section 7. Under unusual conditions, such as very high temperatures and/or in the presence of strong reducing agents, the product may break down to form hazardous decomposition products noted below. The customer is advised to seek further advice from Rhodia Water Technical Service personnel when considering such applications.

Material Safety Data Sheet
TOLCIDE PS20A

10. STABILITY AND REACTIVITY (continued)

Conditions To Be Avoided:
Heat , Temperatures above 160C.
See HAZARD WARNING under HANDLING : in Section 7.

Materials/Chemicals To Be Avoided:
strong bases
strong acids
strong oxidizing agents
strong reducing agents

Decomposition Temperature Range:
> 160 C (320 F)

The Following Hazardous Decomposition Products Might Be Expected:

Decomposition Type: thermal
oxides of sulfur
oxides of phosphorus
oxides of carbon
phosphine gas

Hazardous Polymerization Will Not Occur.

Avoid The Following To Inhibit Hazardous Polymerization:
not applicable

11. TOXICOLOGICAL INFORMATION

Acute Eye Irritation:
Toxicological Information and Interpretation:
eye - eye irritation, rabbit. Severely irritating. This material is expected to cause significant irritation to the eyes.

Acute Skin Irritation:
Toxicological Information and Interpretation:
skin - skin irritation, rabbit. Minimally irritating. This material is not expected to cause significant irritation to the skin.
skin - sensitization, guinea pig. Sensitizing. May cause significant allergic skin reaction.

Acute Dermal Toxicity:
The following data is for similar or related products.
Toxicological Information and Interpretation:
LD50 - lethal dose 50% of test species, > 2000 mg/kg, rat. Material tested was a 75% aqueous solution of Tetrakis (hydroxymethyl) phosphonium sulfate.

Material Safety Data Sheet
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11. TOXICOLOGICAL INFORMATION (continued)

Acute Respiratory Irritation:
No test data found for product.
Toxicological Information and Interpretation:
lung - lung irritation (qualitative), **. This material is not expected to cause significant irritation to the respiratory tract.

Acute Inhalation Toxicity:
The following data is for similar or related products.
Toxicological Information and Interpretation:
LC50 - lethal concentration 50% of test species, 0.59 mg/l/4 hr, rat. Material tested was a 75% aqueous solution of Tetrakis (hydroxymethyl) phosphonium sulfate.

Acute Oral Toxicity:
The following data is for similar or related products.
Toxicological Information and Interpretation:
LD50 - lethal dose 50% of test species, 575 mg/kg, rat. Material tested was a 75% aqueous solution of Tetrakis (hydroxymethyl) phosphonium sulfate.

Chronic Toxicity:
This product does not contain any substances that are considered by OSHA, NTP, IARC or ACGIH to be "probable" or "suspected" human carcinogens.

The following data is for similar or related products.

Toxicological Information and Interpretation - REPRODUCTIVE TOXICITY, rat. Material is not a reproductive toxin. Material tested was a 75% aqueous solution of Tetrakis (hydroxymethyl) phosphonium sulfate. - CARCINOGENICITY, **. There was no evidence of carcinogenicity in F344/N rats and B6C3F1 mice (both sexes) dosed by gavage at 5 or 10 mg THPS/kg/day for 2 years. [a]ref. NTP study report TR296, 1987]. - CHRONIC EXPOSURE, **. Medical surveillance for over 30 years of employees in our manufacturing facility has shown no evidence of developmental toxicity from long-term exposure nor from exposure following an acute incident, for example, a major or minor spillage. - MUTAGENICITY, **. Ames Test: Negative. - MUTAGENICITY, **. Chinese hamester ovary cells (chromosomal aberrations): Positive. - TERATOGENICITY, **. Studies in both rats and rabbits showed no indications of developmental toxicity in the absence of marked maternal (parental) toxicity. No observed effect level for development 15 mg/kg/body weight. No observed effect level for development 18 mg/kg body weight. Material tested was a 75% aqueous solution of Tetrakis (hydroxymethyl) phosphonium sulfate. - MUTAGENICITY, **. Dominant Lethal Assay [a]rat] (in vivo): Negative. - MUTAGENICITY, **. Mouse micronucleus (in vivo): Negative. - MUTAGENICITY, **. Unscheduled DNA synthesis assay: Negative. Material tested was a 75% aqueous solution of Tetrakis (hydroxymethyl) phosphonium sulfate. - SUB-CHRONIC EXPOSURE, 1 mg/kg/90 days, rat. Material tested was a 75% aqueous solution of Tetrakis (hydroxymethyl) phosphonium sulfate.

Material Safety Data Sheet
TOLCIDE PS20A

12. ECOLOGICAL INFORMATION

Ecotoxicological Information:
The following data is based on the technical grade active ingredient(s) (TGAI).

Ecotoxological Information and Interpretation:

LC50 - lethal concentration 50% of test species, 19.4 mg/l/48 hr, Daphnia magna.

LC50 - lethal concentration 50% of test species, 93 mg/l/96 hr, bluegill sunfish (Lepomis macrochirus).

LC50 - lethal concentration 50% of test species, 119 mg/l/96 hr, rainbow trout (Oncorhynchus mykiss).

LC50 - lethal concentration 50% of test species, 86 mg/l/96 hr, Juvenile Plaice.

LC50 - lethal concentration 50% of test species, 340 mg/l/96 hr, Brown Shrimp.

LC50 - ecotox Method for association with dry sediment weight., 2174 mg/kg/10 days, Corophium volutator. (dry sediment weight).

LD50 - lethal dose 50% of test species, 311 mg/kg, Mallard duck (Anas platyrhynchos). Material tested was a 75% aqueous solution of Tetrakis (hydroxymethyl) phosphonium sulfate.

Chemical Fate Information:
Product is not expected to bioaccumulate. The following data is for similar or related product. This product is readily biodegradable under aerobic and anaerobic conditions in a sediment-water system. 28 days (aerobic) and 30 days (anaerobic). **THPS has been shown to degrade rapidly once diluted to sub-ppm concentrations and forms trishydroxymethyl phosphine oxide which is classified as non-toxic.**

13. DISPOSAL CONSIDERATIONS

Waste Disposal Method:
Chemical additions, processing or otherwise altering this material may make the waste management information presented in this MSDS incomplete, inaccurate or otherwise inappropriate. Please be advised that state and local requirements for waste disposal may be more restrictive or otherwise different from federal laws and regulations. Consult state and local regulations regarding the proper disposal of this material.

EPA Hazardous Waste - NO

14. TRANSPORTATION INFORMATION

Transportation Status: IMPORTANT! Statements below provide additional data on listed DOT classification.
The listed Transportation Classification does not address regulatory variations due to changes in package size, mode of shipment or other regulatory descriptors.

Material Safety Data Sheet
TOLCIDE PS20A

14. TRANSPORTATION INFORMATION (continued)

US Department of Transportation
Shipping Name:
NOT REGULATED

15. REGULATORY INFORMATION

Inventory Status

Inventory	Status
UNITED STATES (TSCA)	Y
CANADA (DSL)	N
EUROPE (EINECS/ELINCS)	P
AUSTRALIA (AICS)	N
JAPAN (MITI)	N
SOUTH KOREA (KECL)	N

Y = All ingredients are on the inventory.
E = All ingredients are on the inventory or exempt from listing.
P = One or more ingredients fall under the polymer exemption or are on the no longer polymer list. All other ingredients are on the inventory or exempt from listing.
N = Not determined or one or more ingredients are not on the inventory and are not exempt from listing.

FEDERAL REGULATIONS

Inventory Issues:
This product is excluded from TSCA because it is solely for FIFRA regulated use.

SARA Title III Hazard Classes:

Fire Hazard	- NO
Reactive Hazard	- NO
Release of Pressure	- NO
Acute Health Hazard	- YES
Chronic Health Hazard	- YES

STATE REGULATIONS:
This product contains the following components that are regulated under California Proposition 65:

Ingredient Name	Cancer List	Reprod. List	No Sign. Risk Lvl (ug/day) California	RPI
FORMALDEHYDE	Y	N	40	ND

Material Safety Data Sheet
TOLCIDE PS20A

16. OTHER INFORMATION

National Fire Protection Association Hazard Ratings--NFPA(R):

2 Health Hazard Rating--Moderate
0 Flammability Rating--Minimal
1 Instability Rating--Slight

National Paint & Coating Hazardous Materials Identification System--HMIS(R):

2 Health Hazard Rating--Moderate
0 Flammability Rating--Minimal
1 Reactivity Rating--Slight

Reason for Revisions:
Change and/or addition made to Section 3, Warning Statements in Section 3, Section 11, SARA 313 Information in Section 15

Key Legend Information:
ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
TLV - Threshold Limit Value
PEL - Permissable Exposure Limit
TWA - Time Weighted Average
STEL - Short Term Exposure Limit
NTP - National Toxicology Program
IARC - International Agency for Research on Cancer
ND - Not determined
RPI - Rhodia Established Exposure Limits

Disclaimer:
The information and recommendations contained in this Material Safety Data Sheet have been compiled from sources believed to be reliable and to represent the best opinion on the subject as of the date on this sheet. However, no warranty, guarantee or representation, express or implied, is made as to the correctness or sufficiency of this information or to the results to be obtained for the use thereof.

Titration Test Kit Information

Determination of Tetrakishydroxymethyl Phosphonium Sulfate (THPS) in Tolcide® PS Biocides

CODE 4-8776-01

QUANTITY	CONTENTS	CODE
120 mL	*DSP Reagent, 10% Solution	*4133-J
120 mL	*Borate Buffer Solution	*4135-J
120 mL	*PSSA Reagent, 5% Solution	*4134-J
30 mL	Starch Indicator Solution	4170WT-G
60 mL	*Iodine Solution, 0.025N	*6377-H
15 mL	*Zinc Acetate, 2N	*3843-E
1	Test Tube, plastic, 5-10-25 mL, w/cap	0715
3	Pipets, 1 mL, plastic	0354
1	Direct Reading Titrator, 0 - 100 Range	0381
1	Dispenser Cap	0601

*WARNING: Reagents marked with a * are considered hazardous substances. To view or print a Material Safety Data Sheet (MSDS) for these reagents see MSDS CD or our website. To obtain a printed copy, contact us by e-mail, phone or fax.

To order individual reagents or test kit components, use the specified code number.

INTERFERENCES: Hydrogen sulfide can interfere with the determination of THPS. Pretreatment with zinc acetate will remove the interference. Add 5 drops of *Zinc Acetate, 2N (3843) for every 100 ppm hydrogen sulfide present in a 50 mL sample. Filter off the white precipitate that forms and proceed with Steps 1-11 using the filtrate.

PROCEDURE

1. Fill the test tube (0715) to the 25 mL line with the sample to be tested.
2. For fresh water samples, use a 1 mL pipet (0354) to add 2.0 mL *DSP Reagent, 10% Solution (4133). For saltwater samples, use another
3. 1 mL pipet (0354) to add 2.0 mL *Borate Buffer Solution (4135).
4. Use another 1 mL pipet (0354) to add 2.0 mL of *PSSA Reagent, 5% Solution (4134). Swirl to mix.
5. Add 6 drops of Starch Indicator Solution (4170WT). Swirl to mix.
6. Replace the regular cap on the bottle of *Iodine Solution, 0.025N (6377) with the special dispenser cap (0601).

   NOTE: Replace the regular cap on the Iodine Solution 0.025N bottle for storage.
7. Fill the Direct Reading Titrator (0381) with the *Iodine Solution, 0.025N (6377).
8. Slowly add *Iodine Solution, 0.025N (6377) to the test tube by depressing the plunger. Swirl the test tube after each drop to mix reagents.
9. Continue adding *Iodine Solution, 0.025N (6377) until 1 drop results in a blue/black color that remains for 30 seconds.
10. Read the concentration (in ppm) of THPS directly from the scale on the Titrator.

    NOTE: Take the titrator reading where the plunger meets the titrator scale. Each small division is equal to 2 ppm.
11. Repeat Steps 1-9 on a blank (system water without biocide) to determine background levels.
12. Subtract the blank reading from the reacted sample reading to determine the concentration of THPS in the sample.

    NOTE: This test measures ppm active THPS. To obtain ppm of formulation, divide ppm THPS by the activity (in percent) of the formulation, and multiply by 100.

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PHOSPHONATE KIT

DIRECT READING TITRATOR

CODE 7530-DR-01

QUANTITY	CONTENTS	CODE
15 mL	*Hydrochloric Acid, 1.0N	*6130-E
15 mL	*Fluoride Inhibitor	*3929-E
15 mL	Sodium Thiosulfate, 0.1N	6155-E
10 g	Xylenol Orange Powder	6165-D
60 mL	Thorium Nitrate Solution	6158PS-H
1	Test Tube, 5-10-15 mL, w/cap	0778
1	Dispenser Cap	0601
1	Spoon, 0.1 g	0699
1	Direct Reading Titrator, 0-20 Range	0378
1	pH paper, 1.3-4.4	2958

*WARNING: Reagents marked with an * are considered to be potential health hazards. To view or print a Material Safety Data Sheet (MSDS) for these reagents go to www.lamotte.com. To obtain a printed copy, contact LaMotte by e-mail, phone or fax.

To order individual reagents or test kit components, use the specified code number.

Carefully read the instruction manual for the Direct Reading Titrator before performing the titration procedure described below. The Titrator is calibrated in terms of parts per million Phosphonate, and each minor division on the Titrator scale equals 0.4 ppm.

NOTE: This test has been calibrated for Dequest 2006. When a different compound is to be tested, the amount of Thorium Nitrate added should be multiplied by a conversion factors below to determine ppm Phosphonate. If any other phosphonate compound is used, the factor must be determined experimentally using standard solutions of that compound.

Phosphonate	Compound Name	Factor
Dequest 2000	AMP(NTP)	0.8
Dequest 2006	NaAMP	1.0
Dequest 2010	HEDP(A)	0.6
Belcor 575		0.5

PROCEDURE

For most accurate results, a blank test should be run on a sample of the water containing no phosphonate. Any result from this blank test should be subtracted from the result recorded in Step 6.

1. Fill the test tube (0778) to the 10 mL line with sample water.
2. Add 1 drop of Sodium Thiosulfate (6155) and 5 drops of *Fluoride Inhibitor (3929).
3. Use the 0.1 g measuring spoon (0699) to add one level measure of Xylenol Orange (6165). Swirl to dissolve.
4. Best results are obtained in the pH range 2.5-3.0. This adjustment is made by adding *Hydrochloric Acid (6130) drop by drop to the sample and using the pH paper (2958) to test the solution. After each addition of *Hydrochloric Acid (6130) dip a strip of pH paper, torn from the roll, into the test solution for 5 seconds. Compare the resulting color with the color standards on the side of the pH paper container. Add *Hydrochloric Acid (6130) until the color of the pH paper matches the pH 2.8 color standard. The sample will be yellow.
5. Replace the regular cap on the bottle of Thorium Nitrate (6158PS) with the dispenser cap (0601). Fill the Direct Reading Titrator (0378) with this reagent. Insert the Titrator into the center hole of the titration tube cap.

   NOTE: Replace the regular cap on the Thorium Nitrate bottle for storage.
6. While gently swirling the titration tube, slowly press the plunger to titrate until the solution changes from yellow to pink. Read the test result directly from the scale where the large ring on the Titrator meets the Titrator barrel. Record the result in ppm phosophonate.

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Appendix D

Pilot Test Field Notes & Photographs

SITE OBSERVATION REPORT

Stantec

Project: TOC-MLT
Contractor: Stantec
Owner: TOC
Location: Mountlake Terrace

File No.
Project No. 203700102
Project No.
Date: 11/5/14
Page 1 of 1

The following items were noted: Weather:

0700 On-site w/ Nate M to conduct biocide pilot test.
0830 Baker on-site (1.5 h late)
Restarted system & observed significant leak from Unit 1 carbon drum (1st drum).
Nate pinged hole
0945 Collected background concentration readings for measuring biocide / AN-400 concentrations. See test sheet
1110 Started biocide / AN400 injections

1 dose ~ 4.75 ml THPS
1 dose ~ 0.90 ml AN-400

Time	Dose	~~GAC~~ OWS THPS	OWS AN-400
1110	x 1	–	–
1125	x 1	–	–
1138	x 1	68 ppm	–
1201	x 1	–	–
1228	x 1	–	–
1253	x 1	–	–
1318	x 1	68ppm	8
1345	x 3	156ppm	23
1417	x 3	–	–
1448	x 1	–	–

At 1159 measured OWS THPS concentration / AN-400
THPS = 68ppm / AN400 = 10 ppm
At 1340 measured OWS TPHS concentration / AN400
THPS = 68ppm / AN400 = 8 ppm
End test @ 1632
Flowmeter start: 469,168
Flowmeter End 469,409
= 241 gallons total

Prepared by: Adam Valenti
Print Name
Adam Valenti
Signature

TOC - MLT

Biocide Injection Pilot Test

Date: 11/5/14

Personnel: AV / NM

Add **4.75 ml** of THPS to final compartment of OWS each fill cycle to reach target THPS concentration 70 ppm
Add **0.9 ml** of AN-400 to final compartment of OWS each fill cycle to reach target AN400 concentration 10 ppm
THPS and AN400 measured from sample port of effluent carbon drum
*****For discharge do not exceed 3.6 ppm for THPS and 3 ppm for AN400*** Jean Tran 425-649-7078 (Ecology)**

Background Testing (No Biocide/AN400 Added to OWS)			
Time	**Background Concen. (THPS ppm)**	**Background Concen. (AN400 ppm)**	**Notes**
0915	9/10	0.8	Added 1 drop for AN-400
0945	10	0.8	Added 2 drops for AN 400
1010	10	0.8	
1018	12	1.2 ~~0.8 0.12~~ AV	
1040	9	1.2	
1105	10	1.2	
Average	10	1.0	

Biocide Injection Testing			
Time	**THPS Concentration (ppm)**	**AN400 Concentration**	**Notes**
1230	10	0.8	
1315	12	0.8	
1340	12	0.8	GAC 1 AN-400 = 1.2ppm & THPS = 10ppm
1410	10	0.8	GAC 1 AN-400 = 1.2ppm & THPS = 10ppm
1442	8	1.2	
1509	10	0.8	

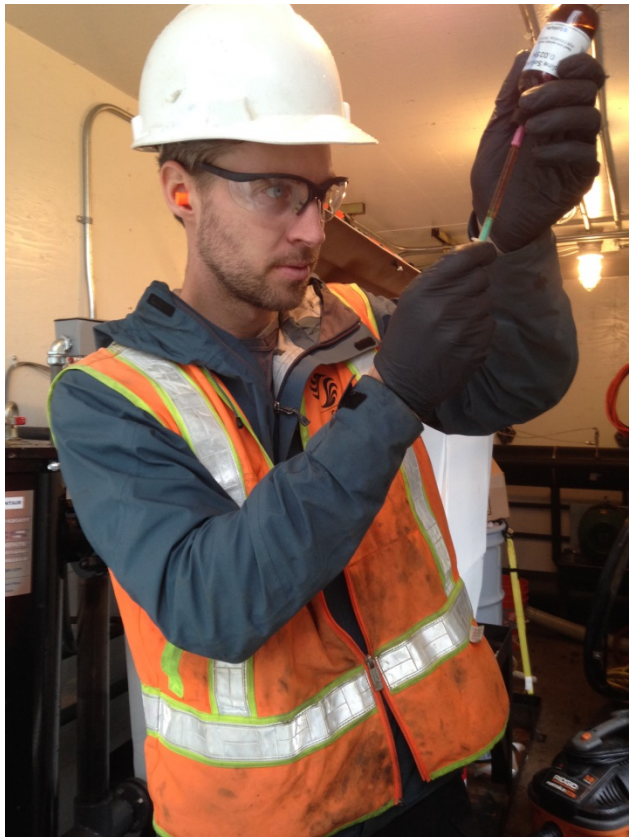
Post Injection Testing (THPS & AN400 Not Injected)			
Time	**THPS Concentration (ppm)**	**AN400 Concentration**	**Notes**
1536	12	1.2	
1607	10	0.8	
1632	10	1.2	Test End - No break through observed during test

Notes: The average background concentration was subtracted from the THPS and AN400 test concentrations to obtain each test concentration.

1110 added biocide/AN400 to OWS (Test start at 1110)
stopped biocide/AN400 additions @ 1520 [last addition at 1448]

Biocide Pilot Test Field Photos

November 5, 2014



Stantec