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Public Review Draft Remedial Investigation/ Feasibility Study (RI/FS) Report

Former Circle K Site

14 December 2017

Prepared for

Washington State
Department of Ecology
3190 160th Avenue SE
Bellevue, Washington 98008

K/J Project No. 1696010.00

Remedial Investigation/Feasibility Study (RI/FS) Report

Report Version: Public Review Draft

Site Name: Former Circle K Site

Site Address: 2350 24th Avenue East
Seattle, WA 98112

Alternate Location Info: Tax Parcel 6788201335
Township 25N, Range 4E, Section 21

2322

Ecology Facility Site ID No.:
Consent Decree No.: 92-2-08095-8

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List of Acronyms and Abbreviations

ARAR	Applicable or Relevant and Appropriate Requirement
ARI	Analytical Resources, Incorporated
AS	air sparging
bgs	below ground surface
BTEX	benzene, ethylbenzene, toluene, and xylenes
CAP	Cleanup Action Plan
City	City of Seattle
CLARC	Cleanup Levels and Risk Calculation
COC	contaminant/chemical of concern
CSID	Cleanup Site Identification number
CSEM	conceptual site exposure model
CUL	cleanup level
cy	cubic yard(s)
DO	dissolved oxygen
DRO	diesel-range organics
EA Engineering	EA Engineering, Science, and Technology, Inc.
Ecology	Washington State Department of Ecology
EDB	1,2-dibromoethane (ethylene dibromide)
EDC	1,2-dichloroethane (ethylene dichloride)
EFR	enhanced fluid recovery
EPA	U.S. Environmental Protection Agency
ETEC	Environmental Technologies LLC
FS	Feasibility Study
FSID	Facility Site identification number
GAC	granular activated carbon
GIS	Geographic Information System
GRO	gasoline-range organics
Holt	Holt Services, Inc.
IDW	investigation-derived waste
in H_2O	inches of water
in Hg	inches of mercury
ISCO	*in situ* chemical oxidation
Kennedy/Jenks	Kennedy/Jenks Consultants
Landau	Landau Associates
lbs/hr	pounds per hour
LNAPL	light non-aqueous phase liquid
µg/L	micrograms per liter
mg/kg	milligrams per kilogram

List of Acronyms and Abbreviations (cont'd)

MOHAI	Museum of History and Industry
MTBE	methyl-tertiary butyl ether
MTCA	Model Toxics Control Act
NPDES	National Pollutant Discharge Elimination System
NWRO	Northwest Regional Office (Ecology)
NWTPH-Gx	Northwest Total Petroleum Hydrocarbon - Gasoline Range
O&M	operation and maintenance
ORP	oxidation-reduction potential
PID	photoionization detector
psi	pounds per square inch
PVC	polyvinyl chloride
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROW	right-of-way
SHA	Site Hazard Assessment
Site	Former Circle K Site
SPU	Seattle Public Utilities
SVE	soil vapor extraction
TEA	terminal electron acceptors
TEE	Terrestrial Ecological Evaluation
TPH	total petroleum hydrocarbon
UST	underground storage tank
VI	vapor intrusion
VOC	volatile organic compound
WAC	Washington State Administrative Code

Executive Summary

Kennedy/Jenks Consultants (Kennedy/Jenks) has prepared this Remedial Investigation/ Feasibility Study (RI/FS) Report for the Washington State Department of Ecology (Ecology) for the Former Circle K #1461 site located at 2350 24th Avenue East, Seattle, King County, Washington (Site) (see Figure 1). The purpose of the RI was to collect and evaluate data to characterize the current environmental conditions associated with past fuel releases at the Site and identify chemicals of concern (COCs) present at concentrations above Ecology's Model Toxics Control Act (MTCA) cleanup standards. The RI data was then used in the FS to evaluate potential COC exposure pathways, and support the evaluation and selection of a cleanup alternative(s) for the Site.

The Site is a former gasoline service station located in an area of primarily commercial and residential mixed-use development that the former service station operated from 1968 to 1990. Four gasoline underground storage tanks (USTs), one pump island, one waste oil UST, and one heating oil UST were located at the Site. Three other Ecology cleanup sites are located within two blocks of the Site and are identified on Figure 2.

In 1989, a leak was discovered in one of the four gasoline USTs. It was estimated that approximately 4,000 to 6,000 gallons of gasoline were released to the subsurface. Following the discovery of the release, all six USTs and the pump island were removed along with about 900 cubic yards (cy) of petroleum hydrocarbon-impacted soil. Follow-up investigative and remedial activities were conducted between 1989 and 2006 including groundwater monitoring, light non-aqueous phase liquid (LNAPL) recovery, groundwater extraction and treatment, soil vapor extraction (SVE), and enhanced fluid recovery (EFR). The Site was redeveloped in 1990 and 1991 and currently includes a single one-story building operated as a retail dry cleaning store (Jay's Cleaners) and a convenience store (Mont's Market).

In October 2009, Ecology prepared a draft RI/FS report based on the available investigative findings. Kennedy/Jenks was subsequently contracted by Ecology to conduct a review of the 2009 RI/FS report and other previous reports and documents pertaining to the Site. This review, including data gaps identified and proposed additional investigation work, was summarize in a 2016 technical memorandum. To address the data gaps identified in the technical mmemorandum, Kennedy/Jenks provided Ecology with a sampling and analysis work plan for additional RI activities.

Additional RI activities were performed in 2016 and 2017. These included (1) construction of three new groundwater monitoring wells (MW-17, MW-18, and MW-19) and nine new multi-purpose wells (MW-20, MW-21, and RW-1 through RW-7); advancing 16 reconnaissance soil borings; collection and laboratory analyses of soil samples; and conducting additional rounds of groundwater monitoring.

A shallow perched groundwater zone is present beneath the Site and depths to groundwater were observed to range from 3 to 12 below ground surface (bgs) over the course of 2016 and 2017 field activities.

Gasoline-range organics (GRO) and benzene have been identified as the primary COCs at the Site. Concentrations of GRO and benzene in soil and groundwater appear to be highest in the western-central portion of the Site and appear to extend off-property to the north and east. The vertical extent of GRO/benzene concentrations in soil above MTCA Method A cleanup levels (CULs) appears to be generally limited to depths from about 8 to 20 feet bgs. No LNAPL was observed in the monitoring wells during the 2016/2017 RI activities. Potentially complete pathways for human exposure to contaminated soil, groundwater, and soil vapors are identified.

The FS evaluated the cleanup options for the Site, with the goal of identifying the most effective cleanup strategy that is protective of human health and the environment and meets the requirements of Ecology's MTCA regulations [Washington Administrative Code (WAC) 173-340].

After evaluating a range of options to address petroleum hydrocarbon-impacted soil and groundwater at the Site, the FS focused on five remedial alternatives:

- Alternative 1: Excavation of petroleum hydrocarbon-impacted soil and disposal at a permitted offsite facility.
- Alternative 2: SVE to mitigate the effects of vapor intrusion into the site buildings.
- Alternative 3: Air sparging combined with soil vapor extraction.
- Alternative 4: *In situ* chemical oxidation (ISCO) of hydrocarbon-impacted soil and groundwater.
- Alternative 5: *In situ* bioremediation of hydrocarbon-impacted soil and groundwater.

Natural attenuation and institutional controls, while not active remediation, are regarded as possible component components of each of the five remedial alternatives.

The preferred remedial action for the site includes a combination Alternative 5 (*In Situ* Bioremediation) to address impacted site saturated soil and groundwater and Alternative 2 (Soil Vapor Extraction) to support remediation of the vadose zone and to mitigate the vapor intrusion (VI) pathway into on-property buildings.

Section 1: Introduction

This Remedial Investigation/Feasibility Study (RI/FS) Report has been prepared for the Washington State Department of Ecology (Ecology) for the Former Circle K #1461 site located at 2350 24th Avenue East, Seattle, King County, Washington (Site) (see Figure 1). The purpose of the RI was to collect and evaluate data to characterize current environmental conditions related to past fuel releases at the Site and identify concentrations of chemicals of concern (COCs) above Ecology's Model Toxics Control Act (MTCA) cleanup standards. The RI data was then used to evaluate potential contaminant exposure pathways and support the evaluation of possible cleanup alternatives in the FS. Both the RI and the FS have been prepared pursuant to the requirements of Ecology's MTCA regulations established under Chapter 173-340 of the Washington Administrative Code (WAC).

This RI/FS was conducted by Kennedy/Jenks Consultants (Kennedy/Jenks) on behalf of Ecology's Northwest Regional Office (NWRO).

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1.1 General Site Information

The Site is located on the southeastern corner of the intersection of 24th Avenue East and East McGraw Street. The Site is a former Circle K gasoline service station. Two businesses currently operate at the Site, and include a general store (Mont's Market) and a dry cleaner (Jay's Cleaners).

The site has been assigned the following Cleanup Identifications by Ecology:

- Ecology Site Name: Former Circle K Site
- Facility Site Identification Number (FSID): 2322
- Cleanup Site Identification Number (CSID): 5089
- Order Number for Consent Decree: 92-2-08095-8, effective 8 April 1992.

The Site is located on Tax Parcel 6788201335 and is zoned for commercial use. According to the King County Department of Assessments, the tax parcel is currently owned by Mr. Kuk Jin Choung and Kathy-Kyung D. Choung. The legal description of the parcel is as follows:

PIKES 2ND ADD TO UNION CITY 1 & 2 LESS E 6 FT; PLAT BLOCK 29, PLAT LOT 1-2

Jay's Cleaners is operated by the Choung family. The Mont's Market space is owned by the Choung family but leased out and operated separately.

The Site is located in an approximately two-block long area of commercial and residential mixed-use development within the Montlake neighborhood of the City of Seattle (City) (a primarily residential neighborhood). Figure 2 is a map of the Site neighborhood and shows other nearby environmental cleanup sites. To the west of the Site, 24th Avenue East is a major north-south arterial that is on a King County Transit hybrid-electric bus route. Nearby properties include a public library to the northwest, several restaurants to the south, an antique store to the west, and residential properties to the north and east. An elementary school is located one block west from the Site. The Washington Park Arboretum, a 230-acre preserve, is located approximately 700 feet to the east of the Site.

The closest water bodies to the Site are Portage Bay, approximately 2,100 feet to the northwest; the Montlake Cut, approximately 2,500 feet to the north; and Duck Bay, approximately 1,500 feet to the northeast. Duck Bay is connected to Union Bay, and Union Bay and Portage Bay are connected via the manmade Montlake Cut.

The Site and the surrounding area to the east are relatively flat and slope gently to the east towards the Washington Park Arboretum and Duck Bay. The topography rises immediately west of the Site, across 24th Avenue East, where a small hill is present.

According to Site maps and Geographic Information System (GIS) information obtained from the City, several underground utility corridors are present near the Site, which are shown on Figure 3. Seattle Public Utilities (SPU) owns and operates 12-inch and 8-inch-diameter cast iron water distribution mains that run along the eastern side of 24th Avenue East and the northern side of East McGraw Street; King County owns and operates a 90-inch-diameter reinforced concrete sewer mainline that runs along the center of 24th Avenue East; and SPU owns and operates an 8-inch-diameter concrete sewer main that begins just to the north of the Site along the center of East McGraw Street. The King County sewer main flows to the north and the SPU sewer main flows to the east, both by gravity. The Site sanitary sewer is connected to the SPU main along East McGraw Street. According to GeoEngineers (1990a), the SPU sewer main is located approximately 12 feet below grade.

1.2 Site History

The Site was operated as a retail gasoline station from 1968 to mid-1990. Four gasoline underground storage tanks (USTs), one pump island, one waste oil UST, and one heating oil UST were located at the Site (see Figure 4). In 1989, a release from a leaking UST was discovered at the Site, and reported to Ecology. At the time of the release, it was estimated that approximately 4,000 to 6,000 gallons of gasoline were released.

Following discovery of the fuel release, six USTs and the gasoline pump island were removed. Approximately 900 cubic yards (cy) of petroleum hydrocarbon-impacted soil were excavated and disposed of off Site. The UST removal and impacted soil excavation activities were conducted in 1989. In October 1990, following the UST removals, property ownership was transferred to the current owner.

Additional remedial activities were conducted between 1989 and 2006 including groundwater monitoring and sampling, light non-aqueous phase liquid (LNAPL) recovery, groundwater extraction and treatment, soil vapor extraction (SVE), and enhanced fluid recovery (EFR). These activities are described in Section 2.

In February 1992, Mr. Choung entered into Consent Decree No. 92-2-08095-8 with Ecology to conduct additional investigation and remediation of petroleum contamination at the Site. Ecology's lien on the property for the sum of $50,000 was released in January 2008 after Ecology received the full payment for past costs from mixed funding sources.

In 1994, Ecology conducted a Site Hazard Assessment (SHA) for the Site. The Site ranked a 3 out of 5, with 1 being the highest risk and 5 being the lowest risk (Ecology 1994).

A health investigation of the Site was reportedly conducted by the Washington State Department of Health in 1995, though the investigation report was not available for review in Ecology's files. The health department noted that while the Site posed a potential for adverse impact to public health, it was not of immediate concern due to the lack of any completed human exposure pathway (State of Washington Department of Health 1995).

1.3 Site Use

Two businesses currently operate at the Site including a dry cleaner (Jay's Cleaners) and a convenience store (Mont's Market). Jay's Cleaners is operated by the property owner and Mont's Market is operated independently under a lease agreement. The unbuilt portions of the Site are paved, and used as a parking area for the businesses.

Jay's Cleaners has a Resource Conservation and Recovery Act (RCRA) Site ID (WAD988515458) as a hazardous waste generator, but is listed as inactive as a hazardous waste generator since 31 December 1994. The Site is also listed in Ecology's Hazardous Waste program with Program ID CRK000003160. The start date for this interaction is listed as 1 January 1988 and the end date is listed in Ecology's database as 1 March 1989.

Section 2: Site History and Description

This section presents a summary of previous Site investigations and remedial activities.

2.1 GeoEngineers 1989-1990

The retail gasoline service station at the Site was in operation until mid-1990. Four gasoline USTs were located on the northern end of the Site and one pump island was located on the western portion of the Site (see Figure 4). One waste oil UST and one heating oil UST were also present at the Site but were reportedly not in operation in 1990 (GeoEngineers 1990a). One service building was also present on Site.

On 7 August 1989, a leak was detected in one of the gasoline USTs at the Site. Upon discovery of the release, the remaining product was removed from the leaking UST, and a release notification was made to Ecology (GeoEngineers 1990a). The capacity of the leaking UST was reportedly 4,000 gallons and it is unknown whether the tank stored leaded or unleaded gasoline. [Note: Leaded gasoline was not completely phased out in Washington until 1996]. Based on a review of tank inventory records by GeoEngineers, the release occurred between 22 June and 7 August 1989.

At approximately the same time the fuel release was discovered, fuel vapors were reportedly observed in a basement restroom of the Museum of History and Industry (MOHAI), located approximately 2,000 feet to the north of the Site (GeoEngineers 1990a) (see Figure 1). According to the Seattle Engineering Department, the source of the odors appeared to be the sanitary sewer (GeoEngineers 1990a). Fuel vapors were also observed at several locations between the Site and MOHAI, particularly along Lake Washington Boulevard, where construction was occurring at the time (GeoEngineers 1990a).

The area between MOHAI and the Site is primarily residential. The Site was believed to be the nearest upgradient source of vapors (GeoEngineers 1990a). The former leaking UST was located within 40 feet of the sewer line running east-west along East McGraw Street, and, according to (GeoEngineers 1990a), fill material around the sanitary sewer line could serve as a preferential pathway for vapor transport. No further information regarding a possible connection between the release at the Site and fuel vapors observed at the MOHAI was found in the project files.

In late 1989, 16 groundwater monitoring wells (MW-1 through MW-16) were constructed at the Site. During drilling, a petroleum-like odor was reportedly observed at several well locations (MW-2, MW-3, MW-4, MW-6, MW-10, MW-13, and MW-15) (GeoEngineers 1990a). Soil samples were collected from each of the monitoring well borings for analysis of gasoline- and diesel-range petroleum hydrocarbons [gasoline-range organics (GRO) and diesel-range organics (DRO)], benzene, ethylbenzene, toluene and xylenes (BTEX), and other gasoline-related compounds. Table 1 includes a summary of the results of the soil samples collected during the 1989 monitoring well installations. The highest detected concentration of GRO was in a soil sample collected from well boring MW-4 at 8.5 feet below ground surface (bgs) [1,200 milligrams per kilogram (mg/kg)].

All six USTs and the pump island were removed from the Site in October 1989. In addition to the USTs removals, approximately 900 cy of petroleum hydrocarbon-impacted soil were excavated and removed. The four gasoline USTs were removed from one excavation, and the used oil and heating oil USTs were each removed from separate excavations (GeoEngineers 1990a). Approximate limits of excavation are shown on Figure 5. Monitoring wells MW-2 and MW-3 were abandoned during excavation activities because they were located within the footprint of the main UST excavation. Following the excavation activities, the excavation was backfilled with pea gravel with a crushed gravel top course.

During excavation of the gasoline USTs, the sanitary and stormwater sewer lines located beneath the northern section of the property were exposed. These sewer lines connect to the main sewer main located beneath East McGraw Street. Due to previous detections of fuel vapors downgradient of the Site, the sewer lines were reportedly inspected for leakage of free product into the sewer system (GeoEngineers 1990a). During excavation of the utility lines, several previously unidentified abandoned sewer and drain lines were encountered at depths ranging from 3 to 6 feet bgs (GeoEngineers 1990a), above the grade of the bottom of the leaking UST. No evidence of free product transport to the sewer system was observed. Repairs were made to the sewer and drain lines to decrease the potential for vapors to migrate from the soil into the sewer system (GeoEngineers 1990a).

Following removal of the gasoline USTs, approximately 80 to 100 gallons of LNAPL were removed from the excavation. Petroleum hydrocarbon-impacted soil was removed from the UST excavation to a depth of approximately 14 to 16 feet bgs. Eight confirmation soil samples were collected from the sidewalls and base of the excavation. The locations of the confirmation samples are shown on Figure 5. The analytical results summary tables of the confirmation samples are provided in Appendix A. The results of the confirmation soil samples showed concentrations of gasoline- and/or diesel-range petroleum hydrocarbons and BTEX constituents that were above MTCA Method A cleanup levels (CULs) with the exception of the samples collected from the eastern sidewall. The concentrations of gasoline-range petroleum hydrocarbons identified in confirmation samples ranged from not detected (samples EW-1 and ET-3, eastern sidewall) to 1,700 mg/kg (sample NW-1 along the northern sidewall). The highest benzene concentration was also detected in sample NW-1.

The used oil and heating oil USTs reportedly contained residual product, which was removed prior to excavation (GeoEngineers 1990a). No perforations were observed in either tank; however, field screening of soil samples surrounding each tank indicated that some petroleum hydrocarbon-impacted soil was present. Approximately 10 cy of impacted soil were removed from the area surrounding the heating oil UST and approximately 80 cy of impacted soil were removed from the used oil UST excavation, primarily from the base and the eastern sidewall (GeoEngineers 1990a). Following excavation of petroleum hydrocarbon-impacted soil, confirmation soil samples were collected from each excavation sidewall and base and analyzed for total petroleum hydrocarbons. The concentration of petroleum hydrocarbons in all samples were below MTCA Method A CULs for diesel and oil in soil (see Appendix A).

The former pump island was reportedly removed from the Site in March 1990 (Ecology 2009); however, no information on confirmation sampling performed, if any, was available.

2.1.1 LNAPL Recovery and Remediation System

An LNAPL recovery system, groundwater treatment system, and SVE system were installed at the Site within the former gasoline tanks excavation area in late 1989. The remediation systems consisted of a 30-inch-diameter steel recovery well along the northern edge of the excavation, and a dual pumping system consisting of an LNAPL (free product) recovery pump and a water table depression pump (Ecology 2009). Three groundwater and LNAPL recovery trenches were also constructed within the excavation along the northern sidewall. These systems were installed under the supervision of GeoEngineers.

Approximately 538 gallons of LNAPL were recovered from December 1989 through September 1990 (GeoEngineers 1990b). In addition, measurable LNAPL was bailed from monitoring wells on a monthly basis. The groundwater treatment system was operated until May 2000, at which time Ecology made a decision to discontinue operation of the system and evaluate other cleanup alternatives (Glacier Environmental Services 2001).

An SVE system was installed in the excavation and consisted of horizontal slotted polyvinyl chloride (PVC) vapor extraction piping connected to a blower. Soil vapors were routed through a condensate trap, particulate filter, and a series of granular activated carbon (GAC) filters for treatment. Although the SVE system was installed at the same time the LNAPL recovery and groundwater treatment systems were installed, it was operated from the early 1990s until 1997, at which time it was shut down because no significant hydrocarbons were detected in the extracted soil vapor for 2 consecutive months (Ecology 2009).

2.2 Glacier Environmental Services 1992-1999

From 1992 through 1999, Glacier Environmental Services performed periodic groundwater monitoring and groundwater treatment system operation and maintenance (O&M) activities at the Site. Groundwater monitoring activities during this time period consisted of collection of groundwater samples and measurement of LNAPL in second quarter 1992 and second quarter 1999.

2.3 EcoVac Services 2005 Enhanced Fluid Recovery

In June 2005, an Enhanced Fluid Recovery (EFR®) mobile dual phase extraction technology pilot test was conducted by EcoVac Services, Inc. EFR® technology employs a combination of a specially designed truck-mounted vacuum and liquid handling system integrated with a mobile hydrocarbon vapor treatment system. High vacuum is applied to one or more monitoring or recovery wells with down-hole apparatuses to control the fluid elevation in each well. EFR® removes multiple phases of hydrocarbons (liquid, dissolved, adsorbed, and vapor phase) simultaneously by extracting free product, soil vapors, and groundwater from the selected monitoring and/or recovery wells. The purpose of the 8-hour EFR® pilot test was to evaluate this technology as a method for removal of LNAPL, impacted groundwater, and hydrocarbon vapors from monitoring wells MW-4, MW-8, MW-9, and MW-13, located near the former UST excavation area. The EFR® pilot test produced the following results:

- Approximately 18 gallons of gasoline were removed during the test.

- Vapor-phase hydrocarbon removal rates ranged from 1.9 pounds per hour (lbs/hr) when extracting from monitoring well MW-13 located farthest from the former UST excavation area, to 38 lbs/hr when extracting from multiple monitoring wells simultaneously (i.e., MW-4, MW-8, and MW-9) located nearer to the former UST excavation area.

- Individual monitoring well vacuum readings ranged from 13 to 19 inches of mercury (in Hg).

- Vacuum influence generally ranged from no influence at distances greater than 22 feet from the extracting well to -0.07 inches of water (in H_2O) at a distance of 19 feet from the extracting well. One exception was the vacuum influence measured at monitoring well MW-7 (-0.06 in H_2O) at a distance of 48 feet (to the south, away from the former UST excavation area) from the well the used for extraction (i.e., MW-4).

- The groundwater drawdown measured in observation monitoring wells ranged from 0.08 foot to 2.75 feet when extracting from monitoring well MW-9 and generally correlated with distance from point of the applied vacuum. The groundwater drawdown measured in three observation wells when extracting from monitoring well MW-4 was approximately the same, regardless of distance.

- Pre-test LNAPL measurements ranged from a sheen in monitoring well MW-8 to 0.42 foot in monitoring well MW-4. LNAPL was not present in measurable thicknesses in measurements taken approximately 3 weeks following the pilot test. Measurements of LNAPL collected in the three subsequent quarters indicated that LNAPL was measurable on the groundwater but did not return to the pre-test thickness in monitoring well MW-4.

2.4 Groundwater Monitoring 2005-2006 (EA Engineering)

In 2005 and 2006, EA Engineering, Science, and Technology, Inc. (EA Engineering) conducted groundwater monitoring activities at the Site. The monitoring activities during this period consisted of collection of groundwater samples from selected monitoring wells and measurement for LNAPL approximately 1 week prior to the EFR pilot test described above and approximately 1 week after the pilot test. Three additional rounds of groundwater monitoring were conducted by EA Engineering in 2006. The results of the groundwater monitoring during this period indicate that GRO and benzene remained in the groundwater at concentrations above MTCA Method A CULs to the north of the former gasoline UST area. In addition, the LNAPL thickness in monitoring wells located in the former gasoline UST area slowly rebounded following the EFR pilot test but did not return to pre-test thicknesses in the monitoring well located adjacent to the former USTs (MW-4) where the greatest thickness had been observed prior to the test. Follow-up monitoring conducted in February 2008 indicated that LNAPL remained as film (i.e., no measurable thickness) in monitoring wells MW-4 and MW-13 and a hydrocarbon sheen was present in monitoring wells to the north (MW-8, MW-9, and MW-15) and that the extent of LNAPL-impacted groundwater was relatively stable.

Section 3: 2016/2017 Remedial Investigation

This section presents the scope and methods of the additional 2016/2017 RI activities as well as description of the Site geology and hydrogeology.

3.1 Data Gaps Summary

Kennedy/Jenks conducted a review of the 2009 RI/FS report and other previous reports and documents, including those described in Section 2, and summarized this information in a *Preliminary Summary of Data Gaps, Potential Exposure Pathways, and Proposed Initial Work Tasks Technical Memorandum* (Technical Memorandum) (Kennedy/Jenks 2016a), which was submitted to Ecology in February 2016. To address the data gaps identified in the Technical Memorandum, Kennedy/Jenks prepared the *Remedial Investigation Sampling and Analysis Work Plan, Former Circle K Site, 2350 24th Avenue East, Seattle, Washington* (RI Work Plan) (Kennedy/Jenks 2016b). This section presents a summary of identified data gaps and describes the activities conducted to address the data gaps and complete the RI.

3.1.1 Soil

Based on information provided in the Technical Memorandum, the lateral and vertical extent of petroleum hydrocarbon impacts to subsurface soil had not been adequately characterized by past investigative work to evaluate further cleanup action(s). The extent of impacts indicated by past sampling (e.g., primarily from the former UST excavation area but also from soil borings) had not been adequatelydelineated, and other areas of potential impacts to soil had not been previously investigated. Furthermore, the available analytical data was over 25 years old in some cases and new data reflecting current conditions were needed at some locations.

3.1.2 Groundwater

Based on information provided in the Technical Memorandum, the extent of petroleum hydrocarbon impacts to groundwater at the Site had not been fully characterized. Past findings indicate that impacted groundwater was present to the north (monitoring wells MW-4, MW-8, MW-9, and MW-15) and west (monitoring well MW-13) of the former gasoline UST area [primarily beneath the East McGraw Street right-of-way (ROW)], but current conditions and the overall extent of groundwater impacts were not adequately understood (e.g., groundwater sampling had not been conducted since 2006). In addition, the current extent and potential accumulation of LNAPL, previously identified to the north and west of the former gasoline UST area, were unknown. As with the soil data, available groundwater analytical data are over 10 years old in some cases and new data reflecting current Site conditions were needed.

3.1.3 Soil Vapor

Based on the information provided in previous Site reports, migration of vapors from gasoline-affected soil and groundwater is possible at the Site.

3.2 Site Characterization

In accordance with WAC 173-340-350, the RI was conducted to characterize the nature and extent of petroleum hydrocarbon-impacted soil and groundwater including identification of potential human and ecological exposure pathways and receptors.

The activities conducted during the RI are summarized below. The following work was conducted by and/or overseen by Kennedy/Jenks field personnel.

- Site reconnaissance and assessment of existing underground utilities.
- Visual inspection and measuring the depth to water in existing monitoring wells conducted in March 2016.
- Redevelopment of the existing monitoring well network, and collection and analyses of groundwater samples in April and December 2016.
- Soil and reconnaissance (one-time grab) groundwater sampling at 16 soil boring locations (KJB-1 through KJB-16) conducted in May 2016 (KJB-1 through KJB-13) and August 2016 (KJB-14, KJB-15, and KJB-16). The boring locations are shown on Figure 6. Each boring was advanced to a depth of 20 feet bgs with the exception of boring KJB-6, which was advanced to a depth of 25 feet bgs. Soil samples and reconnaissance groundwater samples were collected from each of the boring locations. The soil boring logs are included in Appendix B.
- Drilling and installation of three 2-inch-diameter groundwater monitoring wells (MW-17, MW-18, and MW-19) and two 4-inch-diameter multi-purpose wells (MW-20 and MW-21) in August and September 2016.
- Drilling and installation of seven 4-inch-diameter multi-purpose wells (RW-1 through RW-7) in February 2017.

Locations of the soil borings, groundwater monitoring wells, and multi-purpose wells are shown on Figure 3.

3.2.1 Field Methods

The methods used during the RI field activities were described in detail in the RI Work Plan (Kennedy/Jenks 2016b) and are briefly summarized below.

3.2.1.1 Groundwater Sampling

Groundwater sampling was conducted in April and December 2016. Prior to collection of groundwater samples, the depth to groundwater was measured using an electronic water level meter. In addition, an oil-water interface probe was used to determine if measurable LNAPL accumulations were present in wells where LNAPL had been observed previously. A disposable polyethylene bailer was used for the initial purging activities during the April 2016 sampling event to remove accumulated sediment and re-develop the monitoring wells. Following the use of the disposable bailer, a peristaltic pump was used to purge groundwater prior to collection of groundwater samples, using low-flow techniques, until parameters of temperature, pH, specific conductance, dissolved oxygen (DO), and oxidation-reduction potential (ORP) were stabilized. Low-flow purging techniques were used on all of the wells for the December 2016 sampling event. The groundwater purge and sample forms are included in Appendix C.

Following purging, groundwater samples were collected in laboratory-supplied containers for analysis of GRO and BTEX. In addition, groundwater samples collected from monitoring well MW-14 and three of the monitoring wells installed in 2016 (MW-17, MW-19, and MW-21) were analyzed for fuel additives and natural attenuation parameters. Upon collection, the samples were labeled and placed in a chilled ice chest for transportation under chain-of-custody protocol to Analytical Resources, Incorporated (ARI) located in Tukwila, Washington, for analysis. Laboratory analytical methods are described in Section 4.

3.2.1.2 Direct-Push Soil Borings

Prior to performing drilling activities the following activities were performed:

- Reviewing utility information provided by the property owner and available online.
- Conducting a private utility survey using surface detection methods.
- Requesting a One-Call utility locate to identify public utilities.
- Advancing the upper 5 feet to 6 feet of each soil boring using air-knife techniques to assess possible underground utilities.

Soil and reconnaissance groundwater borings were advanced using Geoprobe® direct-push equipment operated by Holt Services, Inc., of Puyallup, Washington (Holt). Nine of the soil borings (KJB-1 through KJB-6, KJB-11, KJB-14, and KJB-15) were located within the City ROW in the planting strip along the northern and southern sides of East McGraw Street or along the western side of 24th Avenue East in accordance with a City Utility permit. One soil boring (KJB-16) was advanced on the neighboring property at 2415 East McGraw Street under an access agreement completed by Ecology.

Continuous soil cores were collected for lithologic identification, field screening, and collection of soil samples. The boring logs are included in Appendix B. Soil samples from selected depth intervals were placed in laboratory-supplied sample containers for analysis of GRO and BTEX. In addition, upon collection, the soil samples were labeled and placed in a chilled ice chest for transportation under chain-of-custody protocol to ARI for analysis. Laboratory analytical methods are described in Section 4.

3.2.1.3 Monitoring/Multi-Purpose Well Installation

All of the monitoring/multi-purpose well locations were cleared for utilities using the same methods described above. All of the new monitoring/multi-purpose wells except for wells MW-17 and MW-18 were drilled and completed using hollow-stem auger drilling methods. Monitoring wells MW-17 and MW-18 were constructed using direct-push methods. Monitoring wells MW-17, MW-18, and MW-19 are constructed with 2-inch-diameter PVC casing and screen and multi-purpose wells MW-20, MW-21, and RW-1 through RW-7 are constructed using 4-inch-diameter PVC casing and screen. These wells are 20 feet deep with 15 feet of screen with the exception of well MW-18, which is 15 feet deep with 10 feet of screen. The well construction details are summarized in Table 2. All of the monitoring/multi-purpose wells were constructed by Holt under the supervision of a Kennedy/Jenks geologist.

Soil samples were collected at 5-foot intervals during well boring for lithologic identification, field screening, and possible laboratory analysis. The boring and well construction logs are included in Appendix B. Multi-purpose wells RW-1 through RW-7 are located in the general vicinity of other borings from which soil samples were collected for laboratory analysis. Therefore, no soil samples were collected from the RW wells for laboratory analysis.

The wellheads were surveyed for location and elevation by True North Land Surveying of Seattle, Washington. The top of casing elevations are summarized in Table 2.

3.2.1.4 Investigation-Derived Waste Disposal

Investigation-derived waste (IDW) generated during the RI consisted of drill cuttings, well development and equipment decontamination water, and purge water. The IDW was placed in 55-gallon drums, labeled, and temporarily stored onsite pending disposal. A waste profile was generated for this general waste stream based on soil and groundwater analytical results. After each phase of the investigation, the IDW was transported offsite, by Cascade Drilling, Inc. of Woodinville, Washington, for disposal at an approved disposal facility.

3.3 Site Geology

Based on review of boring logs generated during the RI activities conducted in 2016/2017 and previous investigations (primarily from GeoEngineers 1990), three generalized stratigraphic units are identified at the Site, as summarized below:

- Silt – Typically encountered from the ground surface (i.e., beneath pavement and subgrade fill) to depths of approximately 2 to 8 feet bgs, but extends to greater depth (up to approximately 13 feet bgs) in the northern portion of the Site. The unit is generally described as soft to stiff, brown to gray, silt to sandy silt, locally with gravel and/or organics.

- Sand/silt – Typically encountered below the silt layer to depths of approximately 17 to 22 feet bgs, and typically described as gray to brown, fine sand, silty fine sand, or sandy silt locally containing cobbles. The unit is described as loose, medium dense, dense, and very dense with vertical and lateral variation. This unit may locally include the uppermost, possibly weathered, portion of the underlying glacial till unit.

- Till – Typically encountered below the sand/silt starting at approximately 17 to 22 feet bgs and generally described as gray silt, silty sand, or sandy silt with sand and gravel. The till unit is typically described as dense to very dense, hard to very hard, or stiff to very stiff, as indicated during drilling by increased drilling pressure and significant increases in blow counts required to drive split-spoon soil samplers.

Figure 7 shows the locations of interpretive geologic cross sections A-A' and B-B', which are presented as Figures 8 and 9, respectively.

None of the Site monitoring/multi-purpose wells or soil borings have been advanced through the till unit; however, a well installed by Landau Associates (Landau) near Site well MW-4 in 2013 (Landau 2013) was advanced to approximately 90 feet bgs. This well was part of an investigation for a separate site, Montlake Neighborhood Former Dry Cleaner, located on the west side of 24th Avenue East, across from the Former Circle K Site. The log for the 2013 Landau well (designated MW-3, included in Appendix B; location shown on Figure 7) shows the upper contact with the till at 18 feet bgs, dense (unweathered) till at 30 feet bgs (see Figure 8), and gray fine to medium sand beneath (or possibly interbedded with) the till from approximately 80 to 90 feet bgs.

3.3.1 Site Hydrogeology

The depth to groundwater at the Site ranges from 3 to 12 feet bgs, based on water levels measured from April to December 2016. This zone of shallow groundwater occurs under unconfined conditions, is perched on top of the Till unit, and is interpreted to represent the local water table aquifer. Although a seasonal fluctuation of a foot or less in the aquifer was generally observed near the former UST area during the April and December 2016 monitoring event, a fluctuation nearly 6 feet was recorded at northernmost monitoring well MW-11. It should be noted that Site wells MW-17 through MW-21 were completed in August and September 2016 and were therefore, only included in the December 2016 monitoring event. The inferred groundwater potentiometric surfaces of the shallow groundwater zone, based on water levels measured in April and December 2016, are shown on Figures 10 and 11, respectively.

Groundwater level data collected from wells located at the Site in April and December 2016 (within the property parking lot) show a flow direction to the southeast, with a localized area of depression in the vicinity of well MW-6 (see Figures 10 and 11). The potentiometric low around well MW-6 (located in East McGraw Street) is likely attributable to utility corridors located in the center of the street ROW.

Previous reports have indicated that the general direction of groundwater flow was towards the northeast, and that while the LNAPL recovery and remediation system was operating (December 1989 through May 2000, a stable cone of depression developed near the recovery well (see Figure 5).

Because of the nature of gasoline contamination, deeper groundwater units beneath the shallow groundwater zone are not expected to be impacted by the release at this Site, and have not been evaluated as part of this RI. Landau installed two deep monitoring wells as part of their characterization of the Montlake Cleaners site (MW-1 and MW-3; see Figure 3), that were screened in the first water-bearing zone beneath the Till unit. This zone was encountered from 80 to 90 feet bgs in Landau well MW-3, and a water level in this well (screened from 83 to 88 feet bgs) measured in April 2013 was 33 feet bgs (Landau 2013). This water level indicates confined conditions in the deeper groundwater zone and a downward vertical gradient from the perched zone to the deeper zone (see Figure 9).

Section 4: Investigation Results

This section presents a summary of the analytical results of the soil and groundwater samples collected during 2016/2017 RI. Analytical results discussed below are compared to MTCA Method A and B CULs developed for unrestricted land use and protection of potable groundwater.

4.1 Soil Results

A total of 48 soil samples were collected for laboratory analysis during advancement of soil borings and monitoring well construction activities in 2016. The samples were submitted to ARI for analysis of GRO by the Northwest Total Petroleum Hydrocarbon - Gasoline Range (NWTPH-Gx) and BTEX using U.S. Environmental Protection Agency (EPA) Method 8260. Analytical results for soil samples are summarized in Table 3, and are discussed below. Laboratory analytical reports and chain-of-custody documentation are included in Appendix D. In addition, three of the soil samples were analyzed for fuel additive compounds [1,2-dibromoethane (ethylene dibromide) (EDB), 1,2-dichloroethane (ethylene dichloride) (EDC), and methyl-tertiary butyl ether ((MTBE)], of which none were detected. Based on the soil analytical results, GRO and benzene are the primary COCs in Site soil. The detected concentrations of GRO and benzene in soil are shown on Figure 6.

Based on the analytical results of the soil samples, GRO concentrations exceed the MTCA Method A CUL for unrestricted land use (soil CUL) in soil samples collected from borings KJB-4, KJB-7 through KJB-10, KJB-13, MW-19, MW-20, and MW-21. Observations [i.e., staining, odor, and photoionization detector (PID) readings] made in the field during drilling are consistent with the laboratory results. Figure 6 shows the approximate lateral extent of GRO concentrations that exceed the soil CUL. The GRO concentrations appear to be highest in the western-central portion of the Site and may extend offsite beneath 24th Avenue East. The lateral extent of impacted soil appears to be limited on the southern side to a short distance south of boring KJB-13, on the eastern side to the approximate western edge of the building footprint (may extend beneath the building) and on the northern side to a short distance north of boring KJB-4.

Based on analytical results, field observations and the measured depths to groundwater, the vertical extent of GRO concentrations that exceed the soil CUL appear to be generally limited to unconsolidated sediments and perched groundwater above the till unit.

Similar to GRO, benzene concentrations that exceed the soil CUL appear to be limited laterally to the northwestern portion of the Site with the highest concentrations reported in soil samples collected from borings KJB-8, KJB-10, and MW-19. Concentrations of benzene in soil that exceed the soil CUL may also extend offsite to the west beneath 24th Avenue East, beneath the building to the east, and a short distance north of boring KJB-4. The vertical extent of benzene concentrations that exceed the soil CUL appear to be generally consistent with the distribution of GRO.

4.2 Groundwater Results

Groundwater samples were collected from monitoring wells in April and December 2016 and reconnaissance groundwater samples were collected from each of the KJB soil borings in May/August 2016. Monitoring wells MW-17 through MW-21 (located at the Site) were installed in August and September 2016 and were only sampled during the December 2016 event.

The groundwater samples were submitted to ARI for analysis of GRO and BTEX using the same analytical methods as for soil. In addition, several groundwater samples were analyzed for fuel additives (EDB, EDC, and MTBE), lead, and natural attenuation parameters. The laboratory results of the GRO, BTEX, and fuel additive analyses are summarized in Table 4 (reconnaissance groundwater samples) and Table 5 (monitoring well groundwater samples). The natural attenuation parameter results are summarized in Table 6. The complete laboratory reports are included in Appendix D. The estimated extents of GRO and benzene in groundwater in December 2016 are shown on Figures 12 and 13, respectively.

Based on the analytical results, GRO concentrations reported in groundwater samples collected from four wells (MW-4, MW-8, MW-9, and MW-13) in April 2016 exceeded the MTCA Method A groundwater CUL. GRO concentrations reported in groundwater samples collected from the same four wells and the four new wells (i.e., MW-17, MW-19, MW-20, and MW-21) in December 2016 exceeded the MTCA Method A groundwater CUL. GRO concentrations exceeding the MTCA Method A groundwater CUL were also reported for the reconnaissance groundwater samples collected from borings KJB-4 through KJB-10 and KJB-13, all of which are onsite. As with soil, the GRO concentrations are highest in the western-central portion of the Site and may extend offsite to the west beneath 24th Avenue East and to the north beneath East McGraw Street. No measurable LNAPL was observed in any of the monitoring wells during either the April or December 2016 monitoring events.

Benzene concentrations exceed the groundwater CUL in generally the same locations as the GRO concentration exceedances, except as noted. Benzene was either not detected or detected at a concentration less than the CUL in the groundwater samples collected from wells MW-7 and MW-9, respectively, in December 2016. Benzene was reported above the CUL in the groundwater samples collected from well MW-6 in April and December 2016. None of the fuel additives were detected in the groundwater samples analyzed for these compounds (samples collected from wells MW-20 and MW-21). Similar to GRO, BTEX concentrations exceeding the MTCA Method A groundwater CUL were reported for the reconnaissance groundwater samples collected from borings KJB-4 through KJB-10 and KJB-13, all of which are onsite. Exceptions are toluene concentrations in the samples collected from borings KJB-5, KJB-6, KJB-7, and KJB-13 and ethylbenzene, and xylene concentrations in the samples collected from boring KJB-6 were less that the MTCA Method A groundwater CUL. The EDC concentration in the reconnaissance sample collected from KJB-8 exceeded the MTCA Method A groundwater CUL.

Groundwater monitoring has been conducted periodically at the Site over the last 26 years. Available analytical results from groundwater monitoring events conducted between 1989 and 2006 indicate the GRO and benzene concentrations exceeded the groundwater CUL on the northern side of East McGraw Street. However, the results from more recent sampling events (including the 2016 events) indicate that the petroleum hydrocarbon plume is at least stable and possibly diminishing in size over time. Several factors may be contributing to the reduction of petroleum hydrocarbon concentrations in groundwater, including:

- Removal of the USTs in 1989, including excavation of petroleum hydrocarbon-impacted soil.
- Past remedial efforts including groundwater extraction, operation of the SVE system, and LNAPL recovery efforts previously performed.
- Natural attenuation of petroleum hydrocarbons compounds.

Deep monitoring well MW-3, installed by Landau and associated with the Montlake Cleaners site, is screened in the first water-bearing zone beneath the Till unit. Groundwater samples collected from this well by Landau were not analyzed for petroleum hydrocarbons fuel mixtures; however, the groundwater samples did not contain BTEX constituents above laboratory reporting limits (reference).

4.3 Vapor Intrusion Assessment

Kennedy/Jenks conducted an initial (Tier 1) assessment of the potential for vapor intrusion (VI) in the main Site structure and adjacent residences following the methods described in the EPA's *Technical Guide for Addressing Petroleum Vapor Intrusion at Leaking Underground Storage Tank Sites* (EPA 2015). The VI assessment included an evaluation of the lateral and vertical distribution of impacted groundwater in relation to nearby structures and an evaluation of the EPA's defined lateral inclusion zone and vertical separation distance from the potential hydrocarbon source (primarily dissolved BTEX compounds in soil and groundwater). Volatile chemicals (e.g., BTEX) are present in groundwater, and are expected to be the primary source for possible subsurface VI issues in surrounding buildings which include the on-property commercial structures and off-property residences. This assessment was performed using available groundwater monitoring results and soil gas sampling was not included in the RI activities.

Ecology's Cleanup Levels and Risk Calculation (CLARC) groundwater screening levels were evaluated to provide a baseline assessment of potential VI resulting from volatilization of various organic compounds from groundwater. The occupied on-property commercial structure is within the lateral inclusion zone based on the maximum benzene, toluene, and xylene concentrations detected in groundwater near the building above the MTCA/CLARC groundwater VI screening levels of 2.4 micrograms per liter (µg/L), 1,560 µg/L, and 310 µg/L, respectively. Based on comparison to these groundwater screening levels, potential VI to the building appears possible. However, Site groundwater is typically encountered about 10 feet bgs adjacent to the building, exceeding EPA's vertical separation distance of 6 feet beneath the building slab for dissolved phase hydrocarbon compounds, suggesting there is adequate vertical distance for biological degradation of petroleum hydrocarbon compounds to prevent VI into on-property buildings. While not investigated during this assessment, underground utilities could provide a preferential pathway for soil vapors into the building. Consequently, the VI pathway into the on-property structure is considered potentially complete pending further characterization of preferential vapor pathways.

BTEX compounds were not detected above laboratory reporting limits in the groundwater samples collected in April and December 2016 from monitoring wells located on the northern side of East McGraw Street (MW-14, MW-15, and MW-16). The residential structures on the northern side of East McGraw Street are located at least 30 feet north of the monitoring wells and are considered to be outside of the lateral inclusion zone. Although soil gas samples have not been collected on the residential properties to the north of East McGraw Street, it does not appear that VI is a potentially complete exposure pathway for the adjacent residential structures based on EPA's lateral inclusion zone and the vertical separation distance criteria.

Several utility corridors are present along East McGraw Street and 24th Avenue East, as shown on Figure 3. The utility corridors (including laterals to residences) can provide a potential for preferential migration of vapors and increase the risk for soil VI to nearby structures. Because of the location of these underground utilities with respect to the dissolved-phase hydrocarbon concentrations in groundwater, VI into adjacent residential properties is not expected. However, in the absence of specific sampling at the residential properties, the VI pathway for off-property residential areas must be regarded as potentially complete.

[Note: In addition to possible VI conduits, due to the high concentrations of volatile petroleum hydrocarbon compounds in groundwater in close proximity to utility corridors (including the 90-inch sanitary sewer along 24th Avenue East), potentially explosive conditions could be created within the sewer line if vapors were able to accumulate and concentrate.]

4.4 Data Quality Evaluation

A Quality Assurance Project Plan (QAPP) was provided in Appendix D of the RI Work Plan (Kennedy/Jenks 2016b*)*. In general, the appropriate field and laboratory quality control measures, analytical procedures, data management protocols, and laboratory report validation described in the QAPP were followed during the RI activities. Samples selected for potential laboratory analysis were submitted, under chain-of-custody protocol to ARI located in Tukwila, Washington. Overall, the findings of the data validations indicate that no adverse effects were identified in the analytical results and the analytical data are appropriate for the intended use. The data validation summaries are provided in Appendix E.

4.5 *In Situ* Bioremediation Pilot Study Results

To assist in the evaluation of remedial alternatives, a bioremediation pilot test was conducted to assess the efficacy of bioremediation for reducing petroleum hydrocarbon concentrations in groundwater. The pilot test was conducted in general accordance with the *Pilot Study Work Plan* (Kennedy/Jenks 2017) submitted to Ecology on 4 February 2017.

The 7-day bioremediation pilot test was performed in March 2017 by Environmental Technologies, LLC (ETEC), of Washougal, Washington, using monitoring and multi-purpose wells (MW-19, MW-20, MW-21, RW-2, RW-3, RW-4, RW-5, RW-7). The pilot study involved obtaining an Ecology Underground Injection Control (UIC) well registration; groundwater extraction; and injection of approximately 4,500 gallons of a solution of extracted groundwater (and tap water) and low-concentration surfactant, followed by injection of approximately 3,100 gallons of a solution of extracted groundwater, macronutrients, and a bacterial consortium. Detailed pilot test field notes prepared by ETEC are provided in Appendix F.

During the latter portion of the pilot test, traces of the injected surfactant solution were observed in monitoring wells located at least 15 feet away from the injection wells, indicating that the soil permeability in the saturated zone is amenable to injection and recirculation. Injection pressures ranged from zero pounds per square inch (psi) in the RW wells to 8 psi in wells MW-20 and MW-21. Follow-up groundwater sampling will be conducted in May 2017.

4.6 Terrestrial Ecological Evaluation

Kennedy/Jenks conducted a Terrestrial Ecological Evaluation (TEE) to evaluate the potential impacts to terrestrial ecological receptors, in accordance with regulations published in WAC 173-340-7490 through 173-340-7494. The purpose of the TEE process is to determine whether a release of hazardous chemicals at the Site may cause potential adverse effects to terrestrial ecological receptors. The first step in the TEE process evaluates whether the Site qualifies for a primary exclusion under WAC 173-340-7941. If the Site does not qualify for a primary exclusion, the next steps in the tiered approach are used to evaluate whether the Site qualifies for a simplified TEE under WAC 173-340-7942 or requires additional evaluation and a Site-specific TEE under WAC 173-240-7943.

4.6.1 TEE Exclusion

The Site was evaluated for the potential to pose a threat to terrestrial ecological receptors. To qualify for exclusion from a TEE, the Site must meet one of the four criteria below and described in WAC 173-340-7491:

1. **Point of Compliance.** All soil contamination is, or will be, at least 6 feet bgs (or alternative depth if approved by Ecology), and institutional controls are used to manage remaining contamination.

2. **Barriers to Exposure.** All contaminated soil, is or will be, covered by physical barriers (such as buildings or paved roads) that prevent exposure to plants and wildlife, and institutional controls are used to manage remaining contamination.

3. **Undeveloped Land.** There is less than 1.5 acres of contiguous undeveloped land on or within 500 feet of any area of the Site.

4. **Background Concentrations.** Concentrations of hazardous substances in soil do not exceed natural background levels as described in WAC 173-340-200 and 173-340-709.

Based on an evaluation of the Site information and current and historical analytical data, the following four conclusions are made regarding each criterion:

1. **Point of Compliance.** During various phases of investigation, petroleum hydrocarbon-impacted soil has not been observed within 6 feet of the ground surface. While, no soil samples have been analyzed from depths within 6 feet of the ground surface, readily identifiable indications of significant petroleum hydrocarbon impacts were not identified in the RI vapor monitoring results using a PID or noted in the boring logs based on physical evidence (staining, odors, or sheen tests). Therefore, impacted soil in the upper 6 feet of soil is not expected.

2. **Barriers to Exposure.** The entire Site, with the exception of small planter boxes is either covered with asphalt or concrete pavement or is covered by buildings with slab-on-grade construction that prevents exposure to plants and wildlife. Therefore, the Barriers to Exposure criterion is met.

3. **Undeveloped Land.** There is no undeveloped land within 500 feet of any part of the Site. Therefore, the Undeveloped Land criterion is met.

4. **Background Concentrations.** Since petroleum hydrocarbons have been detected in soil and groundwater samples collected at the Site, the Background Concentrations criterion has not been met.

The Site qualifies for exclusion from a TEE based on meeting Criteria 1, 2, and 3. Therefore, further evaluation for the potential threat to terrestrial ecological receptors is not required.

4.7 RI Conclusions

Based on the results of the 2016 RI activities, GRO and benzene are the primary COCs in soil and groundwater at the Site and the drivers for evaluation of remedial alternatives. Other compounds reports above MTCA CULs include toluene, ethylbenzene, and xylenes; however, where these compounds are reported in soil and groundwater GRO and/or benzene are also reported. The distribution of GRO and benzene in soil and groundwater are summarized on Figure 6 (soil) and Figures 12 and 13 (groundwater). The RI results indicate that GRO and benzene concentrations in soil appear to be highest in the western portion of the Site and may extend offsite beneath 24th Avenue East. The lateral extent of impacted soil appears to be limited on the southern side to a short distance south of the location of boring KJB-13, on the eastern side to the approximate western edge of the on-property building footprint (may extend beneath this building), and on the northern side to a short distance north of boring KJB-4. Based on analytical results, field observations and the measured depths to groundwater, the vertical extent of GRO/benzene concentrations in soil that exceed the CULs appear to be generally limited to the smear zone created when LNAPL moved with the vertically fluctuations of the shallow water table elevation.

As with soil, the GRO and benzene concentrations in groundwater are highest in the western portion of the Site and may extend offsite to the north and west beneath East McGraw Street and 24th Avenue East, respectively. No measurable LNAPL was observed in the monitoring wells during either the April or December 2016 monitoring events.

The results of recent groundwater sampling events indicate that the petroleum hydrocarbon plume appears to be stable and probably diminishing in size over time. Source removal and subsequent remedial activities in conjunction with natural attenuation processes have contributed to plume stability. A shallow groundwater gradient across much of the Site may also have limited the lateral migration of dissolved-phased petroleum hydrocarbons in groundwater over time.

The utility corridors (including laterals to residences) can provide a potential for preferential migration of vapors and increase the risk for soil VI to nearby structures. Because of the location of these underground utilities with respect to the dissolved-phase concentrations in groundwater, VI into adjacent residential properties is not expected. However, in the absence of specific sampling at the residential properties, the potential for a complete VI pathway to off-property residential areas cannot be dismissed.

The Site qualifies for exclusion from a TEE; therefore, further evaluation for the potential threat to terrestrial ecological receptors is not required.

Sections 8 through 11 of this report present an evaluation of potential cleanup alternatives for the Site and a recommendation for a cleanup action for soil and groundwater.

Section 5: Conceptual Site Exposure Model

Based on background Site information and the findings of the 2016/2017 RI and previous investigations, a conceptual site model (CSEM) and exposure pathway analysis were developed for the Site.

The CSEM exposure pathways for onsite and offsite human and ecological exposures based on the current understanding of the Site and vicinity is presented on Figure 14. The CSEM graphically depicts possible sources of COCs, possible COC-affected media, mechanisms of COC transfer between media, and the processes through which human receptors may be exposed to chemicals. Only those exposure pathways that are potentially complete were evaluated quantitatively in the RI.

The following summarizes the potential exposure scenarios for evaluation based on current and reasonably foreseeable future conditions at the Site.

5.1 Potential Sources

The primary source of the COCs is the former USTs located on the northern end of the Site. The USTs were removed in 1990. The primary release mechanism is considered to be a leak of between approximately 4,000 and 6,000 gallons of gasoline from the USTs discovered in 1989. Soil and groundwater impacted by the gasoline release are secondary sources.

5.2 Fate and Transport

Contaminant transport appears to have been mainly limited by (1) the volume of the gasoline release, (2) the relatively slow groundwater seepage velocities inferred for the Site based ion the saturated media and hydraulic gradients, and (3) natural attenuation processes. As previously discussed**,** the onsite groundwater gradient and flow direction is variable with a slight gradient to the north/northeast towards monitoring well MW-4. To the north and west of the Site, there appears to be a stronger hydraulic gradient primarily to the south and southeast, respectively, generally towards the Site. Groundwater movement may be influenced by recharge from the south (generally upgradient), utility corridors and the differential permeability of the native soil, and the gravel used for backfill material in the UST excavation area. Spreading of LNAPL (free product) after the release along with advection and dispersion of dissolved petroleum hydrocarbons in groundwater appear to be the major transport mechanism for COCs.

The glacial till identified in a significant number of borings at a depth of approximately 17 to 22 feet bgs, consisting of sandy silt with clay, presents a natural impediment to downward movement of groundwater from the shallow perched zone. Because of the presence of this till aquitard layer and the lower-than-water density of gasoline, lateral movement of COCs above the till is expected to predominate COC transport and very limited potential vertical COC migration is expected.

Potential transport processes between sources and exposure media may include (but are not limited to) the following:

- Direct release to media.

- Leaching from soil to groundwater in water-bearing zones.

- Partitioning of dissolved volatile COCs in groundwater into soil vapor.

- Vapor movement to the ground surface (e.g., infiltration into buildings/indoor air) from impacted soil and groundwater.

5.3 Exposure Pathways

Potential exposure pathways for the Site include direct contact for soil and groundwater, leaching (soil to groundwater), and VI to receptors in on-property structures. Potential exposure pathways are shown on Figure 14 and identified below.

- Soil direct contact and/or ingestion for construction and utility workers.

- Groundwater direct contact and/or ingestion by construction and utility workers.

- Vapor inhalation by construction and utility workers.

- VI into the on-property and off-property buildings by occupants and visitors.

- Potential consumption of groundwater if used for drinking water. A search of water wells within a 0.25-mile radius of the Site was conducted using Ecology's Well Log database and no water wells were identified in the search. City water supplies are available in this area of the Site; consequently, consumption of groundwater is not classified as a reasonably potentially complete exposure pathway.

Section 6: Cleanup Objectives, Proposed Cleanup Standards, and Points of Compliance

6.1 Cleanup Objectives

The objective of the cleanup action is to reduce potential risks to human health and the environment. Because the Site is zoned as “Neighborhood-Commercial”, the proposed soil cleanup standards must be protective of unrestricted land use.

Specific risk-based cleanup objectives include:

- Reduce the potential for human contact with soil and groundwater containing COCs at concentrations that exceed the selected cleanup levels.
- Protect groundwater quality by reducing the source(s) of petroleum hydrocarbons for dissolution into groundwater to below levels that pose a threat to potable water supplies.
- Reduce the petroleum hydrocarbon concentrations in soil and groundwater to reduce the threat of potential for VI, both on-property and off-property.

6.2 Proposed Cleanup Standards

The proposed cleanup standards include:

- **Soil:** MTCA Method A soil CULs for unrestricted land use obtained from Ecology’s CLARC database. For those compounds where MTCA Method A levels may not be available, soil cleanup levels will be based on MTCA Method B values.
- **Groundwater:** MTCA Method A groundwater CULs for fuel components (i.e., GRO and BTEX compounds).
- **Vapor Intrusion:** While no soil vapor samples were collected during the RI, screening levels for potential VI will be based on MTCA Method B groundwater screening levels for the vapor intrusion pathway obtained from Ecology’s CLARC database.

These cleanup standards are summarized in Table 7 and provided in the tables presenting the analytical results for soil and groundwater at the Site. [Note: No soil gas or ambient/indoor samples has been collected]. While GRO and benzene are considered “driver compounds” in the evaluation of remedial alternatives, Table 7 includes proposed CULs for other fuel-related compounds (toluene, ethylbenzene, and xylenes) that have been reported above CULs during the RI and/or may be encountered during remedial action confirmation and performance monitoring.

6.3 Justification for Cleanup Levels

MTCA Method A or Method B (when a Method A cleanup level is not available) CULs for unrestricted land uses are proposed as part of the cleanup standards for this Site. These standards are protective of human exposure (direct contact pathway) and protective of groundwater and surface water (Note: There are no surface water bodies in close proximity to the Site.).

Groundwater CULs selected for the Site are based on a combination of MTCA Method A groundwater for fuel components (i.e., GRO and BTEX). MTCA Method A groundwater CULs for GRO and BTEX were selected for fuel components because they are the most applicable and protective standards for gasoline-range hydrocarbon compounds (including BTEX). MTCA allows the use of potable drinking water standards for non-potable water when these standards are protective of human health and the environment and completion of a Site-specific risk assessment is not warranted.

6.4 Points of Compliance

The points of compliance, based on the expected exposure routes, are those points where cleanup levels established for the Site shall be achieved.

The points of compliance for Site media were established as follows:

- **Soil**: Based on WAC 173-340-740, the point of compliance for soil is as follows:
    - Throughout the site for protection of groundwater.
    - From the ground surface to the depth of shallow groundwater for possible vapor intrusion.
    - From the ground surface to a depth of 15 feet below grade for protection of humans based on direct contact.
- **Groundwater**: In accordance with WAC 173-340-720(8) throughout the site from the upper most saturated zone to the lowest depth potentially affected by site contaminants. [Note: This is regarded as a conservative approach, since no potable water supply wells were identified within a 0.25 mile radius of the site, based on a search of the Ecology Well Log database.]
- **Air**: In accordance with WAC 174-340-750 (6), in ambient air throughout the site.

Section 7: Estimated Volumes of Impacted Media above Proposed Cleanup Levels

This section presents an estimate of the area and volume of Site media (soil and groundwater) requiring remedial action. For purposes of the alternative evaluation, it is assumed that remediation of the primary COCs (i.e., GRO and benzene) in soil and groundwater will also address other COCs that are present at concentrations above CULs (see analytical data summary tables).

7.1 Soil

The current distribution of Site soil exceeding MTCA Method A CULs (for unrestricted land use) for GRO and benzene is shown on Figure 6. The area of GRO and benzene-containing soil is estimated to be approximately 0.1 acre (4,000 square feet).

The vertical distribution of GRO and benzene-impacted soil is presented on Interpretive Geologic Cross Section A-A’ and B-B’ (Figures 8 and 9). In general, GRO and benzene-containing soil is encountered from approximately 7 to 12 feet bgs but extends down to approximately 18 feet bgs at some locations, particularly on the western portion of the Site.

Laboratory analytical results and field screening information (i.e., visually stained soils, odor, and sheen) were used to estimate the depth intervals and volumes of assumed un-impacted overburden and petroleum hydrocarbon-impacted soil. The estimated volume of GRO and benzene-containing soil is approximately 2,200 cy.

7.2 Groundwater

The approximate limits of GRO and benzene-containing groundwater are shown on Figures 12 and 13, respectively, based on the results of groundwater samples collected in 2016 from groundwater monitoring wells. In general, the distribution of petroleum hydrocarbon compounds in groundwater is consistent with the extent of petroleum hydrocarbon-impacted soil at the Site. Similarly to the petroleum hydrocarbon-impacted soil, the lateral extent of benzene is greater than GRO in groundwater. Assuming an area of 8,000 square feet, average groundwater thickness of 6 feet, and total porosity of 25 percent (consistent with fine-grained soils), the volume of petroleum hydrocarbon-impacted groundwater is estimated to be approximately 90,000 gallons.

Section 8: Technology Screening and Alternative Development

This section presents the rationale for identifying remedial alternatives to address soil and groundwater containing COCs at concentrations exceeding Site CULs. Section 8.1 presents an initial evaluation (i.e., screening) to identify potentially applicable remedial methods (i.e., process options). In Section 8.2, remedial methods passing the initial screening process are combined to create potentially feasible remedial alternatives. The remedial alternatives are described in detail in the remainder of the section.

8.1 Identification and Evaluation of Potential Remedial Methods

General response actions, remedial technologies, and process options that may be appropriate for addressing Site conditions and COCs were identified. General response actions are broad categories of remedial methods that can address the cleanup of a specific matrix (i.e., soil or groundwater). Remedial technologies are various techniques within the general response actions. Process options are specific processes within each remedial technology category. The identification and evaluation of general response actions, remedial technologies, and process options for soil and groundwater are presented in Tables 8 and 9, respectively. Bold text in Tables 8 and 9 indicates the process option is included for further consideration in the FS.

Process options were initially screened using three criteria: effectiveness, ability to be implemented, and relative cost, as summarized below:

- Effectiveness involves consideration of a process option's ability to address the anticipated volume of soil and groundwater, meet cleanup standards, and protect human health and the environmental during construction and implementation.

- Ability to be implemented includes technical and administrative considerations. This criterion focuses on the ability to technically address COCs in soil and groundwater at concentrations detected during the RI. It also evaluates the permits necessary for onsite and offsite activities and discharges, and the availability of offsite facilities, services, and materials.

- Cost is based on engineering judgments rather than detailed estimates. Process options that are judged to be similar in effectiveness and ability to be implemented, yet costing several times more than other process options in the same technology category, were eliminated from further consideration.

Process options that are not appropriate for Site conditions, planned future Site uses, or COCs contained in soil and groundwater at concentrations detected during the RI were eliminated from further consideration. In addition, process options that are innovative but unproven were also eliminated. If more than one process option in a remedial technology group was identified as potentially appropriate for the Site, further screening was performed, and one process option was selected to represent that technology group.

Based on the initial evaluation, the general response actions and process options with the greatest potential for success in addressing petroleum hydrocarbon-impacted soil and groundwater at the Site include:

- Removal. Excavation and offsite disposal of accessible soils.
- *In Situ* Treatment. Treatment technologies include physical or chemical treatment through air sparging, SVE (including bioventing) and enhanced bioremediation, or chemical oxidation.
- Passive Treatment. Passive treatment includes natural source zone depletion and monitored natural attenuation.

Performance and/or confirmation monitoring are required components of all response actions. Performance monitoring includes sampling performed during removal or treatment to assess progress and/or achievement of cleanup levels. Groundwater confirmation monitoring is required to assess long-term effectiveness and compliance with cleanup levels.

MTCA requires that the process options used minimize the amount of untreated COCs remaining at the Site and that preference be given to a permanent solution and hierarchy of preferred remedial methods. In general, technologies that reuse, recycle, destroy, or detoxify hazardous substances will result in permanent solutions.

Table 10 summarizes the results of the process option evaluation, as completed in Tables 8 (soil) and 9 (groundwater). As indicated in Table 10, the selected process options passing the initial evaluation include a range of technologies that reuse, recycle, destroy, or detoxify affected Site media, resulting in a potential permanent solution.

8.2 Development of Alternatives

This section identifies alternatives that could be appropriate for addressing petroleum hydrocarbon-impacted soil and groundwater at the Site. These alternatives are identified using the requirements and expectations described in MTCA (WAC 173-340-360), which include:

- Meeting threshold requirements for remedial alternatives (refer to Section 7.1)
- Using permanent solutions to the maximum extent practicable
- Providing for a reasonable restoration timeframe.

Ecology has the following expectations for cleanup action alternatives (WAC 173-340-370):

- Use treatment technologies whenever practicable.
- Minimize the need for long-term management of contaminated materials by destroying, detoxifying, or removing hazardous substances that are above cleanup levels.
- Recognize the need to use engineering controls, such as containment for sites with large volumes of relatively low levels of hazardous substances.

- Implement measures to prevent precipitation and runoff from contacting affected soils and waste materials.
- Consolidate hazardous substances to the maximum extent practicable if the hazardous substances remain onsite.
- Prevent/minimize releases to surface water via runoff and groundwater discharges exceeding cleanup levels.
- Consider the use of natural attenuation of hazardous substances, which may be appropriate under some circumstances.
- Do not undertake cleanup actions that will result in a greater overall threat to human health and the environment than will other alternatives.

MTCA recognizes that treatment may not be practicable for all sites. Treatment is required, wherever practicable, for sites containing liquid wastes, areas containing high concentrations of hazardous substances, highly mobile materials, or discrete areas of hazardous substances that lend themselves to treatment. MTCA also recognizes that engineering controls (such as containment, caps, and covers) are appropriate for sites or portions of sites that contain large volumes of materials with relatively low levels of hazardous substances where treatment is impracticable [WAC 173-340-370(3)].

Based on the regulatory considerations and site-specific conditions, the following alternatives were developed for this Site:

- Alternative 1: Excavation of petroleum hydrocarbon-impacted soil and disposal at a permitted offsite facility.
- Alternative 2: SVE to mitigate the effects of vapor intrusion into the Site buildings.
- Alternative 3: Air sparging combined with soil vapor extraction.
- Alternative 4: *In situ* chemical oxidation (ISCO) of hydrocarbon-impacted soil and groundwater.
- Alternative 5: *In situ* bioremediation of hydrocarbon-impacted soil and groundwater.

8.3 Alternative 1 - Excavation and Offsite Disposal

This alternative involves excavation and disposing of affected soils offsite, performing *in situ* bioremediation through strategic placement of biologically amended backfill, and conducting groundwater compliance monitoring. Based on existing Site data, soil and groundwater with concentrations that exceed the cleanup level are present offsite to the west in 24th Avenue East and north beneath East McGraw Street. Excavation outside of the property boundary on 24th Avenue East and East McGraw Street is not feasible for various reasons including: the presence of major utilities; the presence of components of the King County Metro Transit line (including overhead electrical lines and a bus stop); and high traffic volumes. Alternative 1 consists of the following elements (see Figure 15):

- Site preparation activities would include, but are not limited to, Cleanup Action Plan (CAP) preparation and design, obtaining permits [National Pollutant Discharge Elimination System (NPDES) permit, Seattle Department of Planning and Development temporary use permit, etc.], and waste profiling and designation. The King County Metro bus station may need to be temporarily relocated during construction.

- Access to the market and cleaners would need to be constructed to keep the businesses open during construction.

- Utilities serving the Site, including water, sewer and electric would need to be temporarily rerouted.

- The excavation area includes the onsite area where soil concentrations exceed MTCA Method A soil CULs for GRO and benzene. Excavation depths are estimated to be between 2 and 18 feet bgs. The total volume of excavated material is estimated at 2,200 cy. Affected soils would be removed to the maximum extent practicable. Final configuration of the excavation area would be based on physical constraints and performance monitoring (soil sampling) results using a fixed offsite analytical laboratory. Affected soil would be transported and disposed of at a licensed Subtitle D landfill facility as a non-hazardous waste. Soil with concentrations of GRO and benzene that are less than the MTCA Method A CULs are anticipated in the upper portions of the excavation. However, due to Site space constraints, this soil will also be transported offsite for disposal.

- Dewatering would be performed during excavation activities, with the water treated via a temporary onsite groundwater treatment system consisting of particle separation (gravity settling in weir tanks and bag filtration) and GAC. The treated water would be discharged to directly to the City of Seattle combined sewer system under a NPDES permit. Sampling and chemical analyses would be performed to confirm that discharge requirements are met.

- After receipt of favorable performance monitoring results, the excavation would be backfilled and compacted to existing grade with imported clean fill.

- A portion of the imported backfill would be amended with an oxygen-releasing compound (or equivalent) to promote biological degradation of residual petroleum hydrocarbons in soil and groundwater. The amended backfill would be strategically placed alongside slopes and the floor of excavation in areas where affected soils may be inaccessible to further excavation. The volume of imported fill amended with the biological amendment is estimated to be 700 cy.

- Site restoration would include reconnection of utilities, repaving, and other restoration activities to return the Site to its original configuration.

- Five new groundwater monitoring wells would be installed to replace monitoring and multi-purpose wells removed during excavation activities. Quarterly groundwater confirmation monitoring would be conducted for at least a year to assess the effectiveness of remediation activities (including biological degradation of residual petroleum hydrocarbons) and to evaluate groundwater quality with respect to groundwater cleanup standards. Groundwater samples would be analyzed for GRO, BTEX, and natural attenuation parameters.

- Time required to achieve cleanup standards onsite would be relatively short (likely less than 1 year); however, because excavation could not be performed in the off-property impacted areas full cleanup could not be performed in a reasonable time period.

8.4 Alternative 2 – Soil Vapor Extraction

This alternative involves construction of an SVE system, and performance/confirmation monitoring. A SVE system (or high vacuum extraction system) would be installed to remove volatile contaminant mass from the unsaturated zone and promote *in situ* aerobic biodegradation by drawing atmospheric oxygen into the subsurface. Contaminant mass removal would be conducted via long-term operation of the SVE system. The SVE system would also serve as a mitigation system for potential VI into buildings by creating a low pressure zone away from structures. The existing asphalt surface cover and slab-on-grade constructed buildings will prevent direct contact, infiltration, and enhance vapor extraction. Alternative 2 includes the following elements (see Figure 16):

- Site preparation activities would include, but would not be limited to, CAP preparation and design, obtaining permits (e.g., City of Seattle construction permit, Puget Sound Clean Air Agency air discharge permit, etc.), and waste profiling and designation.

- SVE system installation would include vapor extraction from approximately five wells, with treatment consisting of GAC or equivalent. System sampling and chemical analyses would be performed to estimate mass removal, assess treatment performance (including verifying vapor mitigation), and monitor for compliance with air discharge requirements.

- The SVE system components would be housed in an onsite constructed building located on the southeastern corner of the property. Effluent vapor treatment using GAC would likely be required to treat vapors prior discharge to the atmosphere. The need for treatment of vapors before discharge would be determined during a permitting process with the Puget Sound Clean Air Agency. Vapor monitoring of the effluent would be required periodically (monthly to quarterly) to ensure adherence with the discharge permit.

- The majority of the property is either paved or covered by the buildings, which are slab-on-grade construction. The impermeable cap reduces surface water infiltration and will assist with vapor extraction by reducing the potential for SVE system short circuiting near vapor extraction wells. The asphalt pavement cover also prevents direct contact with affected soils.

- Periodic groundwater confirmation monitoring would be conducted until cleanup standards are met; to assess treatment effectiveness, and evaluate groundwater quality. Groundwater samples would be analyzed for GRO, BTEX, and natural attenuation parameters. If SVE is used to mitigate vapor intrusion, sub-slab monitoring would be needed to ensure a negative pressure is maintained below the onsite structures. Periodic change-out of the vapor treatment GAC would be required as needed (likely every 6 to 12 months depending on design). Operation or maintenance of the system would be required throughout the duration of operation.

- A deed restriction would be required to prevent human exposure during potential future onsite excavation or subgrade utility work.
- Because the source mass is not removed, the restoration time period is expected to be several decades.

8.5 Alternative 3 - Soil Vapor Extraction with Air Sparging

This alternative involves construction of an SVE system and an AS system, and performance/ confirmation monitoring. An SVE system (or high vacuum extraction system) would be installed to remove contaminant mass from the unsaturated zone, promote *in situ* aerobic biodegradation by drawing atmospheric oxygen into the unsaturated zone and to serve as a mitigation system for potential VI into Site buildings. In addition, AS wells would be installed to volatilize GRO and related volatile organic compounds (VOCs) (i.e., benzene) in the saturated zone and promote biodegradation in the saturated and unsaturated zones by increasing oxygen concentrations. Contaminant mass removal/ reduction would be conducted via long-term operation of the air sparging (AS)/SVE systems. The existing asphalt surface cover and slab-on-grade constructed buildings will prevent direct contact, infiltration, and enhance vapor extraction. Alternative 3 elements are similar to Alternative 2 and include the following (see Figure 16):

- Site preparation activities would include, but would not be limited to, CAP preparation and design, obtaining permits (e.g., City of Seattle construction permit, air discharge permit, etc.), and waste profiling and designation. A pilot test would be conducted to collect Site-specific information for incorporation in system design.
- The SVE system would include vapor extraction from approximately five wells (assuming a radius of influence of 30 feet each) with treatment consisting of GAC or functional equivalent.
- An AS system would include air sparging from up to 12 wells (assuming a radius of influence of 15 feet).
- System sampling and chemical analyses would be performed to estimate mass removal, assess treatment performance (including verifying vapor mitigation), and monitor for compliance with air discharge requirements.
- The AS/SVE wells would be connected to the system components located in an onsite enclosure which would be constructed on the southeastern corner of the property.
- The majority of the property is either paved or covered by the buildings, which are slab-on-grade construction. The impermeable cap reduces surface water infiltration and will assist with vapor extraction by reducing the potential for short circuiting. The asphalt pavement cover also prevents direct contact with affected soils.
- Periodic groundwater confirmation monitoring would be conducted until cleanup standards are met; to assess treatment effectiveness, and evaluate groundwater quality.

Groundwater samples would be analyzed for GRO, BTEX, and natural attenuation parameters. If SVE is used to mitigate vapor intrusion, sub-slab monitoring would be needed to ensure a negative pressure is maintained below the onsite structures. Periodic change-out of the vapor treatment GAC would be required as needed (likely every 6 to 12 months depending on design). Operation or maintenance of the system would be required throughout the duration of operation.

- A deed restriction would be required to prevent human exposure during potential future onsite excavation or subgrade utility work.

- The restoration time period is expected to be approximately 10 to 15 years with this alternative.

8.6 Alternative 4 – *In Situ* Chemical Oxidation

The ISCO alternative involves injection and recirculation of reduction/oxidation chemicals in the saturated zone to chemically convert GRO and VOCs to innocuous byproducts through chemical reactions. For treatment of GRO and related compounds, the most commonly used ISCO chemicals are hydrogen peroxide/Fenton's Reagent, and ozone. The chemical injection and recirculation process would be accomplished using existing multi-purpose wells and strategically placed new vertical and horizontal remediation wells. Alternative 4 includes the following elements (see Figure 17):

- Site preparation activities would include, but would not be limited to, CAP preparation and design, obtaining permits (e.g., City of Seattle construction permit, Ecology underground injection control permit, NPDES permit, etc.), and waste profiling and designation. A pilot test would be conducted to collect Site-specific information for incorporation into system design and evaluation of the ISCO dose required to degrade GRO and BTEX in the sorbed and dissolved-phase.

- The ISCO system would include use of the existing multi-purpose wells (MW-20, MW-21, and RW-1 through RW-7), five additional multi-purpose wells, and two horizontal wells. The need for additional multi-purpose wells or ISCO injection points would be evaluated during the pilot test. A recirculation cell would likely be established with the new and existing well network to ensure distribution of chemical additives and contact with contaminated site media. The recirculation system would require installation of a permanent treatment system onsite.

- System sampling and chemical analyses would be performed to estimate mass reduction and assess treatment performance.

- The ISCO injection/recirculation wells would be connected to the system components located in an onsite enclosure which would be constructed on the southeastern corner of the property.

- Periodic groundwater confirmation monitoring would be conducted until cleanup standards are met; to assess treatment effectiveness, and evaluate groundwater quality. Groundwater samples would be analyzed for GRO, BTEX, and natural attenuation parameters. Operation or maintenance of the system would be required throughout the duration of operation.

- A deed restriction would be required to prevent human exposure during potential future onsite excavation or subgrade utility work.
- The restoration time period is expected to be approximately 3 to 5 years with this alternative.

8.7 Alternative 5 – *In Situ* Bioremediation

This alternative involves an initial subsurface injection of a low-concentration surfactant followed by injection and recirculation of a solution of extracted groundwater and amendments (i.e., a cultured bacteria consortium and macronutrients) into the affected area to enhance biodegradation of GRO and BTEX in the saturated zone. Following desorption from the soil matrix, the petroleum hydrocarbons mobilized by the surfactant solution are drawn toward the recirculation system extraction wells for hydraulic capture and subsequent mixing with amendments to enhance biodegradation. Bioremediation involves bioaugmentation (i.e., addition of specific microorganisms) and/or stimulation of petroleum-degrading bacteria to mineralize the petroleum hydrocarbon compounds (i.e., convert them to carbon dioxide and water). In addition, this process typically requires adding now-depleted macronutrients (nitrogen as ammonia and phosphorous as phosphate), terminal electron acceptors (TEAs) for microbial respiration (i.e., DO, nitrate, etc.), and, if warranted, bacteria that are selectively cultured for their petroleum-degrading capabilities (e.g., facultative petroleum hydrocarbon-degrading bacteria). The bioremediation injection and recirculation process would be accomplished using existing multi-purpose wells and strategically placed new vertical and horizontal remediation wells. Alternative 5 includes the following elements (see Figure 17):

- Site preparation activities would include, but would not be limited to, CAP preparation and design based on the pilot study performed, obtaining permits (e.g., City of Seattle construction permit, Ecology underground injection control permit, NPDES permit, etc.), and waste profiling and designation.
- The bioremediation system would include use of the existing multi-purpose wells (MW-20, MW-21, and RW-1 through RW-7), five additional multi-purpose wells and three horizontal wells. A recirculation cell would likely be established with the new and existing well network to ensure distribution of chemical additives and contact with contaminated site media. The recirculation system would require installation of a permanent treatment system onsite.
- System sampling and chemical analyses would be performed to estimate mass reduction and assess treatment performance.
- The bioremediation injection/recirculation wells would be connected to the system components located in an onsite enclosure which would be constructed on the southeastern corner of the property.
- Periodic groundwater confirmation monitoring would be conducted until cleanup standards are met; to assess treatment effectiveness, and evaluate groundwater quality.

Groundwater samples would be analyzed for GRO, BTEX, and natural attenuation parameters. Operation or maintenance of the system would be required throughout the duration of operation.

- A deed restriction would be required to prevent human exposure during potential future onsite excavation or subgrade utility work.
- The restoration time period is expected to be approximately 3 to 5 years with this alternative.

Natural attenuation and institutional controls, while not active remediation, will be considered as a possible component part of each of the five remedial alternatives identified above to address residual concentrations of hydrocarbons that may exceed cleanup standards.

Section 9: Evaluation of Remedial Alternatives

The section presents a preliminary analysis of the remedial alternatives against the MTCA threshold criteria in Section 9.1, followed by detailed analyses in Section 9.2.

9.1 MTCA Threshold Criteria

A remedial action must meet certain threshold criteria to be considered under the MTCA [WAC 173-340-360 (2)(a)]. An alternative cannot be selected if it cannot meet the following threshold requirements:

- Protect human health and the environment
- Comply with cleanup standards
- Comply with applicable state and federal laws
- Provide for compliance monitoring.

A cleanup is presumed to be protective of human health and the environment at the Site if it achieves the cleanup levels. Compliance with cleanup standards involves achieving cleanup levels at an appropriate point of compliance and complying with applicable federal and state laws.

Compliance monitoring assesses the protection of human health and the environment during construction and the O&M period of a cleanup action. Compliance monitoring confirms that the remedial action has met cleanup standards and verifies its long-term effectiveness. Compliance with the threshold requirements does not imply that untreated hazardous substances cannot remain onsite. MTCA recognizes that non-treatment alternatives can comply with cleanup standards, provided compliance monitoring is included to ensure system integrity.

Table 11 summarizes the evaluation of the alternatives in relation to MTCA’s threshold criteria. Based on this evaluation, all alternatives meet the threshold criteria. All alternatives can achieve cleanup levels; have an acceptable point of compliance; and provide for compliance monitoring.

9.2 Detailed Analyses of Alternatives

This section evaluates each remedial alternative against seven criteria set in WAC 173-340-360(3)(f) in order to establish whether a cleanup is permanent to the maximum extent practical. The seven criteria are:

1. Protectiveness
2. Permanence
3. Cost

4. Effectiveness over the long term
5. Management of short-term risks
6. Technical and administrative implementability
7. Consideration of public concerns.

These criteria, as well as a discussion of providing a reasonable restoration timeframe and compliance with federal and state Applicable or Relevant and Appropriate Requirements (ARARs), are evaluated below.

9.2.1 Protectiveness

This criterion includes the degree to which existing risks are reduced, the time required to reduce risk at the Site and attain cleanup standards, onsite and offsite risks resulting from implementing the alternative, and improvement of the overall environmental quality.

The overall protectiveness evaluation is included in Table 12.

9.2.2 Permanence

A permanent cleanup achieves cleanup standards without requiring further action such as long-term monitoring or institutional controls. The remedial action alternatives were compared based on their adequacy in destroying hazardous substances, reducing or eliminating hazardous substance releases and sources, the irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated.

The overall permanence evaluation is included in Table 13.

9.2.3 Cost

The costs to implement the alternatives, including the cost of construction and the net present value of long-term costs, were estimated to determine practicability (see Section 10.1.3). Long-term costs include O&M costs, monitoring costs, equipment replacement costs, and the costs of maintaining institutional controls.

9.2.4 Long-Term Effectiveness

Long-term effectiveness is defined as the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time hazardous substances are expected to remain onsite at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes.

The results of the evaluation of these sub-criteria are presented in Table 14.

9.2.5 Short-Term Risks

The short-term risks to human health, public, and the environment associated with each alternative during construction and implementation, and the effectiveness of measures that would need to be taken to manage such risks, were considered.

This evaluation is included in Table 15.

9.2.6 Ability to Implement

This criterion evaluates an alternative's ability to be implemented, including technical feasibility; availability of necessary offsite facilities, services and materials; administrative and regulatory requirements; scheduling; access constraints; and integration with existing facility operations and other current or potential remedial actions.

The implementability evaluation is included in Table 16.

9.2.7 Consideration of Public Concerns

Ecology would address public concerns, if any, during selection of the remedial action. A Public Notice and Participation period is required (WAC 173-340-600) before implementation of the action.

9.2.8 Restoration Timeframe

The time required to attain cleanup levels for each remedial alternative was estimated and summarized below.

9.2.8.1 Alternative 1 – Excavation and Offsite Disposal

For Alternative 1, it is estimated that soil cleanup levels onsite will be attained immediately. However, offsite soil impacts are not addressed with Alternative 1; therefore, it is inappropriate to estimate a timeframe for attaining Site soil cleanup levels offsite. Although Alternative 1 will remove a significant volume of hydrocarbon mass in the unsaturated and saturated zones, it will not fully address groundwater contamination either onsite or offsite.

9.2.8.2 Alternative 2 – Soil Vapor Extraction

For Alternative 2, it is estimated that soil cleanup levels will be attained within approximately 10 to 20 years, possibly longer, because source mass is not removed. Soil vapor extraction alone will not fully address impacted groundwater. The estimate is based on the following assumptions:

- Operation of the SVE system will reduce the potential for leaching to groundwater and mitigate VI into Site buildings. The asphalt pavement cover and deed restriction will prevent direct contact with affected media.

9.2.8.3 Alternative 3 – Soil Vapor Extraction with Air Sparging

For Alternative 3, it is estimated that soil and groundwater cleanup levels will be attained within approximately 10 to 15 years. The estimate is based on the following assumptions:

- Natural attenuation data suggest biological degradation is occurring at the Site (i.e., low ORP observed in monitoring wells within the impacted area suggests oxygen consumption and potential depletion of electron acceptors). Biological degradation would be accelerated through addition of oxygen through the AS system.

9.2.8.4 Alternative 4 – *In Situ* Chemical Oxidation

For Alternative 4, it is estimated that soil and groundwater cleanup levels will be attained within approximately 3 to 5 years. The estimate is based on the following assumptions:

- Site-specific soil permeability will allow adequate contact for destruction of contaminants.
- Access for installing infrastructure (vertical wells, horizontal wells, and associated piping) will not hinder implementation.
- Dissolved GRO/BTEX plume will not be appreciably displaced by the application of ISCO.

9.2.8.5 Alternative 5 – *In Situ* Bioremediation

For Alternative 5, it is estimated that soil and groundwater cleanup levels will be attained within approximately 3 to 5 years. The estimate is based on the following assumptions:

- Natural attenuation data suggest biological degradation is occurring at the Site (i.e., low ORP observed in monitoring wells within the impacted area suggests oxygen consumption and potential depletion of electron acceptors). Biological degradation would be accelerated through addition of a cultured bacteria consortium and macronutrients.
- Access for installing infrastructure (vertical wells, horizontal wells, and associated piping) will not hinder implementation.
- Dissolved GRO/BTEX plume will not be appreciably displaced by the application of ISCO.

9.2.9 Compliance with Applicable or Relevant and Appropriate Requirements

Action-specific ARARs regulate technologies or activities associated with the implementation of the remedial action. Action-specific ARARs are typically technology- or activity-based requirements or limitations. Table 17 summarizes the potential action-specific ARARs.

Section 10: Comparative Analyses and Disproportionate Cost Analysis

This section presents a comparative analysis using the MTCA criteria presented in the detailed analyses of alternatives presented in Section 9.0. A detailed analysis of alternatives for each MTCA criterion/sub-criterion is presented in Tables 12 through 16. In each table, the alternatives are ranked on a scale of 1 to 10 based on how completely each alternative satisfies the MTCA criteria (1 = does not meet criterion; 10 = meets criterion completely). A comparative analysis for each alternative is described below followed by a disproportionate cost analysis (DCA) using the comparative analysis multiplied by weighting factors. The comparative analyses scoring and DCA is summarized in Table 18.

10.1 Comparative Analyses

10.1.1 Protectiveness

For this criterion, the alternatives were ranked based on the degree that risk is reduced and/or managed and the time required to attain cleanup levels.

Alternative 5 was ranked as the most protective, as risk would be reduced significantly through operation of the bioremediation recirculation system. It is estimated that groundwater cleanup levels would be attained within approximately 3 to 5 years for Alternative 5.

The estimated timeframe for attaining cleanup groundwater cleanup levels for Alternative 4 is also approximately 3 to 5 years; however, there is a potential risk of spillage of oxidation chemicals. The estimated timeframe for attaining groundwater cleanup levels for Alternative 3 is approximately 10 to 15 years and several decades for Alternative 2 if other measures are not implemented to address saturated zone soils. For Alternatives 2 and 3, it is expected that effluent vapors will be treated with activated carbon prior to discharge to ambient air, mitigating risks to the surrounding community. Alternative 2 addresses contaminant mass in the unsaturated zone and mitigates the potential for vapor intrusion into on-property structures and off-property residences. By itself, the estimated restoration timeframe for Alternative 2 is expected to be several decades. However, combined with Alternative 5 (the proposed Site remedy which remediates saturated zone soil and groundwater), the restoration timeframe for mitigating the VI pathway is also expected to be 3 to 5 years.

Alternative 1 was ranked the least protective because impacted soil beneath the on-property building and off-property impacted areas is not addressed. Soil cleanup levels could be attained immediately on-property and the time to attain soil cleanup levels in inaccessible soil off-property and beneath the building cannot be reasonably estimated. Although significant contaminant mass will be removed through excavation of on-property impacted soil, residual hydrocarbon mass in soil beneath the building and off-property will be an ongoing contaminant source. In addition, there is a potential risk of exposure, via direct contact to construction workers and via the VI pathway from contaminant mass left in place. Lastly, there is a risk of recontamination of on-property areas from off-property areas that are not included in the cleanup action.

10.1.2 Permanence

Rankings of the alternatives for this criterion were based on the ability to permanently reduce toxicity, mobility, and volume of affected media. All alternatives were considered permanent, to some extent, based on the degree of contaminant mass removal. Alternative 5 was considered the most permanent alternative, as contaminant breakdown is complete, irreversible, and biodegradation products are inert. Alternative 4 is also relatively permanent although there is some potential for post-oxidant application rebound of dissolved petroleum hydrocarbon concentrations in groundwater.

Alternatives 2 and 3 remove contaminant mass through long-term operation of these systems. For each of these alternatives, rebounding may occur, which could extend the restoration timeframe. Alternatives 1 and 2 address contaminant mass in the unsaturated zone but not in the saturated zone. Furthermore, Alternative 1 only addresses impacted soil in accessible areas on-property as it would be impractical to excavate off-property locations due to the presence of critical utilities and high traffic volume on adjacent streets.

10.1.3 Cost

Cost estimates were developed for each alternative based on capital and long-term costs. Long-term costs were estimated using a discount rate of 2.5 percent. Estimated costs are summarized as follows:

- Alternative 1 ($2,498,000) – Table 19
- Alternative 2 ($1,136,000) – Table 20
- Alternative 3 ($1,232,000) – Table 21
- Alternative 4 ($1,635,000) – Table 22
- Alternative 5 ($1,657,000) – Table 23.

***Note**: The cost estimates for each evaluated remedial action alternative are estimated with an accuracy of -30/+50 percent of actual cost based on available information. The estimated costs, including capital and long-term costs, were prepared for the purpose of relative comparison among alternatives. These costs are not definitive cost estimates based on the final remedial designs and should not be used for budgetary purposes.*

10.1.4 Long-Term Effectiveness

The alternatives were ranked for this criterion based on the degree of certainty that the alternative would be successful and its reliability during the period of time that affected media above cleanup levels remain onsite. Alternative 5 ranked the highest for long-term effectiveness as Site data suggest that natural attenuation is already occurring and the addition of bacterial consortium and macronutrients to the smear zone and saturated zone will enhance the existing biological activity.

Alternatives 2, 3, and 4 had equivalent rankings. For Alternative 4, groundwater cleanup levels are estimated to be attained within 3 to 5 years. However, there is some potential post-oxidant application rebound of dissolved petroleum hydrocarbon concentrations in groundwater. For Alternatives 2 and 3, contaminant mass removal would be performed over the long-term provided reliable operation of the AS/SVE systems; vapor mitigation would be maintained through continual operation of SVE system. Post-system operation reduction in contaminant concentrations would be permanent.

Alternative 1 only addresses impacted soil onsite as it would be impractical to excavate offsite locations due to the presence of critical utilities and high traffic volume on adjacent streets. Therefore, this alternative ranked lowest because of contaminant mass left in place.

10.1.5 Short-Term Risks

The alternatives were ranked for this criterion based on potential impacts to workers, the community, and environment during remediation activities.

Alternative 1 carries the highest short-term risk based on the highest potential for remediation workers to contact affected media (i.e., sheet pile shoring wall installation, and excavation/dewatering activities), potential for vehicular spillage during transportation of affected soil to the offsite disposal site.

Alternatives 2 through 5 carry moderate short-term risk to workers by direct contact with impacted soil and vapors during system construction and O&M activities. Alternatives 4 and 5 carry the lowest short-term risk because the shortest estimated timeframe for attaining cleanup levels reduces the amount of time spent onsite for operation and maintenance activities.

10.1.6 Ability to Implement

The alternatives were ranked based on the ease or difficulty of implementing the remedial action. Alternative 1 would be the most difficult to implement and would cause the most disturbances to Site infrastructure and businesses. Alternative 1 includes significant permitting requirements and challenges associated with rerouting Site utilities, installation of the sheet pile shoring, and management of excavated and imported soils while maintaining Site business operations.

Alternative 3 was considered less difficult to implement than Alternative 1 because of the reduced amount of disturbance to the Site businesses during AS/SVE well installation and system construction. Alternatives 2, 4, and 5 were considered the least difficult to implement. In addition, there are fewer permitting requirements for Alternatives 2 through 5 than for Alternative 1.

10.1.7 Consideration of Public Concerns

The alternatives were ranked based on whether the community has concerns regarding the alternative. Alternative 1 has the greatest potential to cause concerns to the public because of the considerable truck traffic and disruption to public transportation associated with excavation of impacted soil and importing of backfill material. In addition, exposure to an open excavation would cause public concern in this densely populated area. As Alternatives 2 through 5 involve on-property construction activities with minimal transitory vehicle traffic, public concern is considered to be minimal.

10.2 Disproportionate Cost Analyses

MTCA specifies that when selecting a remedial action, preference shall be given to actions that are “permanent to the maximum extent practicable.” To determine whether a remedial action uses permanent solutions to the maximum extent possible, a disproportionate cost analysis (DCA) shall be used (WAC 173-340-360[3][b]). Costs are disproportionate to benefits if the incremental cost of the alternative over that of a lower cost alternative exceed the incremental degree of benefits achieved by the alternative over that of the lower cost alternative.

The most practical permanent alternative evaluated in the FS shall be the baseline cleanup alternative against which other alternatives are compared. The permanency of alternatives is largely qualitative and is based on best professional judgment. To document the qualitative analysis, weighting factors are assigned for each of the six non-cost benefits criteria to represent the importance of each benefit criterion and are expressed as a percent. Weighting factors for each non-cost criteria are summarized below.

- **Protectiveness.** A weighting factor of **25%** is assigned based on its overarching importance relative to the ultimate goal of environmental cleanup and protection of human health and the environment.

- **Permanence.** A weighting factor of **20%** is assigned in association with the need or lack thereof for further action in the future.

- **Long Term Effectiveness.** A weighting factor of **30%** is assigned in association with a measure of certainty related to the robustness of the action as well as confidence in the technology used for the protection of human health and the environment.

- **Short Term Risk.** A weighting factor of **15%** is assigned because the majority of short term risks can be managed through the use of best practices during process design and construction.

- **Implementability.** A weighting factor of **5%** is assigned because, although an important consideration, implementability is less associated with environmental concerns than with the above criteria.

- **Consideration of Public Concerns.** A weighting factor of **5%** is assigned because the majority of public concern issues are incorporated in the protectiveness, permanence, and long term effectiveness criteria.

Based on the DCA, Alternatives 2 and 5 provide the highest cost benefit ratio. The results of the DCA are summarized in Table 18. Table 18 also includes cost relative to the most permanent alternative. Figure 18 is a graphical representation of the benefit/cost ratio. Figure 19 presents the benefit/cost ratio and the benefit/cost ratio relative to the most permanent alternative. When combined, Alternatives 2 and 5 provide the highest degree of protection and the estimated fastest restoration timeframe with the lowest concerns for effectiveness. Cost efficiencies are expected for implementation of Alternatives 2 and 5 together due to decreased operation time for Alternative 2 and general construction efficiency when the two alternatives are combined. These efficiencies will increase the overall cost-benefit ratio for the proposed remedy.

Section 11: Recommended Alternative

The preferred remedial action for the Site includes a combination Alternative 5 (*In Situ* Bioremediation) to address impacted site saturated soil and groundwater and Alternative 2 (Soil Vapor Extraction) to support remediation of the vadose zone and to mitigate the VI pathway into on-property buildings. Of the alternatives evaluated, Alternative 5 provides the shortest estimated timeframe for completion and the highest potential to permanently attain soil and groundwater cleanup levels. However, Alternative 5 would not fully address the unsaturated zone and would not mitigate the VI pathway. Consequently, the combination Alternative 5 and Alternative 2 is the most projective of human health and the environment and best addresses the remedial action objectives.

Following installation of necessary wells and site equipment, Alternative 5 involves an injections of a low-concentration surfactant solution followed by injection and recirculation of a combination of extracted groundwater with amendments (i.e., a cultured bacteria consortium and macronutrients) into the target cleanup area to degrade GRO and BTEX in the saturated zone (including smear zone soils). Following desorption from the soil matrix, the petroleum hydrocarbon is mobilized by the surfactant solution in groundwater and drawn toward the recirculation system extraction wells where groundwater is treated with GAC, mixed with amendments and reinjected to enhance biodegradation. With full implementation, Alternative 5 is expected to be effective in reducing petroleum hydrocarbon concentrations in the target treatment zone saturated soil and groundwater to below cleanup levels. Groundwater monitoring will be performed to assess the effectiveness of the bioremediation and to evaluate groundwater quality for compliance.

To enhance the effectiveness of recommended remedial alternative, Alterative 2 is added to address the VI pathway and assist with remediation of vadose zone soils. Alternative 2 would include installation of several SVE wells across the Site connected with subsurface piping and operated until soil vapor concentrations no longer pose a threat to the on-property building occupants. Due to the urban and residential nature of the surrounding area, treatment of effluent vapors from the SVE unit using vapor phase GAC would likely be required following completion of permitting activities.

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Tables

TABLE 1

SOIL SAMPLE ANALYTICAL RESULTS - 1989 MONITORING WELL BORINGS
FORMER CIRCLE K SITE
Seattle, Washington

		Chemical Name	Benzene	Chlorobenzene	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	Toluene	Ethylbenzene	m,p-Xylene	o-Xylene	Total Xylenes	Gasoline-Range Hydrocarbons	Diesel-Range Hydrocarbons
		Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Location ID	Sample Depth (feet bgs)	Date Sampled												
MW-1	8.5	9/11/1989	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	--	<5	<5
MW-2	8.5	9/11/1989	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	--	<5	<5
MW-3	8.5	9/12/1989	<0.025	<0.025	<0.025	<0.025	<0.025	**0.072**	**0.057**	**0.20**	**0.11**	**0.31**	**9**	<5
MW-4	8.5	9/12/1989	<0.50	<0.50	<0.50	<0.50	<0.50	**27**	**27**	**110**	**49**	**159**	**1,200**	<20
MW-5	8.5	9/12/1989	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	--	<5	<5
MW-6	8.0	10/2/1989	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	--	<5	<5
MW-6	10.0	10/2/1989	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	--	<5	<5
MW-7	10.0	10/2/1989	<0.025	<0.025	<0.025	<0.025	<0.025	**0.10**	**0.029**	**0.11**	**0.065**	**0.175**	<5	<5
MW-8	10.0	10/3/1989	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	--	<5	<5
MW-9	10.0	10/3/1989	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	--	<5	<5
MW-10	10.0	10/3/1989	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	--	<5	<5
MW-11	11.0	10/4/1989	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	--	<5	<5
MW-12	10.0	10/4/1989	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.050	<5	<5
MW-13	8.0	12/20/1989	**0.46**	--	--	--	--	**1.1**	**0.22**	--	--	**1.2**	<5	<5
MW-14	13.0	12/20/1989	<0.025	--	--	--	--	<0.025	<0.025	--	--	<0.025	<5	<5
MW-15	8.0	12/21/1989	*<0.036*	--	--	--	--	<0.036	<0.036	--	--	<0.036	<5	<5
MW-15	13.0	12/21/1989	**0.51**	--	--	--	--	**0.84**	**0.090**	--	--	**0.51**	<5	<5
MW-16	8.0	12/21/1989	<0.025	--	--	--	--	0.063	<0.025	--	--	<0.025	<5	<5
MTCA A (unrestricted) (mg/kg)			0.03	--	--	--	--	7	6	9			30/100	2,000
MTCA B (direct contact)			--	1,600	7,200	--	185	--	--	--			--	--

0.46	Detected concentrations above the cleanup level are shaded yellow and bolded.
<0.036	Non-detect values above the cleanup level are shaded gray and italicized.

Notes:

Detected concentrations are shown in bold.

Analytical data taken from Report of Geotechnical Services, Subsurface Contamination Study and Remedial Action Monitoring (GeoEngineer 1990a).

Depths are in feet below ground surface (bgs).

Abbreviations and Symbols

" - -" denotes not measured, not available, or not applicable.

" < " denotes not detected at or above the indicated method reporting limit.

mg/kg = milligrams per kilogram

Cleanup Levels:

Cleanup level values based on Model Toxics Control Act (MTCA) Method A values for unrestricted land use (Method A Un) based on Washington State Administrative Code (WAC) 173-340-740 Table 740-1. Where MTCA Method A values are not available, the lowest of MTCA Method B values (B Cancer or B Non Cancer) from Cleanup Levels and Risk Calculation (CLARC) tables have been used (Accessed January 2017).

Methods:

Samples analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) using EPA Method 8020.

Samples analyzed for purgeable aromatics using EPA Method 8020.

Samples analyzed for fuel hydrocarbons using EPA Method 8015 modified.

TABLE 2

MONITORING AND MULTI-PURPOSE WELL CONSTRUCTION DETAILS
FORMER CIRCLE K SITE
Seattle, Washington

Monitoring Well ID	Date Installed	Well Diameter (inches)	Screened Interval (feet bgs)	Total Depth in 2006 (feet btoc)	Total Depth in 2016 (feet btoc)	Top of Casing Elevation (feet amsl)
MW-1	09/11/89	2	5.5-22.2	abandoned	abandoned	--
MW-2	09/11/89	2	5.5-20.9	20.9	20.90	69.79
MW-3	09/12/89	2	7.5-22.9	abandoned	abandoned	--
MW-4	09/12/89	2	4-18.8	17.9	17.90	63.62
MW-5	09/12/89	2	7-27.4	abandoned	abandoned	--
MW-6	10/02/89	2	5-20.4	20.43	20.33	63.13
MW-7	10/02/89	2	5-20.2	20.49	20.20	62.66
MW-8	10/03/89	2	5-20.3	19.45	19.40	63.59
MW-9	10/03/89	2	5-21.2	20.35	20.23	64.30
MW-10	10/03/89	2	5-20.4	20.47	20.22	62.86
MW-11	10/04/89	2	5-20.0	20.31	20.00	63.59
MW-12	10/04/89	2	5-20.3	abandoned	abandoned	--
MW-13	12/20/89	2	4-19.0	18.81	18.65	65.08
MW-14	12/20/89	2	4-19.3	18.87	15.50	63.30
MW-15	12/21/89	2	4-18.7	16.81	16.75	64.18
MW-16	12/21/89	2	4-19.2	18.94	--	64.00
MW-17	08/01/16	2	4.0-19.0	--	20.0	65.98
MW-18	08/01/16	2	5.0-15.0	--	20.0	66.73
MW-19	09/23/16	2	5.0-20.0	--	20.0	66.36
MW-20	09/23/16	4	5.0-20.0	--	21.0	66.17
MW-21	09/23/16	4	5.0-20.0	--	20.0	65.89
RW-1	02/07/17	4	5.5-21.5	--	21.5	--
RW-2	02/09/17	4	5.0-20.0	--	21.5	--
RW-3	02/09/17	4	5.0-20.0	--	21.5	--
RW-4	02/08/17	4	5.0-20.0	--	21.5	--
RW-5	02/08/17	4	5.0-20.0	--	21.5	--
RW-6	02/10/17	4	5.0-20.0	--	21.5	--
RW-7	02/07/17	4	5.0-20.0	--	21.5	--

Notes:

Top of casing elevations surveyed to City of Seattle Benchmark SNV-2541 located at the northeast quadrant of the intersection of East Boston Street and 24th Avenue.

Abbreviations and Symbols

" - -" denotes not measured, not available, or not applicable.
bgs = below ground surface
btoc = below top of casing
amsl = above mean sea level

SUMMARY 0F 2016 SOIL SAMPLE ANALYTICAL RESULTS
FORMER CIRCLE K SITE
Seattle, Washington

			Chemical Name	Gasoline-Range Organics	Benzene	Toluene	Ethylbenzene	m,p-Xylene	o-Xylene	1,2-Dichloroethane	1,2-Dibromoethane	Methyl tert-Butyl Ether
			Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Boring ID	Top of Sample Depth (feet)	Sample ID	Date Sampled									
KJB-1	7.5	KJB-1-7.5	5/18/2016	<5.9	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	--	--	--
KJB-1	19	KJB-1-19	5/18/2016	<5.1	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	--	--	--
KJB-2	8	KJB-2-8	5/18/2016	<7.0	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	--	--	--
KJB-2	12	KJB-2-12	5/18/2016	<5.6	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	--	--	--
KJB-3	7.5	KJB-3-7.5	5/18/2016	<7.6	< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014	--	--	--
KJB-3	18.5	KJB-3-18.5	5/18/2016	<5.4	< 0.00090	< 0.00090	< 0.00090	< 0.00090	< 0.00090	--	--	--
KJB-4	8.5	KJB-4-8.5	5/18/2016	**80**	**0.022**	**0.094**	**2.9**	**14**	**5.1**	--	--	--
KJB-4	12	KJB-4-12	5/18/2016	**1,700**	**1.8**	**17**	**7.5**	**31**	**11**	< 0.57	*< 0.57*	*< 0.57*
KJB-4	19	KJB-4-19	5/18/2016	**65**	**0.076**	**0.29**	**0.20**	**0.70**	**0.22**	--	--	--
KJB-5	7	KJB-5-7	5/18/2016	<9.4	< 0.0015	< 0.0015	< 0.0015	< 0.0015	< 0.0015	--	--	--
KJB-5	12	KJB-5-12	5/18/2016	<5.6	**0.0016**	**0.0068**	**0.0011**	**0.0038**	**0.0012**	--	--	--
KJB-5	19.5	KJB-5-19.5	5/18/2016	<6.2	**0.031**	**0.0043**	**0.0015**	**0.0028**	< 0.0011	--	--	--
KJB-6	7	KJB-6-7	5/18/2016	<7.4	< 0.0011	**0.0022**	< 0.0011	**0.0014**	< 0.0011	--	--	--
KJB-6	22	KJB-6-22	5/18/2016	<5.5	< 0.00090	< 0.00090	< 0.00090	< 0.00090	< 0.00090	--	--	--
KJB-7	11	KJB-7-11	5/19/2016	**2,200**	**3.9**	**4.4**	**22**	**100**	**32**	--	--	--
KJB-7	18.5	KJB-7-18.5	5/19/2016	**1,700**	**1.4**	**13**	**13**	**63**	**22**	--	--	--
KJB-8	8	KJB-8-8	5/19/2016	<7.4	**0.0022**	**0.0056**	**0.012**	**0.064**	**0.022**	--	--	--
KJB-8	12	KJB-8-12	5/19/2016	**1,200**	**26**	**120**	**49**	**200**	**70**	< 3.0	*< 3.0*	*< 3.0*
KJB-8	19	KJB-8-19	5/19/2016	<5.7	**0.30**	**0.24**	**0.086**	**0.33**	**0.11**	--	--	--
KJB-9	8.5	KJB-9-8.5	5/19/2016	**43,000**	< 1.8	**4.0**	**120**	**420**	**130**	--	--	--
KJB-9	13	KJB-9-13	5/19/2016	**78**	**0.70**	**3.1**	**14**	**51**	**18**	< 0.23	*< 0.23*	*< 0.23*
KJB-9	19	KJB-9-19	5/19/2016	<6.3	**1.0**	**0.10**	**0.12**	**0.54**	**0.13**	--	--	--
KJB-10	8	KJB-10-8	5/19/2016	**28,000**	**8.2**	**41**	**53**	**240**	**79**	--	--	--
KJB-10	13	KJB-10-13	5/19/2016	**2,300**	**20**	**35**	**18**	**75**	**25**	--	--	--
KJB-10	19.5	KJB-10-19.5	5/19/2016	**18,000**	**63**	**200**	**68**	**280**	**94**	--	--	--
KJB-11	8	KJB-11-8	5/19/2016	<6.5	< 0.0012	< 0.0012	< 0.0012	**0.0014**	< 0.0012	--	--	--
KJB-11	19	KJB-11-19	5/19/2016	<7.6	< 0.00080	< 0.00080	< 0.00080	< 0.00080	< 0.00080	--	--	--
KJB-12	8	KJB-12-8	5/19/2016	<5.5	< 0.00090	< 0.00090	< 0.00090	< 0.00090	< 0.00090	--	--	--
KJB-12	19	KJB-12-19	5/19/2016	<7.5	< 0.0012	< 0.0012	< 0.0012	< 0.0012	< 0.0012	--	--	--
KJB-13	12	KJB-13-12	5/19/2016	**390**	< 0.10	< 0.10	**0.54**	**0.42**	< 0.10	--	--	--
KJB-13	19	KJB-13-19	5/19/2016	<6.8/<6.6	< 0.0012/< 0.0011	< 0.0012/< 0.0011	**0.010/0.010**	**0.030/0.030**	**0.0067/0.0066**	--	--	--
KJB-14	7	KJB-14-7	8/1/2016	<5.1	< 0.00090	< 0.00090	< 0.00090	< 0.00090	< 0.00090	--	--	--
KJB-14	13	KJB-14-13	8/1/2016	<6.1	< 0.0014	< 0.0014	< 0.0014	< 0.0014	< 0.0014	--	--	--
KJB-14	18	KJB-14-18	8/1/2016	<7.2	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	--	--	--
KJB-15	11	KJB-15-11	8/1/2016	<5.5	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	--	--	--
KJB-15	19	KJB-15-19	8/1/2016	<6.1	< 0.0012	< 0.0012	< 0.0012	< 0.0012	< 0.0012	--	--	--
KJB-16	7.5	KJB-16-7.5	8/1/2016	<8.7	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	--	--	--
KJB-16	16	KJB-16-16	8/1/2016	<8.0	< 0.0013	< 0.0013	< 0.0013	< 0.0013	< 0.0013	--	--	--
MW-17	8	MW-17-8	8/1/2016	<6.2	< 0.0012	< 0.0012	< 0.0012	< 0.0012	< 0.0012	--	--	--
MW-17	19	MW-17-19	8/1/2016	<5.3	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	--	--	--
MW-18	12.5	MW-18-12.5	8/1/2016	<6.5	< 0.00090	< 0.00090	< 0.00090	< 0.00090	< 0.00090	--	--	--
MW-18	17	MW-18-17	8/1/2016	<7.3/<6.6	< 0.0010/< 0.0011	< 0.0010/< 0.0011	< 0.0010/< 0.0011	< 0.0010/< 0.0011	< 0.0010/< 0.0011	--	--	--
MW-19	10	MW-19-10	9/23/2016	**12,600**	**31**	**230**	**81**	**350**	**140**	--	--	--
MW-19	19	MW-19-19	9/23/2016	<5.25	**0.0072**	**0.017**	**0.0028**	**0.011**	**0.0053**	--	--	--
MW-20	10	MW-20-10	9/23/2016	**630**	**0.12**	< 0.10	**2.4**	**8.8**	**2.7**	--	--	--
MW-20	20	MW-20-20	9/23/2016	<5.78	**0.031**	**0.045**	**0.021**	**0.081**	**0.029**	--	--	--
MW-21	10	MW-21-10	9/23/2016	**198**	**1.1**	**2.8**	**1.4**	**6.7**	**2.9**	--	--	--
MW-21	19.5	MW-21-19.5	9/23/2016	**6.41**	**0.21 E**	**0.062**	**0.012**	**0.044**	**0.021**	--	--	--
Method A Unrestricted (mg/kg)				30/100	0.03	7	6	9	9	--	0.005	0.10
MTCA B (direct contact) (mg/kg)										11		

SUMMARY 0F 2016 SOIL SAMPLE ANALYTICAL RESULTS
FORMER CIRCLE K SITE
Seattle, Washington

80	Detected concentrations above the cleanup level are shaded yellow and bolded.
< 0.57	Non-detect values above the cleanup level are shaded gray and italicized.

Notes:

Detected concentrations at or above the method reporting limit are shown in bold.

Depths are in feet below ground surface (bgs).

When two values are presented, the second value is result of a duplicate sample.

Abbreviations and Symbols

" - -" denotes not measured, not available, or not applicable.

" < " denotes not detected at or above the indicated method reporting limit.

"E" denotes an estimated concentration. The reported concentration exceeded the calibration range of the instrument.

mg/kg = milligrams per kilogram

Cleanup Levels

Cleanup level values based on Model Toxics Control Act (MTCA) Method A values for unrestricted land use (Method A Unrestricted) based on Washington State Administrative Code (WAC) 173-340-740 Table 740-1.

Methods

Samples analyzed for gasoline-range organics (GRO) using Northwest Total Petroleum Hydrocarbon (NWTPH) Method NWTPH-Gx.

Samples analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) using EPA Method 8260.

Samples analyzed for 1,2-dichloroethane (EDC), 1,2-dibromomethane (EDB), and methyl tert-butyl ether (MTBE) using EPA Method 8260.

TABLE 4

SUMMARY OF 2016 RECONNAISANCE GROUNDWATER ANALYTICAL RESULTS
FORMER CIRCLE K SITE
Seattle, Washington

				Analytical Results									Field Parameters				
			Chemical	**Gasoline-Range Organics**	**Benzene**	**Toluene**	**Ethylbenzene**	**m,p-Xylene**	**o-Xylene**	**1,2-Dichloro-ethane**	**1,2-Dibromo-methane**	**Methyl tert-Butyl Ether**	**Temperature**	**Conductivity**	**Dissolved Oxygen**	**pH**	**ORP**
			Units	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**µg/L**	**°C**	**mS/cm**	**mg/L**	**SU**	**mV**
Boring ID	**Date Sampled**	**Temporary Well Screen Interval (feet bgs)**	**Depth to Water (feet bgs)**														
KJB-1	5/18/2016	9-19	8.95	<100	<0.20	<0.20	<0.20	<0.40	<0.20	--	--	--	15.01	0.676	1.27	6.55	-13.1
KJB-2	5/18/2016	8-18	--	<100	<0.20	<0.20	<0.20	<0.40	<0.20	--	--	--	15.06	0.358	0.88	6.56	69.5
KJB-3	5/18/2016	8-18.5	--	<100	<0.20	<0.20	<0.20	<0.40	<0.20	--	--	--	15.63	0.461	1.11	6.54	18.7
KJB-4	5/18/2016	9-19	11.02	**70,000**	**6,500**	**8,300**	**1,600**	**6,400**	**2,600**	*<10*	*<10*	*<25*	15.69	0.873	1.64	6.56	66.2
KJB-5	5/18/2016	9-19	10.79	**13,000**	**1,400**	**290**	**890**	**1,800**	**270**	--	--	--	15.44	0.764	1.07	6.57	-62.2
KJB-6	5/18/2016	13-23	--	**860**	**27**	**2.2**	**24**	**14**	**1.5**	--	--	--	14.99	0.178	0.61	6.81	-43.0
KJB-7	5/19/2016	9-19	11.40	**90,000**	**3,100**	**940**	**2,000**	**12,000**	**5,500**	--	--	--	14.98	0.843	0.96	6.64	-51.8
KJB-8	5/19/2016	9-19	11.79	**110,000**	**31,000**	**34,000**	**2,600**	**13,000**	**5,500**	**33**	*<10*	*<25*	15.63	0.912	0.82	6.83	-34.2
KJB-9	5/19/2016	5-15.5	--	**75,000**	**750**	**6,200**	**2,100**	**7,000**	**2,400**	--	--	--	16.34	1.227	1.16	6.74	-72.0
KJB-10	5/19/2016	8-18	--	**76,000**	**16,000**	**16,000**	**1,700**	**6,500**	**2,700**	--	--	--	16.86	0.592	1.22	6.79	-72.9
KJB-11	5/19/2016	10-20	--	<100/<100	**0.31/0.26**	**0.41/0.39**	<0.20/<0.20	**0.45/0.41**	<0.20/<0.20	--	--	--	16.48	0.359	1.21	6.97	77.1
KJB-12	5/19/2016	9-19	--	<100	<0.20	<0.20	<0.20	<0.40	<0.20	--	--	--	14.45	0.747	0.76	7.17	128.3
KJB-13	5/19/2016	9-19	--	**25,000**	**20**	**120**	**700**	**2,300**	**590**	--	--	--	16.42	0.630	0.78	7.14	65.1
KJB-15	8/1/2016	5-20	14.6	<100	<0.20	<0.20	<0.20	<0.40	<0.20	--	--	--	--	--	--	--	--
MTCA Method A (µg/L)				800/1,000	5	1,000	700	1,000		5	0.01	20	--	--	--	--	--

70,000	Detected concentrations above the cleanup level are shaded yellow and bolded.
<25	Non-detect values above the cleanup level are shaded gray and italicized.

Notes:

Detected concentrations at or above the method reporting limit are shown in bold.

Depths are in feet below ground surface (bgs).

When two values are presented, the second value is result of a duplicate sample.

Abbreviations and Symbols

" - -" denotes not measured, not available, or not applicable.

" < " denotes not detected at or above the indicated method reporting limit.

°C = degrees Celsius

mg/L = milligrams per liter

mV = millivolts

mS/cm = microSiemens per centimeter

µg/L = micrograms per liter

Cleanup Levels

Cleanup level values based on Model Toxics Control Act (MTCA) Method A values for groundwater (Method A) based on Washington State Administrative Code (WAC) 173-340-740 Table 720-1.

Methods

Samples analyzed for gasoline-range organics (GRO) using Northwest Total Petroleum Hydrocarbon (NWTPH) Method NWTPH-G.

Samples analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) using EPA Method 8260.

Samples analyzed for 1,2-dichoroethane (EDC), 1,2-dibromomethane (EDB), and methyl tert-butyl ether (MTBE) using EPA Method 8260.

TABLE 5

SUMMARY OF 2016 MONITORING/MULTI-PURPOSE WELL GROUNDWATER SAMPLE ANALYTICAL RESULTS
FORMER CIRCLE K SITE
Seattle, Washington

				Chemical Units	Gasoline-Range Organics µg/L	Benzene µg/L	Toluene µg/L	Ethylbenzene µg/L	m,p-Xylene µg/L	o-Xylene µg/L	Xylenes, total µg/L	1,2-Dichloroethane µg/L	1,2-Dibromoethane µg/L	Methyl tert-butyl Ether µg/L
Monitoring Well ID	Date Sampled	Top of Casing Elevation (feet amsl)	Depth to Water (feet btoc)	Water Elevation (feet amsl)										
MW-2	12/7/2016	69.79	9.75	60.04	< 100	< 0.20	< 0.20	< 0.20	< 0.40	< 0.20	< 0.60	--	--	--
MW-2	5/15/2017	69.79	9.41	60.38	< 100	< 0.20	< 0.20	< 0.20	< 0.40	< 0.20	< 0.600	--	--	--
MW-4	4/20/2016	63.616	9.19	54.43	**38,200**	**64.4**	**57.3**	**1,080**	**3,750**	**865**	**4610**	--	--	--
MW-4	12/8/2016	63.62	8.53	55.09	**28,000**	**17.6**	**30**	**606**	**2,770**	**664**	**3,430**	--	--	--
MW-4	5/15/2017	63.62	8.57	55.05	**39,300**	**20.5**	**20.0**	**593**	**2,990**	**601**	**3,590**	--	--	--
MW-6	4/20/2016	63.132	11.54	51.59	< 100	**4.29**	**0.40**	< 0.20	< 0.40 U	**0.14**	< 0.60 U	--	--	--
MW-6	12/7/2016	63.13	11.55	51.58	**101**	**16.5**	**1.56**	**1.64**	**1.88**	**0.70**	**2.58**	--	--	--
MW-6	5/15/2017	63.13	11.51	51.62	< 100	**2.25**	**0.31**	**0.68**	**1.07**	**0.27**	**1.34**	--	--	--
MW-7	4/20/2016	62.660	8.45	54.21	< 100	< 0.20	< 0.20	< 0.20 U	< 0.40 U	**0.04**	< 0.60 U	--	--	--
MW-7	12/8/2016	62.66	6.3	56.36	< 100	< 0.20	< 0.20	< 0.20	< 0.40	< 0.20	< 0.60	--	--	--
MW-7	5/15/2017	62.66	7.18	55.48	< 100	< 0.20	< 0.20	< 0.20	< 0.40	< 0.20	< 0.600	--	--	--
MW-8	4/20/2016	63.592	9.6	53.99	**52,100**	**9.59 J**	**1,130**	**1,650**	**4580**	**1,790**	**6,370**	--	--	--
MW-8	12/7/2016	63.59	8.91	54.68	**65,700**	**11.3**	**1,390**	**1,800**	**5,590**	**2,360**	**7,950**	--	--	--
MW-8	5/15/2017	63.59	8.97	54.62	**76,500**	*< 10.0*	**1,210**	**1,780**	**5,160**	**2,230**	**7,390**	--	--	--
MW-9	4/20/2016	64.297	9.43	54.87	**13,800**	**11.3**	**44.5**	**416**	**728**	**61.2**	**789**	--	--	--
MW-9	12/7/2016	64.30	8.31	55.99	**7,910**	**2.05**	**10.6**	**125**	**203**	**21.3**	**224**	--	--	--
MW-9	5/15/2017	64.30	8.65	55.65	**8,870**	**2.47**	**13.8**	**165**	**222**	**22.4**	**244**	--	--	--
MW-10	4/20/2016	62.86	9.61	53.25	< 100	< 0.20	< 0.20	< 0.20	< 0.40	< 0.20	< 0.60	--	--	--
MW-10	12/7/2016	62.86	8.81	54.05	< 100	< 0.20	< 0.20	< 0.20	< 0.40	< 0.20	< 0.60	--	--	--
MW-10	5/15/2017	62.86	9.12	53.74	< 100	< 0.20	< 0.20	**0.21**	**0.75**	< 0.20	**0.95**	--	--	--
MW-11	4/20/2016	63.586	7.85	55.74	< 100	< 0.20	**0.06**	< 0.20 U	< 0.40 U	**0.04**	< 0.60	--	--	--
MW-11	12/7/2016	63.59	1.92	61.67	< 100	< 0.20	< 0.20	< 0.20	< 0.40	< 0.20	< 0.60	--	--	--
MW-11	5/15/2017	63.59	3.04	60.55	< 100	< 0.20	**0.47**	< 0.20	**0.41**	< 0.20	**0.61**	--	--	--
MW-13	4/20/2016	65.08	10.21	54.87	**57,700**	**1,740**	**3,300**	**1,080**	**4,730**	**1,910**	**6,630**	--	--	--
MW-13	12/8/2016	65.08	9.38	55.70	**40,000/38,600**	**1120/1140**	**949/1080**	**808/714**	**3,290/2,970**	**1,060/1,020**	**4,350/3,990**	--	--	--
MW-13	5/16/2017	65.08	9.41	55.67	**56,300**	**1,610**	**1,840**	**729**	**3,510**	**1,410**	**4,920**	--	--	--
MW-13 Dup	5/16/2017	65.08	9.41	55.67	**45,800**	**2,320**	**2,550**	**751**	**4,210**	**1,610**	**5,820**	--	--	--
MW-14	4/20/2016	63.300	7.18	56.12	< 100	< 0.20	< 0.20	< 0.20 U	< 0.40 U	**0.09**	< 0.60 U	--	--	--
MW-14	12/7/2016	63.30	6.45	56.85	< 100	< 0.20	< 0.20	< 0.20	< 0.40	< 0.20	< 0.60	--	--	--
MW-14	5/16/2017	63.30	7.17	56.13	< 100	< 0.20	< 0.20	< 0.20	< 0.40	< 0.20	< 0.600	--	--	--
MW-15	4/20/2016	64.176	8.73	55.45	< 100/< 100	< 0.20/< 0.20	< 0.20/< 0.20 U	< 0.20 U/< 0.20 U	< 0.40 U/< 0.40 U	**0.04**/< 0.20	< 0.60 U/< 0.60 U	--	--	--
MW-15	12/7/2016	64.18	3.28	60.90	< 100	< 0.20	< 0.20	< 0.20	< 0.40	< 0.20	< 0.60	--	--	--
MW-15	5/16/2017	64.18	7.2	56.98	< 100	< 0.20	< 0.20	< 0.20	< 0.40	< 0.20	< 0.600	--	--	--
MW-16	4/20/2016	64.000	--	--	--	--	--	--	--	--	--	--	--	--
MW-16	12/7/2016	64.00	6.62	57.38	< 100	< 0.20	< 0.20	< 0.20	< 0.40	< 0.20	< 0.60	--	--	--
MW-16	5/15/2017	64.00	8.15	55.85	< 100	< 0.20	< 0.20	< 0.20	< 0.40	< 0.20	< 0.600	--	--	--
MW-17	12/7/2016	65.98	10.2	55.78	**1,060**	< 0.20	< 0.20	< 0.20	< 0.40	< 0.20	< 0.60	--	--	--
MW-17	5/17/2017	65.98	9.56	56.42	**4,650**	< 1.00	< 1.00	< 1.00	< 2.00	< 1.00	< 3.00	--	--	--
MW-18	12/7/2016	66.73	11.85	54.88	< 100	< 0.20	< 0.20	< 0.20	< 0.40	< 0.20	< 0.60	--	--	--
MW-18	5/16/2017	66.73	10.4	56.33	< 100	< 0.20	< 0.20	< 0.20	< 0.40	< 0.20	< 0.600	--	--	--
MW-19	12/8/2016	66.36	10.52	55.84	**68,200**	**1,930**	**6,350**	**1,180**	**4,210**	**1,510**	**5,720**	--	--	--
MW-19	5/17/2017	66.36	10.22	56.14	**68,300**	**4,060**	**8,820**	**953**	**4,380**	**1,740**	**6,120**	--	--	--
MW-20	12/8/2016	66.17	10.59	55.58	**85,900**	**7,010**	**9,220**	**1,520**	**5,730**	**2,450**	**8,180**	--	--	--
MW-20	5/17/2017	66.17	10.74	55.43	**13,900**	**801**	**120**	**43.1**	**1,540**	**611**	**2,150**	< 4.00	*< 4.00*	< 10.0
MW-21	12/8/2016	65.89	10.38	55.51	**163,000**	**21,400**	**21,400**	**2,280**	**9,230**	**4,010**	**13,240**	--	--	--
MW-21	5/16/2017	65.89	10.28	55.61	**29,300**	--	--	--	--	--	--	*< 40.0*	*< 40.0*	*< 100*
RW-1	5/17/2017		10.1		**946**	< 0.20	< 0.20	< 0.20	< 0.40	< 0.20	< 0.600	--	--	--
RW-2	5/16/2017		9.58		**14,400**	**354**	**204**	**105**	**1,010**	**493**	**1,500**	--	--	--
RW-3	5/16/2017		9.55		**4,580**	**957**	**27.8**	**0.99**	**135**	**411**	**546**	--	--	--
RW-4	5/16/2017		9.51		**100,000**	**10,300**	**8,200**	**1,990**	**6,170**	**3,400**	**9,570**	--	--	--
RW-5	5/17/2017		10.13		**62,800**	**4,370**	**6,290**	**1,440**	**5,400**	**2,400**	**7,800**	--	--	--
RW-6	5/15/2017		8.55		**137,000**	**1,150**	**7,210**	**2,220**	**8,770**	**3,850**	**12,600**	--	--	--
RW-7	5/17/2017		10.04		**45,000**	**3,070**	**4,370**	**425**	**1,840**	**855**	**2,700**	--	--	--
MTCA Method A (µg/L)					800	5	1,000	700	1,000	1,000	1,000	5	0.01	20

432	Detected concentrations above the cleanup level are shaded yellow and bolded.
< 10.0	Non-detect values above the cleanup level are shaded gray and italicized.
57.3	Detected concentrations at or above the method reporting limit are shown in bold.

Depths are in feet below ground surface (bgs).
When two values are presented, the second value is result of a duplicate sample.

Abbreviations and Symbols

" - -" denotes not measured, not available, or not applicable.
" < " denotes not detected at or above the indicated method reporting limit.
"J" indicates an estimated concentration.
"J+" denotes an estimated concentration with a potential high bias.
"U" denotes that the value has been qualified as undetected at the method reporting limit as a result of validation.
btoc = below top of casing
amsl = above mean sea level
µg/L = micrograms per liter

Cleanup Levels

Cleanup level values based on Model Toxics Control Act (MTCA) Method A values for groundwater (Method A) based on Washington State Administrative Code (WAC) 173-340-740 Table 720-1.

Methods

Samples analyzed for gasoline-range organics (GRO) using Northwest Total Petroleum Hydrocarbon (NWTPH) Method NWTPH-G.
Samples analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) using EPA Method 8260.

TABLE 6

SUMMARY OF NATURAL ATTENUATION PARAMETER RESULTS
FORMER CIRCLE K SITE
Seattle, Washington

	Chemical	Alkalinity, Total	Nitrate-N	Nitrite-N	Nitrate + Nitrite as N	Sulfide	Sulfate	Methane	Iron, Dissolved	Manganese, Dissolved	Lead, Total	Lead, Dissolved
	Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Monitoring Well ID	**Date Sampled**											
MW-14	12/7/2016	**170,000**	< 20	**2,500**		**510**	**15,000**	**730**	**420**	**71**	--	--
MW-14	5/16/2017	**85,400**	**3,920**	**104**	**4,020**	< 50	**12,800**	**7.08**	**74**	**36.5**	*< 20.0*	< 20.0
MW-17	12/7/2016	**38,000**	< 20	**470**		< 50	**4,900**	< 0.65	**31**	**38**	--	--
MW-17	5/17/2017	**40,200**	**2,210**	< 10	**2,210 D**	< 50	**12,200**	< 0.65	< 50.0	**13.8**	*< 20.0*	< 20.0
MW-19	12/8/2016	**110,000**	< 20	< 10		**68**	**6,200**	**29**	**1,900**	**930**	--	--
MW-19	5/17/2017	**320,000**	**151,000**	**9,410 D**	**160,000 D**	< 50	**14,500**	**31.6**	**205**	**1,480**	*< 20.0*	< 20.0
MW-21	12/8/2016	**470,000**	< 20	**14**		< 50	**4,200**	**730**	**11,000**	**5,100**	--	--
MW-21	5/16/2017	**1,510,000**	**1350000**	26,000 D	**1,380,000 D**	< 50	**50,800 D**	**25.2**	< 50.0	**67.8**	*< 20.0*	< 20.0
MTCA Method A (µg/L)		--	--	--	--	--	--	--	--	--	15	15

###	Detected concentrations above the cleanup level are shaded yellow and bolded.
< 10.0	Non-detect values above the cleanup level are shaded gray and italicized.
170,000	Detected concentrations at or above the method reporting limit are shown in bold.

Abbreviations and Symbols

" - -" denotes not measured, not available, or not applicable.

" < " denotes not detected at or above the indicated method reporting limit.

µg/L = micrograms per liter

Cleanup Levels

Cleanup level values based on Model Toxics Control Act (MTCA) Method A values for groundwater (Method A) based on Washington State Administrative Code (WAC) 173-340-740 Table 720-1.

Methods

Samples analyzed for total alkalinity using Standard Method SM2320.

Samples analyzed for nitrate/nitrite using Standard Method SM4500.

Samples analyzed for sulfide/sulfate using Standard Method SM4500.

Samples analyzed for dissolved gasses using EPA RSK-175.

Sample analyzed for dissolved metals using EPA Method 6010. Samples were field filtered using 0.45 micron in-line filter.

TABLE 7

SUMMARY OF PROPOSED SOIL AND GROUNDWATER CLEANUP LEVELS
FORMER CIRCLE K SITE
Seattle, Washington

Chemicals of Concern (COCs)	Soil CULs	Groundwater CULs	CUL Basis(a)
Total Petroleum Hydrocarbon (TPH)-Gasoline	100 mg/kg (w/o benzene) **30 mg/kg** (with benzene)	1,000 µg/L (w/o benzene) **800 µg/L** (with benzene)	MTCA Method A(b)
Benzene	**0.03 mg/kg** / 18.2 mg/kg	**5 µg/L /** 0.795 µg/L	MTCA Method A / MTCA Method B
Toluene	**7 mg/kg** / 6400 mg/kg	**1,000 µg/L /** 640 µg/L	MTCA Method A / MTCA Method B
Ethylbenzene	**6 mg/kg** / 8000 mg/kg	**700 µg/L** / 800 µg/L	MTCA Method A / MTCA Method B
Xylenes	**9 mg/kg** / 16000 mg/kg	**1,000 µg/L** / 1,600 µg/L	MTCA Method A / MTCA Method B
Methyl-tert-butyl ether (MTBE)	**0.1 mg/kg** / 556 mg/kg	**20 µg/L** / 24.3 µg/L	MTCA Method A / MTCA Method B
1,2-dibromomethane (EDB)	**0.005 mg/kg** / 0.5 mg/kg	**0.01 µg/L** / 0.0219 µg/L	MTCA Method A / MTCA Method B
1,2-dichoroethane (EDC)	(MTCA A n/a) / **11 mg/kg**	**5 µg/L /** 0.481 µg/L	MTCA Method A / MTCA Method B
Lead	**250 mg/kg** / (MTCA B n/a)	**15 µg/L** / (MTCA B n/a)	MTCA Method A / MTCA Method B

Notes:

(a) Model Toxics Control Act (MTCA) Method A/B cleanup levels (CULs) based on the following:

- Method A (Soil unrestricted land use) - Washington State Administrative Code (WAC) 173-340-740 Table 740-1.
- Method A (Groundwater) - WAC 173-340-720 Table 720-1.
- Method B (Soil and Groundwater) - Cleanup Levels and Risk Calculation (CLARC) (Accessed January 2017).

(b) Tabulated values for MTCA Method B CULs are not available for total petroleum hydrocarbon (TPH)-gasoline. Evaluation of risk-based CULs for TPH may be performed, if needed, including analysis of TPH fractions using Ecology Methods for volatile petroleum hydrocarbons (VPH).

MTCA Method A values used as cleanup standards. Where MTCA Method A is not available, the lowest MTCA Method B value is used.

mg/kg = milligrams per kilogram
µg/L = micrograms per liter
Bold values denote the lower of the listed MTCA Method A and B cleanup levels.

TABLE 8

GENERAL RESPONSE ACTIONS, REMEDIAL TECHNOLOGIES, AND PROCESS OPTIONS FOR SOIL
FORMER CIRCLE K SITE
Seattle, Washington

General Response Action	Remedial Technologies	Process Options	Description	Evaluation Comments
Institutional Controls	Access Restrictions	Physical Restrictions	Physical restrictions (e.g., fencing and signs) limit contact with media.	Risk receptor pathways not addressed.
		Deed Restrictions	**Restrictive covenants recorded in the property deed prohibit site activities (e.g., excavation) that could result in exposure to chemicals of concern; requires worker protection and Soil/Groundwater Management Plan.**	**Applicable to reduce human contact with impacted media; excavation or subgrade utility work.**
		Monitoring	**Laboratory chemical analyses of soil, groundwater, and/or vapor samples.**	**Applicable for documenting conditions and concentrations of contaminants in soil, groundwater, and air. Applicable to document effectiveness of treatment technologies.**
Containment	Covers	Soil	Clean soil is placed over ground surface to provide a physical barrier to chemicals of concern.	Not appropriate for site conditions.
		Clay	Low permeability clay layer overlain with soil over chemically impacted materials provides physical barrier that minimizes potential for contact and infiltration.	Not appropriate for site conditions.
		Concrete	Similar to clay cover description with concrete used as low permeability barrier.	Existing site conditions include concrete slab-on-grade building construction and asphalt cover.
		Asphalt	Similar to clay cover description with asphalt used as low permeability barrier.	Existing site conditions include concrete slab-on-grade building construction and asphalt cover.
		RCRA	Multi-media barrier consisting of low-permeability layer, synthetic liner, drainage layer, and vegetative cover. Performs functions similar to those described for clay cover.	Not appropriate for site conditions.
	Vertical Barriers	Slurry Wall	Subsurface vertical barrier consisting of low-hydraulic conductivity material surrounds a subsurface source to prevent chemical migration.	Not appropriate for site conditions.
		Grout Curtain	Subsurface vertical barrier consisting of low-hydraulic conductivity material is pressure injected into soil or rock. Performs function similar to slurry wall.	Not appropriate for site conditions.

TABLE 8

GENERAL RESPONSE ACTIONS, REMEDIAL TECHNOLOGIES, AND PROCESS OPTIONS FOR SOIL
FORMER CIRCLE K SITE
Seattle, Washington

General Response Action	Remedial Technologies	Process Options	Description	Evaluation Comments
Containment (continued)	Horizontal Barriers	Sheet Pile Cutoff Wall	Interlocking sheet piling driven vertically into subsurface to form a low permeability barrier. Performs function similar to slurry wall.	Not appropriate for site conditions.
		Grout Injection	Injection of grout to form a horizontal barrier in the ground underneath chemical source to reduce the vertical movement of chemicals.	Not appropriate for site conditions.
		Block Displacement	Vertical barrier (slurry trench or grout curtain) surrounds source. Continued injection of grout through injection holes causes displacement of source and forms a barrier beneath source.	Not appropriate for site conditions.
	Surface Controls	Revegetation	Planting grasses, shrubs, or trees to minimize contact with soil, reduce dust generation, and control surface water runoff.	Not appropriate for site conditions.
	Dust Suppression	**Wet Suppression**	**Watering ground surface to control dust generation.**	**Applicable for excavation and construction activities.**
		Chemical Stabilization	A suppressant sprayed on the ground binds dust and surface particles into a protective crust that minimizes dust generation.	Not appropriate for site conditions.
		Physical Stabilization	Placing a cover (e.g. rock, soil, straw) on exposed surfaces to prevent particles from becoming airborne.	Not appropriate for site conditions.
		Vegetative Stabilization	Same as revegetation above.	Not appropriate for site conditions.
		Wind Fences/Screens	Fences or screens are installed around site perimeter to block wind and reduce dust generation.	Not appropriate for site conditions.
Removal	Excavation	**Backhoe, Excavators, Loaders, Dozers**	**Excavate material for subsequent aboveground treatment and/or disposal.**	**Applicable for removal of impacted soils.**
Ex Situ (Aboveground) Treatment	Solidification/ Stabilization	Solidification	Siliceous materials are combined with a setting agent (e.g., lime, cement, or gypsum) and soil. Treatment results in a solidified product that resists leaching.	Not appropriate for site conditions or chemicals of concern.
		Stabilization	Dry or liquid chemical mix which forms insoluble molecular bonds through hydroxyapaptite crystal formations with heavy metals [and polychlorinated biphenyls (PCBs)] which significantly reduces the metals leaching potential.	Not appropriate for site conditions or chemicals of concern.
	Physical/Chemical	Soil Washing	Removal of inorganic or organic chemicals by washing excavated soil with a liquid medium (e.g., water). The wash water may be augmented with a basic leaching agent, surfactant, pH adjustment, or chelating agent to help remove organics and heavy metals.	Other more cost effective treatment methods are available. Creates secondary waste stream.

GENERAL RESPONSE ACTIONS, REMEDIAL TECHNOLOGIES, AND PROCESS OPTIONS FOR SOIL
FORMER CIRCLE K SITE
Seattle, Washington

General Response Action	Remedial Technologies	Process Options	Description	Evaluation Comments
Ex Situ (Aboveground) Treatment (continued)	Physical/Chemical (continued)	Organic Solvent Extraction	Removal of organics, oil, and grease from soil, using an organic solvent as the mass transfer medium and then recovering the solvent by distillation.	Other more cost effective treatment methods are available. Creates secondary waste stream.
		Vapor Extraction	**Removal of low molecular weight organics by creating a vacuum pressure gradient in soil that causes volatile organics to transfer from soil to air stream.**	**In-Situ Vapor Extraction retained.**
		Chemical Dehalogenation	Specially synthesized chemical reagents are used to dehalogenate certain classes of chlorinated organics (e.g., PCBs).	Not appropriate for chemicals of concern.
		Chemical Oxidation/Reduction	**Reduction/oxidation chemically converts hazardous contaminants to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert.**	**In situ chemical oxidation retained.**
		Solar Detoxification	Solar detoxification is a process that destroys contaminants by photochemical and thermal reactions using the ultraviolet energy in sunlight.	Other more cost effective treatment methods are available.
		Separation/Sieving	Sieving and physical separation processes use different size sieves and screens to effectively concentrate contaminants into smaller volumes. Physical separation can also be used to remove undesirable materials (i.e., debris) which may impact treatment processes.	Soil matrix does not consist of large particles (i.e., cobbles/ boulders).
	Biological/ Bioremediation	Landfarming	Contaminated soil is excavated, applied into lined beds, and periodically turned over or tilled to aerate the waste.	Assumes treated soil would be suitable for re-use as backfill. Extended period of an open excavation (i.e., not backfilled) not acceptable. Ex Situ treatment duration unknown.
		Land Treatment	Contaminated surface soil is treated in-place by tilling to achieve aeration, and if necessary, by addition of amendments. Periodically tilling, to aerate the waste, enhances the biological activity.	Assumes treated soil would be suitable for re-use as backfill. Extended period of an open excavation (i.e., not backfilled) not acceptable. Ex Situ treatment duration unknown.
		Composting	Contaminated soil is excavated and mixed with bulking agents and organic amendments such as wood chips, hay, manure, and vegetative (e.g., potato) wastes. Proper amendment selection ensures adequate porosity and provides a balance of carbon and nitrogen to promote thermophilic, microbial activity.	Assumes treated soil would be suitable for re-use as backfill. Extended period of an open excavation (i.e., not backfilled) not acceptable. Ex Situ treatment duration unknown.

GENERAL RESPONSE ACTIONS, REMEDIAL TECHNOLOGIES, AND PROCESS OPTIONS FOR SOIL
FORMER CIRCLE K SITE
Seattle, Washington

General Response Action	Remedial Technologies	Process Options	Description	Evaluation Comments
Ex Situ (Aboveground) Treatment (continued)	Biological/ Bioremediation (continued)	Biopiles	Excavated soils are mixed with soil amendments and placed in aboveground enclosures. It is an aerated static pile composting process in which compost is formed into piles and aerated with blowers or vacuum pumps.	Assumes treated soil would be suitable for re-use as backfill. Extended period of an open excavation (i.e., not backfilled) not acceptable. Ex Situ treatment duration unknown.
		Fungal Biodegradation	Fungal biodegradation refers to the degradation of a wide variety of organopollutants by using their lignin-degrading or wood-rotting enzyme system. White rot fungus has been tested under two different treatment configurations: in situ and bioreactor.	Other more cost effective treatment methods are available.
		Bio-Reactor System	Degradation with the use of a liquid/solids contact reactor. Reactor environment enhances mass transfer rates and contact between chemicals and microorganisms capable of degrading the chemicals.	Other more cost effective treatment methods are available.
	Thermal	Thermal Desorption	Soils are heated, driving off water and organics with boiling points less than 1,100°F. Organics are incinerated in an afterburner or collected for subsequent treatment.	Other more cost effective treatment methods are available.
		Rotary Kiln Incineration	Incineration process (in the presence of oxygen) uses temperatures ranging from 1,500°F to 3,000°F and turbulence caused by rotation to vaporize and destroy organics.	Other more cost effective treatment methods are available..
In Situ Treatment	Solidification/ Stabilization	Pozzolanic Cement-Based	In situ treatment of soil by the injection and mixing of solidifying agents with soil. Treatment results in a solidified product that resists leaching.	Not appropriate for chemicals of concern.
		Chemical-Based Stabilization	Liquid chemical mix which forms insoluble molecular bonds through hydroxyapaptite crystal formations with heavy metals (and PCBs) which significantly reduces the metals leaching potential.	Not appropriate for chemicals of concern.
	Physical/Chemical	Soil Freezing	Freezing surrounding soil to create a physical barrier to chemical migration.	Not appropriate for site conditions.
		Soil Flushing	In situ extraction of inorganics or organics from soils, accomplished by passing solvents through soil using an injection/recirculation process.	Difficult to control; may result in groundwater contamination.
		Soil Vapor Extraction	**Extraction of volatile organics from subsurface soil by creating a pressure gradient that causes volatile organics to transfer from soil to airstream.**	**Applicable for mass removal and vapor mitigation.**

GENERAL RESPONSE ACTIONS, REMEDIAL TECHNOLOGIES, AND PROCESS OPTIONS FOR SOIL
FORMER CIRCLE K SITE
Seattle, Washington

General Response Action	Remedial Technologies	Process Options	Description	Evaluation Comments
In Situ Treatment (continued)	Physical/Chemical (continued)	Electrokinetic Separation	The Electrokinetic Remediation (ER) process removes metals and organic contaminants from low permeability soil. ER uses electrochemical and electrokinetic processes to desorb, and then remove, metals and polar organics. This in situ soil processing technology is primarily a separation and removal technique for extracting contaminants from soils.	Not appropriate for site conditions.
		Fracturing	Cracks are developed by fracturing beneath the surface in low permeability and over-consolidated sediments to open new passageways that increase the effectiveness of many in situ processes and enhance extraction efficiencies.	Not appropriate for site conditions.
		Precipitation	Application of specific treatment reagents which aid in the formation of insoluble metal precipitates that reduce chemical mobility. Metals could later resolubilize as conditions change.	Not appropriate for organics; may result in groundwater contamination.
		Chemical Oxidation/Reduction	**Reduction/oxidation chemically converts hazardous contaminants to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert.**	**In situ chemical oxidation retained.**
	Biological/ Bioremediation	**Enhanced Bioremediation (Aerobic)**	**Application of nutrients, oxygen, and microorganisms to accelerate the natural biodegradation of organic compounds.**	**Applicable for biological treatment of both petroleum-impacted soils and groundwater.**
		Enhanced Bioremediation (Anaerobic)	Same as aerobic process with the omission of oxygen application. The anaerobic process degrades organics generally slower than the aerobic process.	Not appropriate for chemicals of concern.
		Bioventing	**Oxygen is delivered to contaminated unsaturated soils by forced air movement (either extraction or injection of air) to increase oxygen concentrations and stimulate biodegradation.**	**Applicable. Soil vapor extraction retained as In Situ Treatment technology; influx of air through SVE operation increases oxygen concentrations in unsaturated/smear zone.**
		Phytoremediation	Phytoremediation is a process that uses plants to remove, transfer, stabilize, and destroy contaminants in soil and sediment. Contaminants may be either organic or inorganic.	Not appropriate for site conditions.
	Thermal	Vitrification	Using high temperatures to melt soil and bind chemicals in a stable non-crystalline solid that resists leaching. Organics are destroyed by pyrolysis.	Not appropriate for chemicals of concern.

GENERAL RESPONSE ACTIONS, REMEDIAL TECHNOLOGIES, AND PROCESS OPTIONS FOR SOIL
FORMER CIRCLE K SITE
Seattle, Washington

General Response Action	Remedial Technologies	Process Options	Description	Evaluation Comments
In Situ Treatment (continued)	Thermal (continued)	Electrical Resistive Heating	Applying electrical current for heating subsurface soils to volatilize contaminants into the vapor phase for removal by soil vapor extraction.	More cost-effective methods are available.
		Steam-Enhanced Vapor Extraction	Vapor extraction with the addition of steam to increase chemical mobility and removal rate.	More cost-effective methods are available.
		Radio Frequency Heating	Application of radio frequency waves to heat soil and vaporize volatile organics. Volatiles are then collected for destruction or treatment.	Experimental. More tested and cost-effective methods are available.
Disposal	Offsite	**Management Unit**	**Disposal of soil in a permitted offsite management unit.**	**Applicable for offsite disposal at a licensed landfill facility.**
	Onsite	Containment	Containment of soil onsite.	Not appropriate for site conditions.
Reuse/Recycling	Onsite	Backfilling	Onsite reuse/recycling of site materials for suitable applications in accordance with applicable local, state, and federal regulations.	Not appropriate for site conditions.
		Grading	Onsite reuse/recycling of site materials for suitable applications in accordance with applicable local, state, and federal regulations. One option may be reuse treated soil onsite to consolidated impacted soils or bring low areas within an impacted zone to grade prior to placement of a cover.	Not appropriate for site conditions.

Note:

Bold text in table indicates the Process Option is included for further consideration.

GENERAL RESPONSE ACTIONS, REMEDIAL TECHNOLOGIES, AND PROCESS OPTIONS FOR GROUNDWATER
FORMER CIRCLE K SITE
Seattle, Washington

General Response Action	Remedial Technologies	Process Options	Description	Evaluation Comments
Institutional Controls	Addressed under Evaluation of General Response Actions, Remedial Technologies, and Process Options for Soil (see Table 1).			
Containment	Covers	Addressed under Evaluation of General Response Actions, Remedial Technologies, and Process Options for Soil (see Table 1).		
	Vertical Barriers	Addressed under Evaluation of General Response Actions, Remedial Technologies, and Process Options for Soil (see Table 1).		
Collection	**Extraction**	**Extraction Wells**	**Series of wells to extract contaminated groundwater.**	**Applicable for removal of petroleum-impacted groundwater for above-ground treatment; serve as hydraulic control. Retained for chemical oxidation and bioremediation.**
		Extraction/Injection Wells	**Inject treated or uncontaminated groundwater to increase flow to extraction wells.**	**Applicable for removal of petroleum-impacted groundwater for above-ground treatment; serve as hydraulic control. Retained for chemical oxidation and bioremediation.**
	Subsurface Drains	Interceptor Trenches	Perforated pipe in trenches backfilled with porous media to collect contaminated water.	Not appropriate for site conditions.
Aboveground Treatment (assuming extraction)	Physical/Chemical	**Adsorption/ Absorption - Granulated Activated Carbon (GAC)/Liquid Phase Carbon Adsorption**	**In liquid adsorption, solutes concentrate at the surface of a sorbent, thereby reducing their concentration in the bulk liquid phase. Ground water is pumped through a series of canisters or columns containing activated carbon to which dissolved organic contaminants adsorb. Periodic replacement or regeneration of saturated carbon is required.**	**Applicable for above-groundwater treatment of extracted petroleum-impacted groundwater. Retained for chemical oxidation and bioremediation recirculation.**
		Air Stripping/Air Sparging	Volatile organics are partitioned from extracted ground water by increasing the surface area of the contaminated water exposed to air. Aeration methods include packed towers, diffused aeration, tray aeration, and spray aeration.	Other more cost effective treatment methods are available.
		Ion Exchange	Ion exchange removes ions from the aqueous phase by exchange with counter ions on the exchange medium.	Other more cost effective treatment methods are available.
		Precipitation/ Coagulation/ Flocculation	This process transforms dissolved contaminants into an insoluble solid, facilitating the contaminant's subsequent removal from the liquid phase by sedimentation or filtration. The process usually uses pH adjustment, addition of a chemical precipitant, and flocculation.	Other more cost effective treatment methods are available.
		Separation	Separation techniques concentrate contaminated waste water through physical and chemical means. Includes distillation, filtration. ultrafiltration/ microfiltration, freeze crystallization, membrane pervaporation, and reverse osmosis.	Other more cost effective treatment methods are available.

GENERAL RESPONSE ACTIONS, REMEDIAL TECHNOLOGIES, AND PROCESS OPTIONS FOR GROUNDWATER
FORMER CIRCLE K SITE
Seattle, Washington

General Response Action	Remedial Technologies	Process Options	Description	Evaluation Comments
Aboveground Treatment (assuming extraction) (continued)	Physical/Chemical (continued)	Sprinkler Irrigation	The process that involves the pressurized distribution of volatile organic compound (VOC)-laden water through a standard sprinkler irrigation system.	Not appropriate for site conditions.
		UV Oxidation	Ultraviolet (UV) radiation, ozone, and/or hydrogen peroxide are used to destroy organic contaminants as water flows into a treatment tank. If ozone is used as the oxidizer, an ozone destruction unit is used to treat collected off-gases from the treatment tank and downstream units where ozone gas may collect, or escape.	Not appropriate for site conditions.
	Biological/ Bioremediation	Bioreactors	Contaminants in extracted groundwater are put into contact with microorganisms in attached or suspended growth biological reactors. In suspended systems, such as activated sludge, contaminated groundwater is circulated in an aeration basin. In attached systems, such as rotating biological contractors and trickling filters, microorganisms are established on an inert support matrix.	Not appropriate for site conditions.
		Constructed Wetlands	The constructed wetlands-based treatment technology uses natural geochemical and biological processes inherent in an artificial wetland ecosystem to accumulate and remove metals, explosives, and other contaminants from influent waters. The process can use a filtration or degradation process.	Not appropriate for site conditions.
In Situ Treatment	Physical/Chemical	Air Sparging	Air is injected into saturated matrices to remove contaminants through volatilization.	Applicable for desorbing low molecular weight petroleum hydrocarbons from saturated zone. Retained for SVE/air sparging.
		Bioslurping	Bioslurping combines the two remedial approaches of bioventing and vacuum-enhanced free-product recovery. Bioventing stimulates the aerobic bioremediation of hydrocarbon-contaminated soils. Vacuum-enhanced free-product recovery extracts light non-aqueous phase liquids (LNAPLs) from the capillary fringe and the water table.	LNAPL not present at the site.
		Soil Vapor Extraction (SVE)/Bioventing	**A vacuum is applied to wells screen in the unsaturated zone. The flow of oxygenated air through the vadose zone enhances natural biodegradation of petroleum hydrocarbon compounds in soil. SVE can also be used to apply a negative pressure in the subsurface to mitigate potential vapor intrusion.**	**Applicable to Site conditions.**
		Dual Phase Extraction	A high vacuum system is applied to simultaneously remove various combinations of contaminated groundwater, separate-phase petroleum product (LNAPLs), and hydrocarbon vapor from the subsurface.	LNAPL not present at the site.
		Fluid/Vapor Extraction	**A high vacuum system is applied to simultaneously remove liquid and gas from low permeability or heterogeneous formations.**	Other more cost-effective treatment options are available.

GENERAL RESPONSE ACTIONS, REMEDIAL TECHNOLOGIES, AND PROCESS OPTIONS FOR GROUNDWATER
FORMER CIRCLE K SITE
Seattle, Washington

General Response Action	Remedial Technologies	Process Options	Description	Evaluation Comments
In Situ Treatment (continued)	Physical/Chemical (continued)	Hot Water or Steam Flushing/Stripping	Steam is forced into an aquifer through injection wells to vaporize volatile and semivolatile contaminants. Vaporized components rise to the unsaturated zone where they are removed by vacuum extraction and then treated.	Other more cost-effective treatment options are available.
		Hydrofracturing	Injection of pressurized water through wells into low permeability and over-consolidated sediments. Cracks are filled with porous media that serve as substrates for bioremediation or to improve pumping efficiency.	Not appropriate for site conditions.
		In-Well Air Stripping	Air is injected into a double screened well, lifting the water in the well and forcing it out the upper screen. Simultaneously, additional water is drawn in the lower screen. Once in the well, some of the VOCs in the contaminated groundwater are transferred from the dissolved phase to the vapor phase by air bubbles. The contaminated air rises in the well to the water surface where vapors are drawn off and treated by a soil vapor extraction system.	Other more cost-effective treatment options are available.
		Passive/Reactive Treatment Walls	These barriers allow the passage of water while causing the degradation or removal of contaminants by employing such agents as zero-valent metals, chelators (ligands selected for their specificity for a given metal), sorbents, microbes, and others.	Not appropriate for site conditions.
	Biological/ Bioremediation	Co-metabolic Treatment	Injection of a dilute solution of primary substrate (e.g., toluene, methane) into the contaminated ground water zone to support the co-metabolic breakdown of targeted organic contaminants.	Not appropriate for chemicals of concern.
		Enhanced Biodegradation	**Rate of bioremediation of organic contaminants by microbes is enhanced by increasing the concentration of electron acceptors and nutrients in groundwater. Oxygen is the main electron acceptor for aerobic bioremediation. Nitrate serves as an alternative electron acceptor under anoxic conditions.**	**Applicable for biological treatment of both petroleum-impacted soils and groundwater.**
		Natural Attenuation	**Natural subsurface processes such as dilution, volatilization, biodegradation, adsorption, and chemical reactions with subsurface materials are allowed to reduce contaminant concentrations to acceptable levels.**	**Applicable.**
		Phytoremediation	Phytoremediation is a set of processes that uses plants to remove, transfer, stabilize and destroy organic/inorganic contamination in groundwater, surface water, and leachate.	Not appropriate for site conditions.

GENERAL RESPONSE ACTIONS, REMEDIAL TECHNOLOGIES, AND PROCESS OPTIONS FOR GROUNDWATER
FORMER CIRCLE K SITE
Seattle, Washington

General Response Action	Remedial Technologies	Process Options	Description	Evaluation Comments
Disposal/Discharge	Onsite	Storm Drain	Discharge of treated groundwater to storm drain.	Not appropriate for site conditions.
	Offsite	**Publicly Owned Treatment Works (POTW)**	**Discharge treated groundwater to POTW.**	**Applicable and retained for disposal/discharge of treated water generated during dewatering activities.**
Reuse/Recycling	Onsite/Offsite	Landscape Irrigation	Use of treated groundwater for landscape irrigation.	Not appropriate for site conditions.

Note:

Bold text in table indicates the Process Option is included for further consideration.

TABLE 10

POTENTIAL REMEDIAL PROCESS OPTIONS FOR SOIL AND GROUNDWATER
FORMER CIRCLE K SITE
Seattle, Washington

MTCA Preference[(a)]	General Technology Description	Soil and Groundwater Process Option
1	Reuse or Recycling	Soil Onsite: Soil for backfill/grading Offsite: Soil for daily landfill cover material
2	Destruction or Detoxification	Thermal Desorption *In Situ* Bioremediation *In Situ* Chemical Oxidation
3	Separation Followed by Reuse or Destruction	Excavation Soil Vapor Extraction Soil Vapor Extraction with Air Sparging Groundwater Extraction and Recirculation
4	Immobilization or Solidification	None
5	Onsite or Offsite Disposal	Offsite Management Unit (Landfill)
6	Containment	Asphalt or Concrete Cover
7	Institutional Controls and Monitoring	Deed Restriction Compliance Monitoring

Note:

Cleanup action components, in descending order, when assessing relative degree of long-term effectiveness [WAC 173-340-360(3)(C)(iv)].

TABLE 11

MTCA'S THRESHOLD CRITERIA
FORMER CIRCLE K SITE
Seattle, Washington

Threshold Criteria	**ALTERNATIVE 1 Excavation and Offsite Disposal**	**ALTERNATIVE 2 Soil Vapor Extraction**	**ALTERNATIVE 3 Soil Vapor Extraction with Air Sparging**	**ALTERNATIVE 4 *In Situ* Chemical Oxidation**	**ALTERNATIVE 5 *In Situ* Bioremediation**
Protection of Human Health and Environment	Excavation and offsite disposal of impacted soils eliminates direct human contact. Residual contaminant mass would remain under the building and off site beneath the adjacent streets.	Soil vapor extraction provides mass removal in the unsaturated zone (prevents leaching to groundwater) and mitigates potential vapor migration into site buildings. Asphalt pavement cover and deed restrictions prevent direct human contact with impacted media.	Soil vapor extraction with air sparging provides mass removal in the saturated and unsaturated zone and mitigates potential vapor migration into site buildings. Asphalt pavement cover and deed restrictions prevent direct human contact with impacted media.	Chemical oxidation transforms contaminant mass within the smear/saturated zone reducing the risk of exposure through the vapor intrusion pathway.	Bioremediation degrades contaminant mass within the smear/saturated zone reducing the risk of exposure through the vapor intrusion pathway.
Applicable State and Federal Laws	Yes.	Yes.	Yes	Yes	Yes.
Point of Compliance	The soil point of compliance is from the ground surface to the uppermost groundwater saturated zone throughout the site based on the vapor intrusion pathway. The groundwater point of compliance is throughout the site.	The soil point of compliance is from the ground surface to the uppermost groundwater saturated zone throughout the site based on the vapor intrusion pathway. The groundwater point of compliance is throughout the site.	The soil point of compliance is from the ground surface to the uppermost groundwater saturated zone throughout the site based on the vapor intrusion pathway. The groundwater point of compliance is throughout the site.	The soil point of compliance is from the ground surface to the uppermost groundwater saturated zone throughout the site based on the vapor intrusion pathway. The groundwater point of compliance is throughout the site.	The soil point of compliance is from the ground surface to the uppermost groundwater saturated zone throughout the site based on the vapor intrusion pathway. The groundwater point of compliance is throughout the site.
Compliance Monitoring	Confirmation soil samples would be collected and analyzed to evaluate compliance with soil cleanup levels. Quarterly groundwater confirmation monitoring would be conducted until cleanup standards are met; to assess treatment effectiveness, and evaluate groundwater quality.	Long-term vapor monitoring would be performed to estimate mass removal, assess treatment effectiveness (including vapor mitigation), and satisfy air discharge requirements. Quarterly groundwater confirmation monitoring would be conducted until cleanup standards are met; to assess treatment effectiveness, and evaluate groundwater quality.	Long-term vapor monitoring would be performed to estimate mass removal, assess treatment effectiveness (including vapor mitigation), and satisfy air discharge requirements. Quarterly groundwater confirmation monitoring would be conducted until cleanup standards are met; to assess treatment effectiveness, and evaluate groundwater quality.	Quarterly groundwater confirmation monitoring would be conducted until cleanup standards are met; to assess treatment effectiveness, and evaluate groundwater quality.	Quarterly groundwater confirmation monitoring would be conducted until cleanup standards are met; to assess treatment effectiveness, and evaluate groundwater quality.

TABLE 12

PROTECTIVENESS OF HUMAN HEALTH AND THE ENVIRONMENT
FORMER CIRCLE K SITE
Seattle, Washington

Sub-criteria	ALTERNATIVE 1 Excavation and Offsite Disposal	ALTERNATIVE 2 Soil Vapor Extraction	ALTERNATIVE 3 Soil Vapor Extraction with Air Sparging	ALTERNATIVE 4 *In Situ* Chemical Oxidation	ALTERNATIVE 5 *In Situ* Bioremediation
Degree to which existing risks are reduced.	Excavation and offsite disposal of impacted soils eliminates direct human contact, leaching to groundwater. The ongoing contaminant source to groundwater is reduced. Offsite contamination and contamination under the building is not addressed; therefore, a potential for vapor intrusion from residual contamination exists.	Soil vapor extraction provides mass removal in the unsaturated zone (prevents leaching to groundwater) and mitigates potential vapor migration into site buildings. Asphalt pavement cover and deed restrictions prevent direct human contact with impacted media.	Soil vapor extraction provides mass removal in the unsaturated zone (prevents leaching to groundwater) and prevents potential vapor migration into site buildings. Air sparging volatilizes groundwater contaminants in the saturated zone and promotes biodegradation in the saturated and unsaturated zones by increasing oxygen concentrations. Asphalt pavement cover and deed restrictions prevent direct human contact with impacted media.	Chemical oxidation involves reduction/oxidation (redox) reactions that chemically convert hazardous compounds to non-hazardous or less toxic compounds through transfer of electrons from one compound to another. Asphalt pavement cover and deed restrictions prevent direct human contact with impacted media.	Bioremediation degrades contaminant mass within the smear/saturated zone reducing the potential for contaminant migration to surface water. Asphalt pavement cover and deed restrictions prevent direct human contact with impacted media.
Time required in reducing risk and attaining cleanup standards.	Remediation and site restoration activities completed within 1 year. Performance groundwater monitoring conducted for an additional 5 years following remediation and restoration activities. It is estimated cleanup levels on site would be attained within 1 year of completion. Because excavation could not be performed in the off property impacted areas, full cleanup could not be performed in a reasonable time period.	Remedial construction activities completed within 1 year with long-term operation of soil vapor extraction system. Because the source mass is not removed, the restoration time frame is expected to be several decades.	Remedial construction activities completed within 1 year with long-term operation of air sparge and soil vapor extraction systems. It is estimated cleanup levels would be attained within 10 to 15 years.	Remedial construction activities will likely require multiple applications of chemicals over the course of several years. It is estimated cleanup levels would be attained within 3 to 5 years.	Remedial construction activities will likely require multiple applications of bioremediation components over the course of several years. It is estimated cleanup levels would be attained within 3 to 5 years.
Onsite and offsite risks from implementing alternative.	Onsite risk includes worker contact with impacted media during remediation activities. Offsite risk includes potential spillage of impacted soils during transport to landfill facility, potential dust exposure during excavation and biological amendment/backfill activities, and discharge of treated water.	Onsite risk includes worker contact with impacted media during remediation activities. Offsite risk to the community and environment include discharge of treated air.	Onsite risk includes worker contact with impacted media during remediation activities. Offsite risk to the community and environment include discharge of treated air.	Onsite risk includes worker contact with impacted media and oxidation chemicals during remediation activities. Offsite risk includes potential spillage of oxidation chemicals.	Onsite risk includes worker contact with impacted media during remediation activities. Offsite risk potential is low.
Improvement of overall environmental quality.	Will permanently reduce human exposure. Very little impact to environment for disposal of impacted soils at licensed landfill facility.	Soil vapor extraction will reduce contaminant mass over the long-term. Soil vapor extraction would reduce potential for vapor intrusion to site buildings.	Soil vapor extraction would reduce potential for vapor intrusion to site buildings. Air sparging with soil vapor extraction will reduce contaminant mass over the long-term.	*In situ* chemical oxidation within the smear/saturated zone reduces the contaminant mass over the long-term and reduces potential contaminant migration.	Biological degradation within smear/saturated zone reduces contaminant mass and potential contaminant migration.
"Benefit" Score	4	5	5	6	9

Note:

Alternatives are ranked on a scale of 1 to 10 based on how each alternative satisfies the listed criteria (1 = does not meet criteria, 10 = meets criteria completely).

TABLE 13

PERMANENT REDUCTION OF TOXICITY, MOBILITY, OR VOLUME
FORMER CIRCLE K SITE
Seattle, Washington

Sub-Criteria	ALTERNATIVE 1 Excavation and Offsite Disposal	ALTERNATIVE 2 Soil Vapor Extraction	ALTERNATIVE 3 Soil Vapor Extraction with Air Sparging	ALTERNATIVE 4 *In Situ* Chemical Oxidation	ALTERNATIVE 5 *In Situ* Bioremediation
Reduction or elimination of hazardous substance releases and sources of releases.	Excavation of impacted soils removes majority of contaminant mass from the Site. Residual petroleum hydrocarbons, offsite and under the building, would be naturally attenuated and/or biological degraded (i.e., portion of backfill amended with oxygen release compound or equivalent).	Contaminant mass is removed from the unsaturated zone through long-term operation of soil vapor extraction system.	Contaminant mass is removed from the unsaturated and saturated zones through long-term operation of soil vapor extraction and air sparging systems.	Contaminant mass is removed from the saturated zone through long-term operation of *in situ* chemical oxidation system.	Contaminant mass is removed through long-term operation of a bioremediation system.
Adequacy of alternative in destroying hazardous substances.	Extracted groundwater (dewatering during excavation activities) treated using granular activated carbon; mass transfer through adsorption as opposed to contaminant destruction. Introduction of biological amendment accelerates natural processes. Contaminant breakdown is complete.	Extracted vapor treated using granular activated carbon; mass transfer through adsorption as opposed to contaminant destruction.	Extracted vapor treated using granular activated carbon; mass transfer through adsorption as opposed to contaminant destruction.	Introduction and recirculation of chemical oxidant accelerated destruction of contaminant. Contaminant is chemically converted, through redox reactions, to less toxic compounds.	Introduction and recirculation of bacterial consortium and macronutrients accelerates natural processes. Contaminant breakdown is complete.
Irreversibility of waste treatment process.	Impacted soils are transported to and managed in a licensed landfill facility. Mass transfer through adsorption as opposed to contaminant destruction. Biological treatment is irreversible; enhancement of a natural process.	Mass transfer through adsorption as opposed to contaminant destruction.	Mass transfer through adsorption as opposed to contaminant destruction.	Chemical oxidation is irreversible.	Biological treatment is irreversible; enhancement of a natural process.

TABLE 13

PERMANENT REDUCTION OF TOXICITY, MOBILITY, OR VOLUME
FORMER CIRCLE K SITE
Seattle, Washington

Sub-Criteria	**ALTERNATIVE 1 Excavation and Offsite Disposal**	**ALTERNATIVE 2 Soil Vapor Extraction**	**ALTERNATIVE 3 Soil Vapor Extraction with Air Sparging**	**ALTERNATIVE 4 *In Situ* Chemical Oxidation**	**ALTERNATIVE 5 *In Situ* Bioremediation**
Characteristics and quantity of treatment residuals generated.	Biodegradation by-products are inert.	Extracted soil vapor would be treated prior to discharge. Treatment residuals are non-hazardous.	Extracted soil vapor would be treated prior to discharge. Treatment residuals are non-hazardous.	Chemical oxidation by-products are non-hazardous.	Biodegradation by-products are inert.
Score	4	7	7	8	9

Note:

Alternatives are ranked on a scale of 1 to 10 based on how each alternative satisfies the listed criteria (1 = does not meet criteria, 10 = meets criteria completely).

TABLE 14

LONG-TERM EFFECTIVENESS
FORMER CIRCLE K SITE
Seattle, Washington

Sub-Criteria	**ALTERNATIVE 1 Excavation and Offsite Disposal**	**ALTERNATIVE 2 Soil Vapor Extraction**	**ALTERNATIVE 3 Soil Vapor Extraction with Air Sparging**	**ALTERNATIVE 4 *In Situ* Chemical Oxidation**	**ALTERNATIVE 5 *In Situ* Bioremediation**
Degree of certainty that alternative will be successful.	Excavation of impacted soils removes majority of contaminant mass from on site. Residual contaminant mass will remain beneath the building and offsite. Residual petroleum hydrocarbons would be naturally attenuated and/or biological degraded via strategically placed amended backfill.	Contaminant mass removal via soil vapor extraction would be slow and require long-term operation; vapor mitigation maintained through continual operation of soil vapor extraction system.	Contaminant mass removal via soil vapor extraction and air sparging would require long-term operation; vapor mitigation maintained through continual operation of soil vapor extraction system.	Contaminant mass removal via chemical oxidation would require long-term operation of the *in situ* chemical oxidation system.	Natural attenuation data indicate biological degradation is occurring. Biological degradation of petroleum hydrocarbons is well documented.
Magnitude of residual risk.	Residual risk would be moderate. Potential vapor intrusion risk from remaining contaminant mass beneath the building. Residual petroleum hydrocarbons would be naturally attenuated and/or biological degraded.	Contaminant mass would be removed slowly over the long-term through operation of the soil vapor extraction system. Soil vapor extraction system manages vapor intrusion pathway risk.	Contaminant mass would be removed slowly over the long-term through operation of the soil vapor extraction system. Soil vapor extraction system manages vapor intrusion pathway risk.	Contaminant mass would be removed over the long-term through operation of the *in situ* chemical oxidation system.	Contaminant mass would be removed over the long-term through operation of the bioremediation system
Effectiveness of controls required to manage treatment residues or remaining wastes.	Excavation of impacted soils permanently removes contaminant mass from the site. Long-term reliability of licensed landfill facility is expected to be adequate. Biological amendments longevity is estimated at approximately 1 year. Operations and maintenance (O&M) is not required; groundwater monitoring performed.	Contaminant mass removal effective provided reliable operation of soil vapor extraction system. Vapor mitigation maintained by continual operation of soil vapor extraction system.	Contaminant mass removal effective provided reliable operation of soil vapor extraction and air sparging systems. Vapor mitigation maintained by continual operation of soil vapor extraction system.	Contaminant mass removal effective provided reliable operation of the *in situ* chemical oxidation system.	Contaminant mass removal effective provided reliable operation of the bioremediation system.
Score	4	6	6	6	8

Note:

Alternatives are ranked on a scale of 1 to 10 based on how each alternative satisfies the listed criteria (1 = does not meet criteria, 10 = meets criteria completely).

TABLE 15

SHORT-TERM RISKS
FORMER CIRCLE K SITE
Seattle, Washington

Sub-Criteria	**ALTERNATIVE 1 Excavation and Offsite Disposal**	**ALTERNATIVE 2 Soil Vapor Extraction**	**ALTERNATIVE 3 Soil Vapor Extraction with Air Sparging**	**ALTERNATIVE 4 *In Situ* Chemical Oxidation**	**ALTERNATIVE 5 *In Situ* Bioremediation**
Protection of human health during construction and implementation	Remediation worker risk due to potential contact with impacted media during excavation/ dewatering activities. Fugitive dust emissions could be generated during soil handling and mixing of biological amendment (i.e., fine powder) with backfill. Use of water could control fugitive dust. Offsite transport of impacted soils would present risks for spillage and vehicle accident.	Remediation worker risk due to potential contact with impacted media during installation, operation, and maintenance of the soil vapor extraction system.	Remediation worker risk due to potential contact with impacted media during installation, operation, and maintenance of the soil vapor extraction system.	Remediation worker risk due to potential contact with impacted media during installation and operation of the *in situ* chemical oxidation system.	Remediation worker risk due to potential contact with impacted media during installation and operation of the *in situ* bioremediation system.
Degree of risk prior to attainment of cleanup standards	High degree of risk to workers (contact with impacted media) and moderate risk to the community and environment (dust, impacted soil spillage, and discharge of treated water).	Moderate degree of risk to workers (contact with impacted media) and minimal risk to the community and environment (discharge of treated air).	Moderate degree of risk to workers (contact with impacted media) and minimal risk to the community and environment (discharge of treated air).	Moderate degree of risk to workers (contact with impacted media) and minimal risk to the community and environment (use of chemical oxidant).	Moderate degree of risk to workers (contact with impacted media) and minimal risk to the community and environment (use of macronutrient).
Time to achieve objectives	Soil cleanup levels would be attained following excavation of impacted soils except for residual contaminant mass beneath the building and off site. Soil cleanup levels in off property impacted areas would not be achieved in a reasonable timeframe.	Because the source mass is not removed, the restoration timeframe is expected to be several decades. Soil vapor extraction by itself does not address groundwater contamination.	It is estimated soil and groundwater cleanup levels would be attained within 10 to 15 years.	It is estimated soil and groundwater cleanup levels would be attained within 3 to 5 years.	It is estimated soil and groundwater cleanup levels would be attained within 3 to 5 years.
Score	4	6	6	8	9

Note:

Alternatives are ranked on a scale of 1 to 10 based on how each alternative satisfies the listed criteria (1 = does not meet criteria, 10 = meets criteria completely).

TABLE 16

ABILITY TO IMPLEMENT
FORMER CIRCLE K SITE
Seattle, Washington

Sub-Criteria	**ALTERNATIVE 1 Excavation and Offsite Disposal**	**ALTERNATIVE 2 Soil Vapor Extraction**	**ALTERNATIVE 3 Soil Vapor Extraction with Air Sparging**	**ALTERNATIVE 4 *In Situ* Chemical Oxidation**	**ALTERNATIVE 5 *In Situ* Bioremediation**
Consideration of whether alternative is technically possible.	Technically possible, although excavation is difficult due to physical constraints and proximity to buildings and public right-of-way. Sheet pile shoring will be implemented to prevent unstable excavation wall conditions.	Soil vapor extraction system installation, operation, and monitoring are relatively straightforward.	Soil vapor extraction and air sparging system installation, operation, and monitoring are relatively straightforward.	*In situ* chemical oxidation system installation, operation, and monitoring are relatively straightforward.	*In situ* bioremediation system installation, operation, and monitoring are relatively straightforward.
Availability of necessary offsite facilities, services, and materials.	Adequate offsite facilities, services, and materials are available.	Adequate offsite facilities, services, and materials are available.	Adequate offsite facilities, services, and materials are available.	Adequate offsite facilities, services, and materials are available.	Adequate offsite facilities, services, and materials are available.
Administrative and regulatory requirements.	Requirements include, but not limited to, the following: general construction permit, National Pollutant Discharge Elimination System (NPDES) permit. Permitting process may require up to 6 months.	Requirements include, but not limited to, the following: general construction permit, air discharge permit. Permit process may require up to 6 months.	Requirements include, but not limited to, the following: general construction permit, air discharge permit. Permit process may require up to 6 months.	Requirements include, but not limited to, the following: general construction permit and Underground Injection Control (UIC) permit. Permit process may require up to 6 months.	Requirements include, but not limited to, the following: general construction permit, and UIC permit. Permit process may require up to 6 months.
Scheduling, size, and complexity.	Dry season is more suitable for construction activities. Scheduling/traffic control for transportation of impacted soils offsite (in excess of 150 truck loads). Maintaining access to on site businesses during construction activities.	Dry season is more suitable for construction activities. Installation of five soil vapor extraction wells. System installation would consist of trenching, piping, backfilling and construction of an onsite enclosure to house system components.	Dry season is more suitable for construction activities. Installation of five soil vapor extraction wells and 12 air sparging wells. System installation would consist of trenching, piping, backfilling, and construction of an onsite enclosure to house system components.	Dry season is more suitable for construction activities. Installation of five vertical multi-purpose wells and two horizontal wells. System installation would consist of trenching, piping, backfilling, and construction of an onsite enclosure to house system components.	Dry season is more suitable for construction activities. Installation of five vertical multi-purpose wells and two horizontal wells. System installation would consist of trenching, piping and backfilling and construction of an onsite enclosure to house system components.
Monitoring requirements.	Confirmation soil samples would be collected and analyzed to evaluate compliance with soil cleanup levels. Groundwater monitoring would be performed to assess the effectiveness of the impacted soil removal and evaluate groundwater quality.	Long-term vapor monitoring would be performed to estimate mass removal, assess treatment effectiveness (including vapor mitigation), and satisfy air discharge requirements. Long-term groundwater monitoring would be performed to assess treatment effectiveness, and evaluate groundwater quality.	Long-term vapor monitoring would be performed to estimate mass removal, assess treatment effectiveness (including vapor mitigation), and satisfy air discharge requirements. Long-term groundwater monitoring would be performed to assess treatment effectiveness, and evaluate groundwater quality.	Long-term groundwater monitoring would be performed to assess treatment effectiveness, and evaluate groundwater quality.	Long-term groundwater monitoring would be performed to assess treatment effectiveness and evaluate groundwater quality.
Access for construction, operations, and monitoring.	Available. Periodic site access for groundwater monitoring. Traffic control required for entrance and egress of construction equipment and haul trucks.	Available. Access required for well and system installation. Periodic site access required for soil vapor extraction system operation, maintenance, and groundwater monitoring.	Available. Access required for well and system installation. Periodic site access required for soil vapor extraction and air sparging system operation, maintenance, and groundwater monitoring.	Available. Access required for well and system installation. Periodic site access required for *in situ* chemical oxidation system operation, maintenance, and groundwater monitoring.	Available. Access required for well and system installation. Periodic site access required for bioremediation system operation, maintenance, and groundwater monitoring.
Integration with existing facility operations and other current or potential remedial actions.	Site utilities would be temporarily relocated/restored as part of steel sheet pile installation and excavation activities. Highest degree of disturbance to site infrastructure of the evaluated alternatives.	Moderate degree of disturbance to site infrastructure during well installation and system construction. Minimal disturbance during long-term system operation and maintenance and monitoring activities.	Moderate degree of disturbance to site infrastructure during well installation and system construction. Minimal disturbance during long term system operation and maintenance and monitoring activities.	Moderate degree of disturbance to site infrastructure during well installation and system construction. Minimal disturbance during long-term system operation and maintenance and monitoring activities.	Moderate degree of disturbance to site infrastructure during well installation and system construction. Minimal disturbance during long-term system operation and maintenance and monitoring activities.
“Benefit” Score	4	8	6	8	8

Note:

Alternatives are ranked on a scale of 1 to 5 based on how each alternative satisfies the listed criteria (1 = does not meet criteria, 5 = meets criteria completely).

TABLE 17

POTENTIAL ACTION-SPECIFIC APPLICABLE, RELEVANT, AND APPROPRIATE REQUIREMENTS (ARARS)
FORMER CIRCLE K SITE
Seattle, Washington

Federal/State Citation	ALTERNATIVE 1 Excavation and Offsite Disposal	ALTERNATIVE 2 Soil Vapor Extraction	ALTERNATIVE 3 Soil Vapor Extraction with Air Sparging	ALTERNATIVE 4 *In Situ* Chemical Oxidation	ALTERNATIVE 5 *In Situ* Bioremediation
Clean Water Act (CWA) National Pollutant Discharge Elimination System (NPDES)	Applicable for groundwater treatment and discharge.				
Safe Drinking Water Act (National Primary and Secondary Drinking Water Regulations)	The remedial actions are being completed to reduce chemical concentrations in soil and groundwater to MTCA Method A (unrestricted use) cleanup levels.				
Resource Conservation and Recovery Act (RCRA)	Waste generated during the remedial action will be characterized and disposed per RCRA, as implemented by the State of Washington Danger Waste Regulations (WAC 173-303).				
Clean Air Act, as Amended	Applicable for vapor treatment and discharge; production of air emissions.				
Endangered Species Act (ESA)	Threatened or endangered species are known to inhabit the general area, but not the Cornet Bay Marina. Site activities will not jeopardize threatened or endangered species.				
National Historic Preservation Act, Archeological Resources Protect (36 CFR 800)	Historically significant archeological resources are not known to be present at the site. Historically significant properties will not be disturbed by any remedial action proposed.				
Occupational Safety and Health Act (29 CFR 1910)	Site activities will be performed under appropriate Occupation Safety and Health Act standards and WISHA requirements.				
Standards Applicable to Transporters of Hazardous Waste (29 CFR 107, 29 CRF 171)	Hazardous waste, if any, generated at the site will be characterized/waste profiled as required to determine packaging, handling, and transportation requirements.				
STATE or LOCAL					
Dangerous Waste Regulations (WAC 173-303)	Waste generated during the remedial action will be characterized and disposed per RCRA, as implemented by the State of Washington Danger Waste Regulations (WAC 173-303).				
Model Toxics Control Act (MTCA) (WAC 173-340)	Applicable to all aspects of the project. Each remedial alternative would be completed in accordance with MTCA regulations.				
State Clean Air Act (RCW 70.94)	Applicable for vapor treatment and discharge; production of air emissions.				
Washington Industrial Safety and Health Act (WISHA) (WAC 296-62)	Site activities will be performed under appropriate Washington Industrial and Safety and Health Act standards.				
Water Pollution Control Act (RCW 90.48)	Applicable for discharge of effluents from remediation activities.				
Water Quality Standards for Groundwater of the State of Washington (WAC 173-200)	The remedial actions are being completed to reduce chemical concentrations in groundwater to MTCA Method A (unrestricted use) cleanup levels.				
Underground Injection Control (WAC 173-218)	Applicable for chemical oxidation and bioremediation recirculation systems.				
Maximum Environmental Noise Levels (WAC 173-60)	Relevant depending on remedial action.				

TABLE 17

POTENTIAL ACTION-SPECIFIC APPLICABLE, RELEVANT, AND APPROPRIATE REQUIREMENTS (ARARS)
FORMER CIRCLE K SITE
Seattle, Washington

Federal/State Citation	**ALTERNATIVE 1 Excavation and Offsite Disposal**	**ALTERNATIVE 2 Soil Vapor Extraction**	**ALTERNATIVE 3 Soil Vapor Extraction with Air Sparging**	**ALTERNATIVE 4 *In Situ* Chemical Oxidation**	**ALTERNATIVE 5 *In Situ* Bioremediation**
Shoreline Management Act (RCW 90.58 and WAC 173-60)	Act directs local governments to develop and administer local shoreline master programs for regulation of uses of shoreline of the state.				
Minimum Standards for Construction and Maintenance of Wells (WAC 173-160)	Soil borings and well construction to be completed in accordance with these regulations.				
Maximum Environmental Noise Levels (WAC 173-60)	Applicable to all alternatives, especially those that include installation of a sheet pile bulkhead.				
State Environmental Policy Act (SEPA) (WAC 197-11)	Applicable to each alternative.				
Puget Sound Clean Air Regulatory Requirements	Applicable for vapor treatment and discharge; production of air emissions.				
Land Development Standards (SBC)	Compliance with substantive conditions of local permits; stormwater regulations, demolition, clearing, and grading.				
Building and Construction (SBC)	Compliance with substantive conditions of local building codes; building permits.				

Notes:

ARARs = Applicable, relevant, and appropriate requirements
CFR = Code of Federal Regulations
WAC = Washington Administrative Code
RCW = Revised Code of Washington
SBC = Seattle Building Code

TABLE 18

DISPROPORTIONATE COST ANALYSIS
FORMER CIRCLE K SITE
Seattle, Washington

Benefit	Benefit Weighting Factor	ALTERNATIVE 1 Excavation and Offsite Disposal	ALTERNATIVE 2 Soil Vapor Extraction	ALTERNATIVE 3 Soil Vapor Extraction with Air Sparging	ALTERNATIVE 4 *In Situ* Chemical Oxidation	ALTERNATIVE 5 *In Situ* Bioremediation
Protectiveness (Table 12)	25%	4	5	5	6	9
Permanence (Table 13)	20%	4	7	7	8	9
Long-Term Effectiveness (Table 14)	30%	4	6	6	6	8
Short-Term Risks (Table 15)	15%	4	6	6	8	9
Ability to Implement (Table 16)	5%	4	8	6	8	8
Consideration of Public Concerns	5%	4	6	6	6	6
Total Weighted Benefits	**100%**	**4.0**	**6.1**	**6.0**	**6.8**	**8.5**
Cost (Million $)		**$2.498**	**$1.136**	**$1.232**	**$1.635**	**$1.657**
Benefit/Cost Ratio		16	53	48	42	51
Benefit/Cost Ratio Relative to the Most Permanent Alternative		0.3	1.0	0.9	0.8	1.0

TABLE 19

EXCAVATION AND OFFSITE DISPOSAL (ESTIMATED COST), FEASIBILITY STUDY
FORMER CIRCLE K SITE
Seattle, Washington

Item Description	Quantity	Unit	Unit Cost	Extension	Assumptions
A. Preliminary Activities					
Cleanup Action Plan (CAP)	1	lump sum	$20,000	$20,000	
Design (plans and specifications)	1	lump sum	$120,000	$120,000	
Topographical Survey	1	lump sum	$10,000	$10,000	
Permitting					
General Demolition/Grading/Construction	1	lump sum	$20,000	$20,000	
National Pollutant Discharge Elimination System (NPDES)	1	lump sum	$10,000	$10,000	
City of Seattle Street use Permits	1	lump sum	$15,000	$15,000	
Coordination with King County Metro	1	lump sum	$10,000	$10,000	
Health and Safety Plan	1	lump sum	$5,000	$5,000	
Deed Restriction/Soil Management Plan	1	lump sum	$30,000	$30,000	
Item A. Estimated Cost				**$240,000**	
B. Impacted Soil Excavation and Disposal/Amend and Backfill/Compaction					
Mobilization/Demobilization	1	lump sum	$98,018	$98,018	8 percent of construction cost (Item C, excluding construction management).
Private Utility Locate	1	lump sum	$2,000	$2,000	
Site Security	1	lump sum	$10,000	$10,000	Temporary fencing, signage, etc.
Erosion Control	1	lump sum	$10,000	$10,000	Construction entrance, silt fence, catch basin protection, stockpile management, etc.
Traffic Control	20	day	$500	$10,000	Traffic control for dump trucks entering and leaving site.
Protect Existing Public Trees	1	lump sum	$5,000	$5,000	3 trees.
Protect Existing Public Power Poles/Traffic Light/Overhead Bus Power	1	lump sum	$15,000	$15,000	Perform in accordance with Seattle City Light requirements.
Remove and Replace Existing Sign	1	lump sum	$5,000	$5,000	
Abandon Monitoring Wells	5	well	$1,000	$5,000	Wells MW-4, MW-13, MW-19, MW-20, and MW-21 require abandonment, located within designated excavation area.
Utility Disconnect/Re-Route	1	lump sum	$40,000	$40,000	Estimate.
Steel Sheet Pile					Length = 350 feet; Depth =20 feet.
Mobilization	1	lump sum	$28,000	$28,000	8. percent of sheet pile install cost.
Materials/Installation/Removal	7,000	square feet	$50	$350,000	Onsite excavation only - 4000 sf 350ft perimeter.
Shoring Monitoring Survey	1	lump sum	$8,000	$8,000	Survey for monitoring of potential settlement of City of Seattle street.
Sawcut Existing Pavement	350	linear feet	$5	$1,750	
Demo and Remove Existing Pavement (4" to 6")	444	square yard	$8	$3,556	
Haul and Dispose Pavement	96	ton	$15	$1,436	
Excavation (landfill disposal)	2,963	cubic yard	$15	$44,444	Load directly to trucks. Assume material previously profiled. Excavate to 15' bgs.
Waste Profiling for Landfill Disposal	1	lump sum	$1,000	$1,000	Use existing laboratory analytical data for landfill waste profiling.
Hauling	6,111	ton	$15	$91,667	Hauling from site to landfill. Assumes wet soil.
Landfill Disposal	6,111	ton	$45	$275,000	Non-hazardous waste - Subtitle D landfill facility in Seattle, Washington (Robanco/Allied Waste).
Soil Chemical Analyses (confirmation sampling)					
TPH-Gasoline	50	sample	$35	$1,750	Discrete soil samples from excavation floor and sidewalls.
BTEX	50	sample	$35	$1,750	
TPH-Diesel	50	sample	$35	$1,750	
Metals	50	sample	$75	$3,750	
On-Site Temporary Water Treatment System Construction/Dismantling	1	lump sum	$30,000	$30,000	Pumps, hoses, weir tanks, bag filters, and activated carbon vessels.
Discharge of Treated Water	1	lump sum	$20,000	$20,000	
Dewatering/Treatment System Management	9	week	$3,000	$27,000	
NPDES Water Chemical Analyses					
TPH-Gasoline	18	sample	$35	$630	Weekly collection, influent and effluent water samples.
BTEX	18	sample	$35	$630	
TPH-Diesel	18	sample	$35	$630	
Imported Backfill (material and transport)	4,800	ton	$30	$144,000	Imported fill. Includes 20% compaction factor in quantity estimate.
Placement and Compaction (imported fill)	3,393	cubic yard	$10	$33,926	
Biological Amendment (material and transport)	660	lb	$12	$7,920	660 pounds amendment @ 3 pounds/tn of backfill; 1-foot amended backfill thickness placed a floor of excavation.
Placement/Mixing Amendment/Compaction	163	cubic yard	$10	$1,630	
CSBC Pavement Subgrade (6" thick)	82	cubic yard	$45	$3,675	
Asphalt Concrete Pavement (4" thick)	444	square yard	$21	$9,333	Replace parking lot pavement.
Utility Restoration	1	lump sum	$30,000	$30,000	
Construction Management	1	lump sum	$132,324	$132,324	Project management, oversight, direct expenses, etc. 10 percent of construction cost (Item B).
Item B. Estimated Cost				**$1,455,569**	
C. Monitoring Well Installation/Groundwater Sampling and Chemical Analyses					
Monitoring Well Installation					Replacement wells for MW-4, MW-13, MW-19, MW-20, MW-21.
Mobilization/Demobilization	1	lump sum	$2,000	$2,000	
Well Installation	5	well	$2,500	$12,500	
Consultant Labor and Equipment	5	day	$1,200	$6,000	
Groundwater Sampling and Chemical Analyses					Following completion of remediation activities, quarterly for 2 years from twelve monitoring wells. After 2 years, semi annual for 10 years.
TPH-Gasoline	336	sample	$35	$11,760	
BTEX	336	sample	$35	$11,760	
TPH-Diesel	336	sample	$35	$11,760	
Natural Attenuation Parameters	336	sample	$150	$50,400	
Consultant Labor and Equipment	28	event	$2,500	$70,000	
Groundwater Monitoring Report	28	report	$16,000	$319,500	
Investigation-Derived Waste Water Handling/Disposal	28	events	$1,000	$20,000	1 disposal event per sampling event.
Item C. Estimated Cost				**$515,680**	
D. Other					
Project Management	2	years	$6,000	$12,000	
Construction Report	1	report	$15,000	$15,000	Includes as-built drawings.
Groundwater Monitoring Report	28	report	$4,000	$112,000	Quarterly for 2 years. After 2 years, semi annual for 10 years.
Washington State Sales Tax	1	lump sum	$147,012	$147,012	10.1 percent of construction capital cost (Item B).
Item D. Estimated Cost				**$286,012**	
Total Estimated Cost				**$2,498,000**	

Notes:
1. Estimated cost was prepared at -30/+50% for relative comparison amongst alternatives. The prepared cost estimate is not intended for budgetary purposes.
2. An engineering cost estimate will be prepared in conjunction with CAP preparation and design (technical specifications and drawings).

TABLE 20

SOIL VAPOR EXTRACTION (ESTIMATED COST), FEASIBILITY STUDY
FORMER CIRCLE K SITE
Seattle, Washington

Item Description	Quantity	Unit	Unit Cost	Extension	Assumptions
A. Preliminary Activities					
Cleanup Action Plan (CAP)	1	lump sum	$20,000	$20,000	
Design (plans and specifications)	1	lump sum	$80,000	$80,000	
Topographical Survey	1	lump sum	$10,000	$10,000	
Permitting					
General Demolition/Grading/Construction	1	lump sum	$10,000	$10,000	
Air Discharge	1	lump sum	$5,000	$5,000	
Health and Safety Plan	1	lump sum	$5,000	$5,000	
Deed Restriction/Soil Management Plan	1	lump sum	$30,000	$30,000	
Item A. Estimated Cost				**$160,000**	
B. Soil Vapor Extraction System Construction					
Mobilization/Demobilization	1	lump sum	$13,225	$13,225	8. percent of construction cost (Item C, excluding construction management).
Private Utility Locate	1	lump sum	$2,000	$2,000	
Extraction Well Installation	5	well	$2,900	$14,500	
Investigation-Derived Waste (IDW) Water Transport and Disposal	1	Unit Cost	$1,000	$1,000	Decontamination and development water.
Investigation-Derived Waste (IDW) Soil Transport and Disposal	1	Unit Cost	$3,000	$3,000	6 drums per well SVE well; $100 per drum T&D.
Power Drop/Electrical - Upgrade Existing	1	lump sum	$3,000	$3,000	
Enclosure Construction	1	lump sum	$10,000	$10,000	
Vaults/Well Head Appurtenances	5	each	$1,400	$7,000	
Saw Cut pavement	500	linear feet	$5	$2,500	
Demo and Remove Existing Pavement (4" to 6")	83	square yard	$8	$667	3' wide pavement cut.
Haul and Dispose Pavement	18	ton	$13	$233	
Excavation (landfill disposal)	31	cubic yard	$15	$463	
Waste Profiling for Landfill Disposal	1	lump sum	$1,000	$1,000	Use existing laboratory analytical data for landfill waste profiling.
Hauling	52	ton	$15	$781	Hauling from site to landfill .
Landfill Disposal	52	ton	$45	$2,344	Non-hazardous waste - Subtitle D landfill facility in Seattle, Washington (Robanco/Allied Waste).
Piping	650	linear feet	$5	$3,250	2" Schedule 80 PVC.
Imported Backfill (material and transport)	50	ton	$30	$1,500	Imported fill. Includes 20% compaction factor in quantity estimate.
Placement and Compaction (imported fill)	22	cubic yard	$10	$216	
CSBC Pavement Subgrade (6" thick)	6	cubic yard	$45	$271	
Asphalt Concrete Pavement (4" thick)	83	square yard	$67	$5,583	Pavement replacement over trench.
Knockout Tank/Vacuum Blower	1	lump sum	$25,000	$25,000	
Activated Carbon Vessels	1	lump sum	$18,000	$18,000	Two, 2,000 carbon vessels in series.
System Installation	1	lump sum	$20,000	$20,000	
Consultant Labor (oversight)	30	day	$1,500	$45,000	
Item B. Estimated Cost				**$180,534**	
C. Long-Term (Net Present Worth)					Soil vapor extraction system operation for 10 years.
SVE System O&M	10	year	$3,250	$28,500	General contractor labor, equipment, replacement equipment, activated carbon changeout, etc.
SVE System Consultant Labor (monthly sampling)	10	year	$6,480	$56,800	one person, 8 hours per event, $135/hr, bi-monthly
SVE System Chemical Analyses	10	sample	$6,000	$52,600	Bi-monthly inf. and eff. vapor samples for VOCs. Select extraction well sampling and chem. analyses. 5 sample/event.
Investigation-Derived Waste GAC Handling/Disposal	10	year	$200	$1,800	Assume annual replacement of both 2000 lb carbon vessels @ $100/tn for disposal, cost increased for small quantity.
SVE System Monthly Discharge Reports	10	report	$6,000	$52,600	Semi-annual for 10 years.
Groundwater Sampling and Chemical Analyses					Quarterly for 2 years from twelve monitoring wells. After 2 years, semi annual for 10 years.
TPH-Gasoline	336	sample	$35	$11,760	
BTEX	336	sample	$35	$11,760	
TPH-Diesel	336	sample	$35	$11,760	
Consultant Labor and Equipment	28	event	$2,500	$70,000	
Groundwater Monitoring Report	28	report	$16,000	$319,500	
Investigation-Derived Waste Water Handling/Disposal	28	events	$3,000	$59,900	1 disposal event per sampling event.
Item C. Estimated Cost				**$676,980**	
D. Other					
Construction Report	1	report	$25,000	$25,000	Includes as-built drawings.
O&M Manuals (SVE system)	1	report	$15,000	$15,000	
Project Coordination	10	years	$6,000	$60,000	
Washington State Sales Tax	1	lump sum	$18,234	$18,234	10.1 percent of construction capital cost (Item B).
Item D. Estimated Cost				**$118,234**	
Total Estimated Cost				**$1,136,000**	

Notes:
1. Estimated cost was prepared at -30/+50% for relative comparison amongst alternatives. The prepared cost estimate is not intended for budgetary purposes.
2. Net present worth cost prepared using discount rate of 2.5 percent (%).
3. An engineering cost estimate will be prepared in conjunction with CAP preparation and design (technical specifications and drawings).

TABLE 21

SOIL VAPOR EXTRACTION AND AIR SPARGING (ESTIMATED COST), FEASIBILITY STUDY
FORMER CIRCLE K SITE
Seattle, Washington

Item Description	Quantity	Unit	Unit Cost	Extension	Assumptions
A. Preliminary Activities					
Cleanup Action Plan (CAP)	1	lump sum	$20,000	$20,000	
Design (plans and specifications)	1	lump sum	$80,000	$80,000	
Topographical Survey	1	lump sum	$10,000	$10,000	
Permitting					
General Demolition/Grading/Construction	1	lump sum	$10,000	$10,000	
Air Discharge	1	lump sum	$5,000	$5,000	
Health and Safety Plan	1	lump sum	$5,000	$5,000	
Deed Restriction/Soil Management Plan	1	lump sum	$30,000	$30,000	
Item A. Estimated Cost				**$160,000**	
B. Air Sparge/Soil Vapor Extraction System Construction					
Mobilization/Demobilization	1	lump sum	$14,444	$14,444	8. percent of construction cost (Item C, excluding construction management).
Private Utility Locate	1	lump sum	$2,000	$2,000	
Extraction Well Installation	5	well	$2,500	$12,500	
Air Sparge Well Installation	10	well	$2,500	$25,000	
Investigation-Derived Waste (IDW) Water Transport and Disposal	1	Unit Cost	$1,000	$1,000	Decontamination and development water.
Investigation-Derived Waste (IDW) Soil Transport and Disposal	1	Unit Cost	$9,000	$9,000	6 drums per well SVE/AS well; $100 per drum T&D.
Power Drop/Electrical - Upgrade Existing	1	lump sum	$3,000	$3,000	
Enclosure Construction	1	lump sum	$10,000	$10,000	
Vaults/Well Head Appurtenances	15	each	$1,400	$21,000	
Saw Cut pavement	700	linear feet	$5	$3,500	
Demo and Remove Existing Pavement (4" to 6")	117	square yard	$8	$933	3' wide pavement cut.
Haul and Dispose Pavement	25	ton	$15	$377	
Excavation (landfill disposal)	43	cubic yard	$15	$648	Load directly to trucks. Assume material previously profiled. Pipe trench 2' wide, 1.67' deep (excludes pavement thickness).
Waste Profiling for Landfill Disposal	1	lump sum	$1,000	$1,000	Use existing laboratory analytical data for landfill waste profiling.
Hauling	73	ton	$15	$1,094	Hauling from site to landfill.
Landfill Disposal	73	ton	$45	$3,282	Non-hazardous waste - Subtitle D landfill facility in Seattle, Washington (Robanco/Allied Waste).
Piping	1,950	linear feet	$5	$9,750	2" Schedule 80 PVC.
Imported Backfill (material and transport)	70	ton	$30	$2,100	Imported fill. Includes 20% compaction factor in quantity estimate.
Placement and Compaction (imported fill)	17	cubic yard	$10	$173	
CSBC Pavement Subgrade (6" thick)	8	cubic yard	$45	$379	
Asphalt Concrete Pavement (4" thick)	117	square yard	$67	$7,817	Pavement replacement over trench.
Knockout Tank/Vacuum Blower	1	lump sum	$25,000	$25,000	
Activated Carbon Vessels	1	lump sum	$18,000	$18,000	Two, 2,000 carbon vessels in series.
System Installation	1	lump sum	$25,000	$25,000	
Consultant Labor (oversight)	30	day	$1,500	$45,000	
Item B. Estimated Cost				**$241,998**	
C. Long-Term (Net Present Worth)					Soil vapor extraction system operation for 10 years.
SVE/AS System O&M	10	year	$3,700	$32,400	General contractor labor, equipment, replacement equipment, activated carbon changeout, etc.
SVE/AS System Consultant Labor (monthly sampling)	10	year	$8,100	$70,900	One person, 10 hours per event, $135/hr.
SVE/AS System Chemical Analyses	10	sample	$6,000	$52,600	Bi-monthly inf. and eff. vapor samples for VOCs. Select extraction well sampling and chem. analyses. 5 sample/event.
Investigation-Derived Waste GAC Handling/Disposal	10	year	$200	$1,800	Assume annual replacement of both 2,000 lb carbon vessels @ $100/tn for disposal, cost increased for small quantity.
SVE System Monthly Discharge Reports	10	report	$6,200	$54,300	Semi-annual for 10 years.
Groundwater Sampling and Chemical Analyses					Quarterly for 2 years from twelve monitoring wells. After 2 years, semi annual for 10 years.
TPH-Gasoline	336	sample	$35	$11,760	
BTEX	336	sample	$35	$11,760	
TPH-Diesel	336	sample	$35	$11,760	
Consultant Labor and Equipment	28	event	$2,800	$78,400	
Groundwater Monitoring Report	28	report	$16,000	$319,500	
Investigation-Derived Waste Water Handling/Disposal	28	events	$3,000	$59,900	1 disposal event per sampling event
Item C. Estimated Cost				**$705,080**	
D. Other					
Construction Report	1	report	$25,000	$25,000	Includes as-built drawings.
O&M Manuals (SVE system)	1	report	$15,000	$15,000	
Project Coordination	10	year	$6,000	$60,000	
Washington State Sales Tax	1	lump sum	$24,442	$24,442	10.1 percent of construction capital cost (Item B).
Item D. Estimated Cost				**$124,442**	
Total Estimated Cost				**$1,232,000**	

Notes:
1. Estimated cost was prepared at -30/+50% for relative comparison amongst alternatives. The prepared cost estimate is not intended for budgetary purposes.
2. Net present worth cost prepared using discount rate of 2.5 percent (%).
3. An engineering cost estimate will be prepared in conjunction with CAP preparation and design (technical specifications and drawings).

TABLE 22

IN SITU CHEMICAL OXIDATION (ESTIMATED COST), FEASIBILITY STUDY
FORMER CIRCLE K SITE
Seattle, Washington

Item Description	Quantity	Unit	Unit Cost	Extension	Assumptions
A. Preliminary Activities					
Cleanup Action Plan (CAP)	1	lump sum	$20,000	$20,000	
Design (plans and specifications)	1	lump sum	$80,000	$80,000	
Topographical Survey	1	lump sum	$10,000	$10,000	
Permitting					
General Demolition/Grading/Construction	1	lump sum	$10,000	$10,000	
Air Discharge	1	lump sum	$5,000	$5,000	
Underground Injection Control (UIC)	1	lump sum	$5,000	$5,000	
Health and Safety Plan	1	lump sum	$5,000	$5,000	
Deed Restriction/Soil Management Plan	1	lump sum	$30,000	$30,000	
Item A. Estimated Cost				**$165,000**	
B. Chemical Oxidation System Construction					
Mobilization/Demobilization	1	lump sum	$16,731	$16,731	8. percent of construction cost (Item C, excluding construction management).
Private Utility Locate	1	lump sum	$2,000	$2,000	
Multi-Purpose Vertical Well Installation	5	well	$2,900	$14,500	4-inch diameter well casing and screen.
Horizontal Well Installation	3	well	$25,000	$75,000	4-inch diameter well casing and screen.
Investigation-Derived Waste (IDW) Water Transport and Disposal	1	Unit Cost	$1,000	$1,000	Decontamination and development water for vertical and horizontal wells.
Investigation-Derived Waste (IDW) Soil Transport and Disposal	1	Unit Cost	$4,000	$4,000	6 drums per well multi-purpose well; $100 per drum T&D.
Power Drop/Electrical - Upgrade Existing	1	lump sum	$3,000	$3,000	Power drop exists at site but will need to be evaluated for viability for use. Assumes new power drop will be necessary.
Enclosure Construction	1	lump sum	$10,000	$10,000	
Vaults/Well Head Appurtenances	8	each	$1,400	$11,200	
Saw Cut pavement	560	linear feet	$5	$2,800	
Demo and Remove Existing Pavement (4" to 6")	93	square yard	$8	$747	3' wide pavement cut.
Haul and Dispose Pavement	20	ton	$15	$301	
Excavation (landfill disposal)	35	cubic yard	$15	$519	Load directly to trucks. Assume material previously profiled. Pipe trench 2' wide, 1.67' deep (excludes pavement thickness).
Waste Profiling for Landfill Disposal	1	lump sum	$1,000	$1,000	Use existing laboratory analytical data for landfill waste profiling.
Hauling	58	ton	$15	$875	Hauling from site to landfill.
Landfill Disposal	58	ton	$45	$2,626	Non-hazardous waste - Subtitle D landfill facility in Seattle, Washington (Robanco/Allied Waste).
Piping	1,040	linear feet	$5	$5,200	2" Schedule 80 PVC.
Imported Backfill (material and transport)	56	ton	$30	$1,680	Imported fill. Includes 20% compaction factor in quantity estimate.
Placement and Compaction (imported fill)	14	cubic yard	$10	$138	
CSBC Pavement Subgrade (6" thick)	7	cubic yard	$45	$303	
Asphalt Concrete Pavement (4" thick)	93	square yard	$67	$6,253	Pavement replacement over trench.
Knockout Tank/Vacuum Blower	1	lump sum	$25,000	$25,000	
Activated Carbon Vessels	1	lump sum	$18,000	$18,000	Two, 2,000 carbon vessels in series.
System Installation	1	lump sum	$25,000	$25,000	
Consultant Labor (oversight)	30	day	$1,500	$45,000	
Item B. Estimated Cost				**$272,874**	
C. Long-Term (Net Present Worth)					Soil vapor extraction system operation for 5 years.
Chemical Oxidation System O&M	5	year	$115,000	$534,300	General contractor labor, chemical oxidation products, equipment, replacement equipment, activated carbon changeout, etc.
Chemical Oxidation System Consultant Labor (monthly site visit)	5	year	$12,960	$60,300	one person, 8 hours per event, $135/hr.
Investigation-Derived Waste GAC Handling/Disposal	5	year	$200	$1,000	Assume annual replacement of both 2,000 lb carbon vessels @ $100/tn for disposal, cost increased for small quantity.
Groundwater Sampling and Chemical Analyses					Quarterly for 2 years from 12 monitoring wells. After 2 years, semiannual for 10 years.
TPH-Gasoline	336	sample	$35	$11,760	
BTEX	336	sample	$35	$11,760	
TPH-Diesel	336	sample	$35	$11,760	
Consultant Labor and Equipment	28	event	$2,500	$70,000	
Groundwater Monitoring Report	28	report	$16,000	$319,500	
Investigation-Derived Waste Water Handling/Disposal	28	events	$3,000	$59,900	1 disposal event per sampling event.
Item C. Estimated Cost				**$1,080,280**	
D. Other					
Construction Report	1	report	$25,000	$25,000	Includes as-built drawings.
Project Coordination	10	year	$6,000	$60,000	
O&M Manuals (chemical oxidation system)	1	report	$15,000	$15,000	
Washington State Sales Tax	1	lump sum	$16,665	$16,665	10.1 percent of construction capital cost (Item B).
Item D. Estimated Cost				**$116,665**	
Total Estimated Cost				**$1,635,000**	

Notes:

1. Estimated cost was prepared at -30/+50% for relative comparison amongst alternatives. The prepared cost estimate is not intended for budgetary purposes.
2. Net present worth cost prepared using discount rate of 2.5 percent (%).
3. An engineering cost estimate will be prepared in conjunction with CAP preparation and design (technical specifications and drawings).

TABLE 23

IN SITU BIOREMEDIATION (ESTIMATED COST), FEASIBILITY STUDY
FORMER CIRCLE K SITE
Seattle, Washington

Item Description	Quantity	Unit	Unit Cost	Extension	Assumptions
A. Preliminary Activities					
Cleanup Action Plan (CAP)	1	lump sum	$20,000	$20,000	
Design (plans and specifications)	1	lump sum	$100,000	$100,000	
Permitting					
General Demolition/Grading/Construction	1	lump sum	$10,000	$10,000	
Underground Injection Control (UIC)	1	lump sum	$5,000	$5,000	
Health and Safety Plan	1	lump sum	$5,000	$5,000	
Deed Restriction/Soil Management Plan	1	lump sum	$30,000	$30,000	
Item A. Estimated Cost				**$170,000**	
B. Bioremediation System Construction					
Mobilization/Demobilization	1	lump sum	$16,731	$16,731	8. percent of construction cost (Item C, excluding construction management).
Private Utility Locate	1	lump sum	$2,000	$2,000	
Multi-Purpose Vertical Well Installation	5	well	$2,900	$14,500	4-inch diameter well casing and screen.
Horizontal Well Installation	3	well	$25,000	$75,000	4-inch diameter well casing and screen.
Investigation-Derived Waste (IDW) Water Transport and Disposal	1	Unit Cost	$1,000	$1,000	Decontamination and development water for vertical and horizontal wells.
Investigation-Derived Waste (IDW) Soil Transport and Disposal	1	Unit Cost	$4,000	$4,000	6 drums per well multi-purpose well; $100 per drum T&D.
Power Drop/Electrical - Upgrade Existing	1	lump sum	$3,000	$3,000	Power drop exists at site but will need to be evaluated for viability for use. Assumes new power drop will be necessary.
Enclosure Construction	1	lump sum	$10,000	$10,000	
Vaults/Well Head Appurtenances	8	each	$1,400	$11,200	
Saw Cut pavement	560	linear feet	$5	$2,800	
Demo and Remove Existing Pavement (4" to 6")	93	square yard	$8	$747	3' wide pavement cut
Haul and Dispose Pavement	20	ton	$15	$301	
Excavation (landfill disposal)	35	cubic yard	$15	$519	Load directly to trucks. Assume material previously profiled. Pipe trench 2' wide, 1.67' deep (excludes pavement thickness).
Waste Profiling for Landfill Disposal	1	lump sum	$1,000	$1,000	Use existing laboratory analytical data for landfill waste profiling.
Hauling	58	ton	$15	$875	Hauling from site to landfill.
Landfill Disposal	58	ton	$45	$2,626	Non-hazardous waste - Subtitle D landfill facility in Seattle, Washington (Robanco/Allied Waste).
Piping	1,040	linear feet	$5	$5,200	2" Schedule 80 PVC.
Imported Backfill (material and transport)	56	ton	$30	$1,680	Imported fill. Includes 20% compaction factor in quantity estimate.
Placement and Compaction (imported fill)	14	cubic yard	$10	$138	
CSBC Pavement Subgrade (6" thick)	7	cubic yard	$45	$303	
Asphalt Concrete Pavement (4" thick)	93	square yard	$67	$6,253	Pavement replacement over trench.
Knockout Tank/Vacuum Blower	1	lump sum	$25,000	$25,000	
Activated Carbon Vessels	1	lump sum	$18,000	$18,000	Two, 2,000 carbon vessels in series.
System Installation	1	lump sum	$25,000	$25,000	
Consultant Labor (oversight)	30	day	$1,500	$45,000	
Item B. Estimated Cost				**$272,874**	
C. Long-Term (Net Present Worth)					Soil vapor extraction system operation for 5 years.
Bioremediation System O&M	5	year	$115,000	$534,300	General contractor labor, bioremediation products, equipment, replacement equipment, activated carbon changeout, etc.
Bioremediation System Consultant Labor (monthly site visit)	5	year	$12,960	$60,300	One person, 8 hours per event, $135/hr.
Investigation-Derived Waste GAC Handling/Disposal	5	year	$200	$1,000	Assume annual replacement of both 2,000 lb carbon vessels @ $100/tn for disposal, cost increased for small quantity.
Groundwater Sampling and Chemical Analyses					Quarterly for 2 years from 12 monitoring wells. After 2 years, semiannual for 10 years.
TPH-Gasoline	336	sample	$35	$11,760	
BTEX	336	sample	$35	$11,760	
TPH-Diesel	336	sample	$35	$11,760	
Consultant Labor and Equipment	28	event	$2,500	$70,000	
Groundwater Monitoring Report	28	report	$16,000	$319,500	
Investigation-Derived Waste Water Handling/Disposal	28	events	$3,000	$59,900	1 disposal event per sampling event.
Item C. Estimated Cost				**$1,080,280**	
D. Other					
Construction Report	1	report	$25,000	$25,000	Includes as-built drawings.
Project Coordination	11	year	$6,000	$66,000	
O&M Manuals (bioremediation system)	1	report	$15,000	$15,000	
Washington State Sales Tax	1	lump sum	$27,560	$27,560	10.1 percent of construction capital cost (Item B).
Item D. Estimated Cost				**$133,560**	
Total Estimated Cost				**$1,657,000**	

Notes:
1. Estimated cost was prepared at -30/+50% for relative comparison amongst alternatives. The prepared cost estimate is not intended for budgetary purposes.
2. Net present worth cost prepared using discount rate of 2.5 percent (%).
3. An engineering cost estimate will be prepared in conjunction with CAP preparation and design (technical specifications and drawings).

Figures

Path: Q:\Projects\2016\1696010.00 WA DOE Circle K Site Assessment\GIS\Events\RI Figures\Figure1 VicinityMap.mxd ©2017 Kennedy/Jenks Consultants

Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap

Legend

▨ Site Location

N

0 200 400

Scale: Feet

Note:

1. All locations are approximate.

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Former Circle K Site
Seattle, Washington

Site Location and Vicinity Map

K/J 1696010*00

Figure 1

Path: Q:\Projects\2016\1696010.00 WA DOE Circle K Site Assessment\GIS\Events\RI Figures\Figure2_NeighboringSitesAndUtilities.mxd ©2017 Kennedy/Jenks Consultants

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

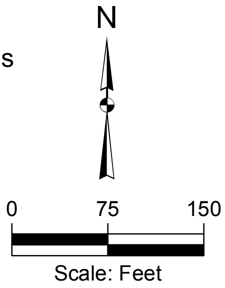
▨ Site Location

☐ Parcel Boundaries

🟧 Nearby State Listed Cleanup Sites

Notes:

1. All locations are approximate.
2. Parcel boundaries from King County Assessor's Office. State listed cleanup sites from Ecology's Facility/Site Database.



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Former Circle K Site
Seattle, Washington

Nearby Sites

K/J 1696010*00

Figure 2

Path: Q:\Projects\2016\1696010.00 WA DOE Circle K Site Assessment\GIS\Events\RI Figures\Figure3_SiteMap.mxd ©2017 Kennedy/Jenks Consultants

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

⊕ Remediation Wells	Sewer Line
⊕ Monitoring Well	Water Line
⊕ Abandoned Well	☐ Parcel Boundary
⊕ Landau Well	
● Boring	
○ Landau Boring	

Notes:
1. All locations are approximate.
2. Sewer and water line locations are based on available site information and not appropriate for construction purposes.

N

0 15 30

Scale: Feet

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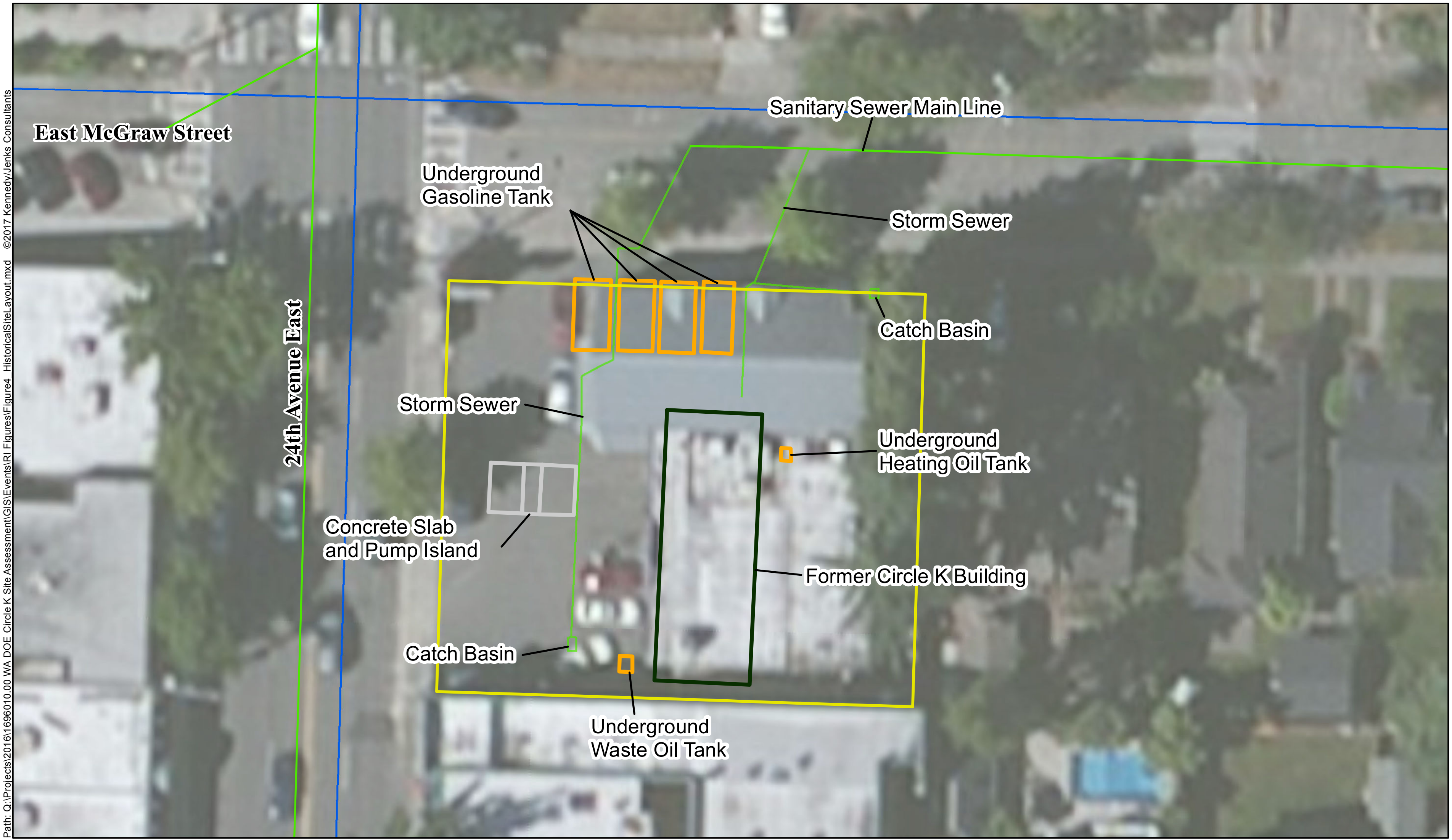
Former Circle K Site
Seattle, Washington

Site Map and Utilities

K/J 1696010*00

Figure 3

Path: Q:\Projects\2016\1696010.00 WA DOE Circle K Site Assessment\GIS\Events\RI Figures\Figure4_HistoricalSiteLayout.mxd ©2017 Kennedy/Jenks Consultants



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

▭ Former Building
▭ Former Pump Island
▭ Former Tank
▭ Parcel Boundary
— Sewer Line
— Water Line

Notes:

1. All locations are approximate.
2. Sewer and water line locations are based on available site information and not appropriate for construction purposes.
3. Former feature locations georeferenced from *Report of Geotechnical Services Subsurface Contamination Study and Remedial Action Monitoring Circle K Facility 1461 Seattle, Washington*, dated 6 March 1990 by GeoEngineers.

N

0 20 40

Scale: Feet

Kennedy/Jenks Consultants

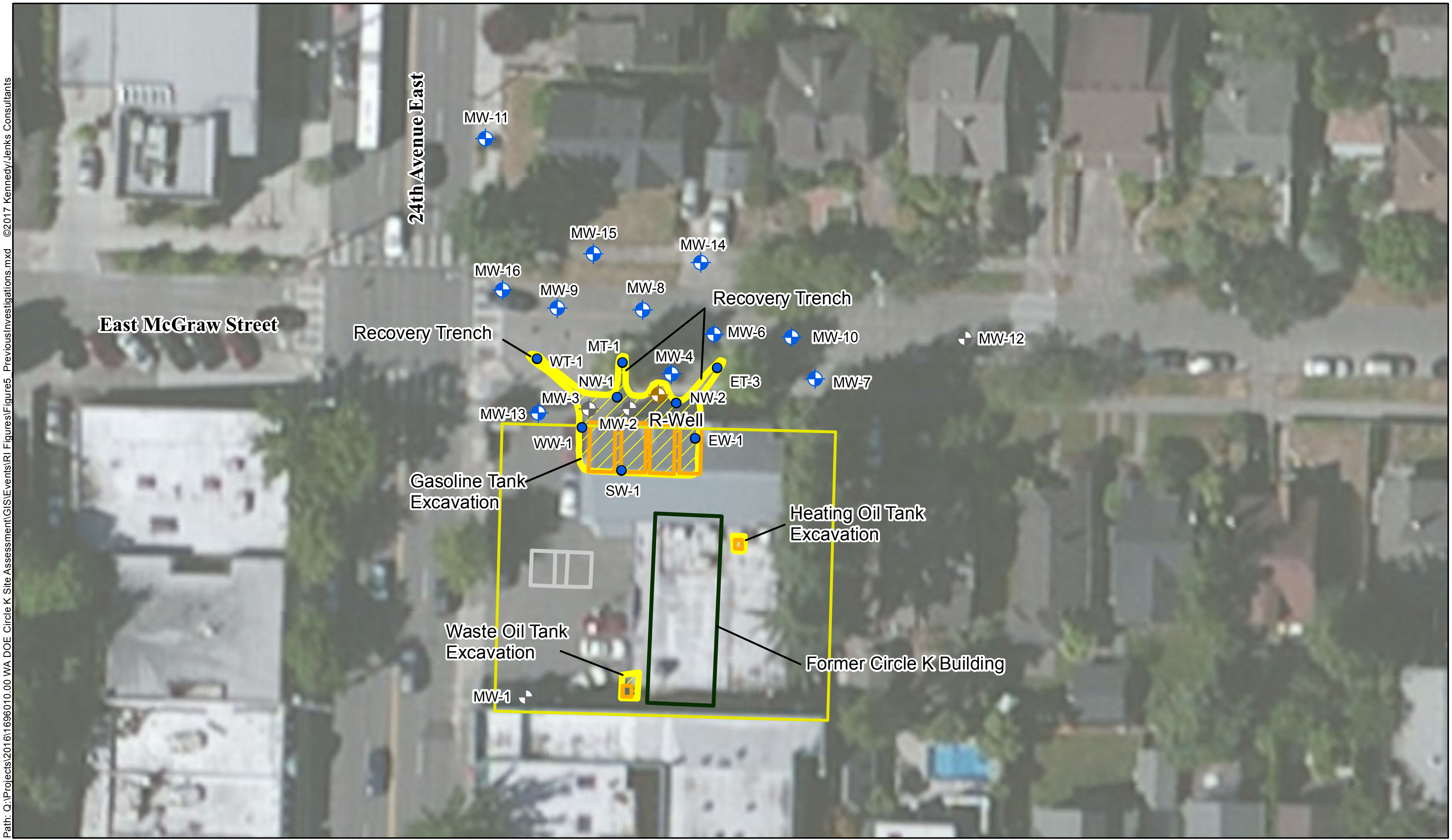
Former Circle K Site
Seattle, Washington

Historical Site Features

K/J 1696010*00

Figure 4

Path: Q:\Projects\2016\1696010.00 WA DOE Circle K Site Assessment\GIS\Events\RI Figures\Figure5_PreviousInvestigations.mxd



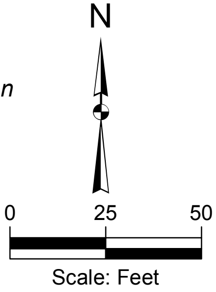
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- ⊕ 1989 Monitoring Well
- ⊕ Abandoned Well
- ▭ Former Building
- ▭ Former Pump Island
- ▭ Former Tank
- ▭ Site Boundary
- ⊕ Recovery Well
- ● Soil Sample
- ▨ Excavations

Notes:

1. All locations are approximate.
2. Map locations georeferenced from *Report of Geotechnical Services Subsurface Contamination Study and Remedial Action Monitoring Circle K Facility 1461 Seattle, Washington,* dated 6 March 1990 by GeoEngineers.
3. MW-2 and MW-3 were abandoned in 1989 during excavation activities. MW-1 was abandoned in 2003, and MW-12 was abandoned between 2003 and 2005.



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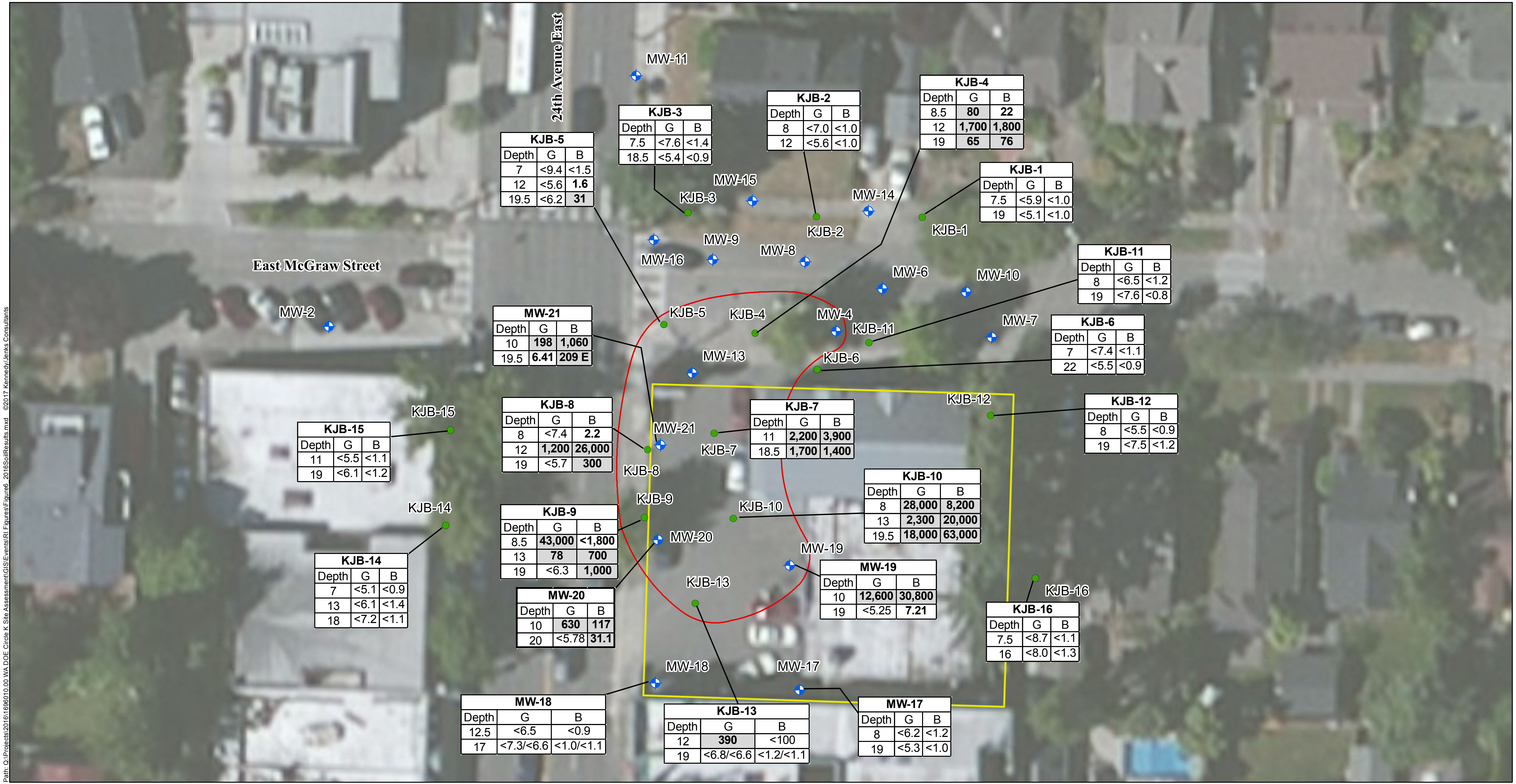
Former Circle K Site
Seattle, Washington

Previous Investigations and Excavation Limits

K/J 1696010*00

Figure 5



KJB-5

Depth	G	B
7	<9.4	<1.5
12	<5.6	**1.6**
19.5	<6.2	**31**

KJB-3

Depth	G	B
7.5	<7.6	<1.4
18.5	<5.4	<0.9

KJB-2

Depth	G	B
8	<7.0	<1.0
12	<5.6	<1.0

KJB-4

Depth	G	B
8.5	**80**	**22**
12	**1,700**	**1,800**
19	**65**	**76**

KJB-1

Depth	G	B
7.5	<5.9	<1.0
19	<5.1	<1.0

KJB-11

Depth	G	B
8	<6.5	<1.2
19	<7.6	<0.8

MW-21

Depth	G	B
10	**198**	**1,060**
19.5	**6.41**	**209 E**

KJB-6

Depth	G	B
7	<7.4	<1.1
22	<5.5	<0.9

KJB-12

Depth	G	B
8	<5.5	<0.9
19	<7.5	<1.2

KJB-15

Depth	G	B
11	<5.5	<1.1
19	<6.1	<1.2

KJB-8

Depth	G	B
8	<7.4	**2.2**
12	**1,200**	**26,000**
19	<5.7	**300**

KJB-7

Depth	G	B
11	**2,200**	**3,900**
18.5	**1,700**	**1,400**

KJB-10

Depth	G	B
8	**28,000**	**8,200**
13	**2,300**	**20,000**
19.5	**18,000**	**63,000**

KJB-9

Depth	G	B
8.5	**43,000**	**<1,800**
13	**78**	**700**
19	<6.3	**1,000**

KJB-14

Depth	G	B
7	<5.1	<0.9
13	<6.1	<1.4
18	<7.2	<1.1

MW-19

Depth	G	B
10	**12,600**	**30,800**
19	<5.25	**7.21**

MW-20

Depth	G	B
10	**630**	**117**
20	<5.78	**31.1**

KJB-16

Depth	G	B
7.5	<8.7	<1.1
16	<8.0	<1.3

MW-18

Depth	G	B
12.5	<6.5	<0.9
17	<7.3/<6.6	<1.0/<1.1

KJB-13

Depth	G	B
12	**390**	<100
19	<6.8/<6.6	<1.2/<1.1

MW-17

Depth	G	B
8	<6.2	<1.2
19	<5.3	<1.0

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- ⊕ Monitoring Well
- ● Soil Boring
- 🟨 Parcel Boundary
- 🟥 Approximate Extent of Gasoline-Range Organics/Benzene in Soil above MTCA Method A Cleanup Levels

Boring ID →
Sample Depth in feet →

MW-17

Depth	G	B
8	<6.2	<1.2
19	<5.3	<1.0

← All concentrations in mg/kg.
Concentrations are bolded where detected.
Shaded concentrations are above the MTCA Method A cleanup level.

Notes:

1. All locations are approximate.
2. mg/kg = milligrams per kilogram.
3. G = gasoline-range organics.
4. B = benzene.

N

0 15 30
Scale: Feet

Kennedy/Jenks Consultants

Former Circle K Site
Seattle, Washington

2016 Soil Boring
Soil Sample Results

K/J 1696010*00

Figure 6

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Path: Q:\Projects\2016\1696010.00 WA DOE Circle K Site Assessment\GIS\Events\RI Figures\Figure7_CrossSectionLocations.mxd ©2017 Kennedy/Jenks Consultants

Legend

⊕ Remediation Wells
⊕ Monitoring Well
⊕ Abandoned Well
⊕ Landau Monitoring Well
● Boring
○ Landau Boring
— Cross Sections
▭ Parcel Boundary

Note:
1. All locations are approximate.

N

0 20 40
Scale: Feet

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Seattle, Washington

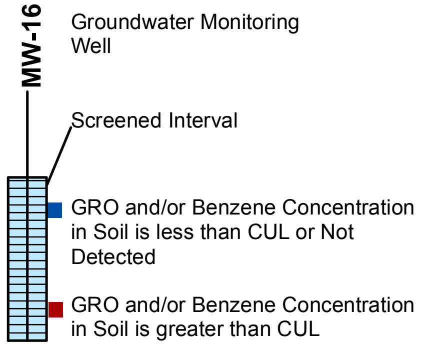
Surface Representation of Interpretive Geologic Cross Sections A-A' and B-B'

K/J 1696010*00

Figure 7

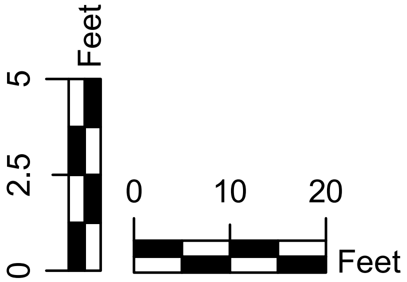
Legend

- ⊽ Water Table in December 2016
- ▤ GRO and/or Benzene Concentration in Groundwater less than CUL
- ▤ GRO and/or Benzene Concentration in Groundwater exceeds CUL
- ⁘ Sand with silt
- ▨ Sandy silt/silty sand
- ▨ Silt with sand lenses
- ▭ Approximate Extent of GRO and/or Benzene in Soil that exceeds the CUL



Notes:

1. All locations and depths are approximate.
2. BGS = below ground surface.
3. CUL = MTCA Method A Cleanup Level.
4. GRO = Gasoline Range Organics.



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Interpretive Geologic Cross Section A - A'

K/J 1696010*00

Figure 8

Path: Q:\Projects\2016\1696010.00 WA DOE Circle K Site Assessment\GIS\Events\CrossSectionB.mxd ©2017 Kennedy/Jenks Consultants

[redacted]

Legend

- ▽ Water Table in December 2016
- ▤ GRO and/or Benzene Concentration in Groundwater less than CUL
- ▤ GRO and/or Benzene Concentration in Groundwater exceeds CUL
- ⬚ Sand with silt
- ▨ Sandy silt

MW-16 Groundwater Monitoring Well

Screened Interval

■ GRO and/or Benzene Concentration in Soil is less than CUL or Not Detected

Notes:

1. All locations and depths are approximate.
2. BGS = below ground surface.
3. CUL = MTCA Method A Cleanup Level.
4. GRO = Gasoline Range Organics.

Feet 0 2.5 5

0 10 20 Feet

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Seattle, WA

Interpretive Geologic Cross Section B - B'

K/J 1696010*00

Figure 9

Path: Q:\Projects\2016\1696010.00 WA DOE Circle K Site Assessment\GIS\Events\RI Figures\Figure10_GWPotentiometric_April2016.mxd ©2017 Kennedy/Jenks Consultants

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Monitoring Well
- Landau Monitoring Well
- 91.98 Groundwater elevation
- Approximate direction of hydraulic gradient
- Approximate elevation contour (dashed where inferred)
- Parcel Boundary

N

0 20 40

Scale: Feet

Notes:

1. All locations are approximate.
2. NM = not measured
3. Contours in feet above mean sea level.

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Former Circle K Site
Seattle, Washington

Groundwater Potentiometric Surface
20 April 2016

K/J 1696010*00

Figure 10

Path: Q:\Projects\2016\1696010.00 WA DOE Circle K Site Assessment\GIS\Events\RI Figures\Figure11_GWPotentiometric_December2016.mxd ©2017 Kennedy/Jenks Consultants

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- ⊕ Monitoring Well
- ⊕ Landau Monitoring Well
- → Approximate direction of hydraulic gradient
- — Approximate elevation contour (dashed where inferred)
- — Sewer Line
- — Water Line
- ▭ Parcel Boundary

N

0 20 40

Scale: Feet

Notes:
1. All locations are approximate.
2. Contours in feet above mean sea level.

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Groundwater Potentiometric Surface
8 December 2016

K/J 1696010*00

Figure 11

Path: Q:\Projects\2016\1696010.00 WA DOE Circle K Site Assessment\GIS\Events\RI Figures\Figure12_GWGROResultsDecember2016.mxd ©2017 Kennedy/Jenks Consultants

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

⌖	Monitoring Well
⌖	Landau Monitoring Well
7,910	Gasoline-Range Organics Concentration (µg/L)
—	Water Line
—	Sewer Line
☐	Parcel Boundary
▨	Estimated Gasoline-Range Organics Isoconcentration (>50,000 µg/L)
▨	Estimated Gasoline-Range Organics Isoconcentration (>1,000 µg/L)

Notes:
1. All locations are approximate.
2. Groundwater samples were collected 7-8 December 2016 from monitoring wells.
3. NS = not sampled.
4. µg/L = micrograms per liter.

N

0 15 30

Scale: Feet

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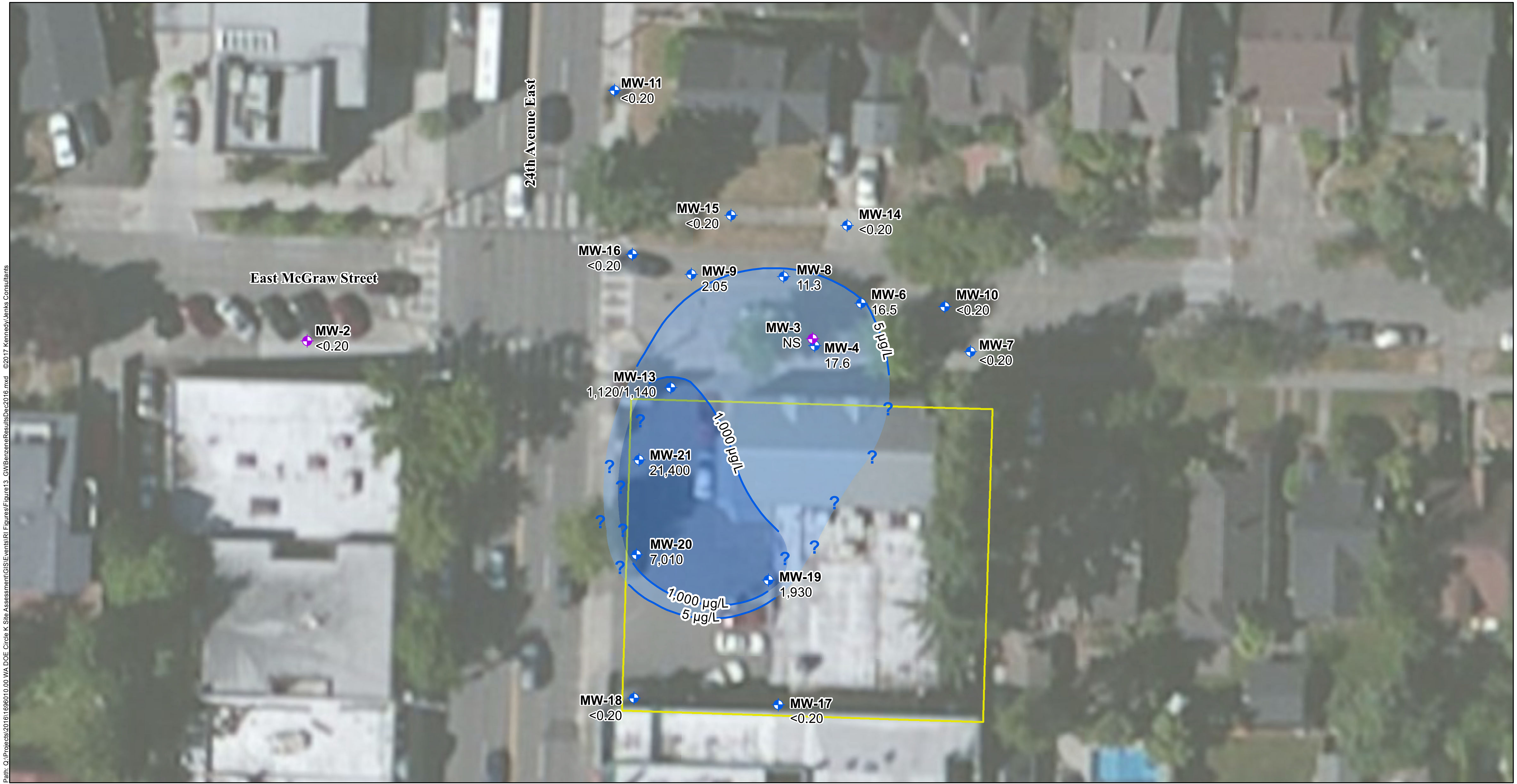
Former Circle K Site
Seattle, Washington

Estimated Groundwater Gasoline-Range Organics Isoconcentrations December 2016

K/J 1696010*00

Figure 12



Path: Q:\Projects\2016\1696010.00 WA DOE Circle K Site Assessment\GIS\Events\RI Figures\Figure13_GWBenzeneResultsDec2016.mxd ©2017 Kennedy/Jenks Consultants

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- ⊕ Monitoring Well
- ⊕ Landau Monitoring Well
- 2.05 Benzene Concentration (µg/L)
- ☐ Parcel Boundary
- ▨ Estimated Benzene Isoconcentration (>1,000 µg/L)
- ▨ Estimated Benzene Isoconcentration (>5 µg/L)

Notes:

1. All locations are approximate.
2. Groundwater samples were collected 7-8 December 2016 from monitoring wells.
3. NS = not sampled.
4. µg/L = micrograms per liter.

N

0 15 30

Scale: Feet

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Former Circle K Site
Seattle, Washington

Estimated Groundwater Benzene Isoconcentrations December 2016

K/J 1696010*00

Figure 13

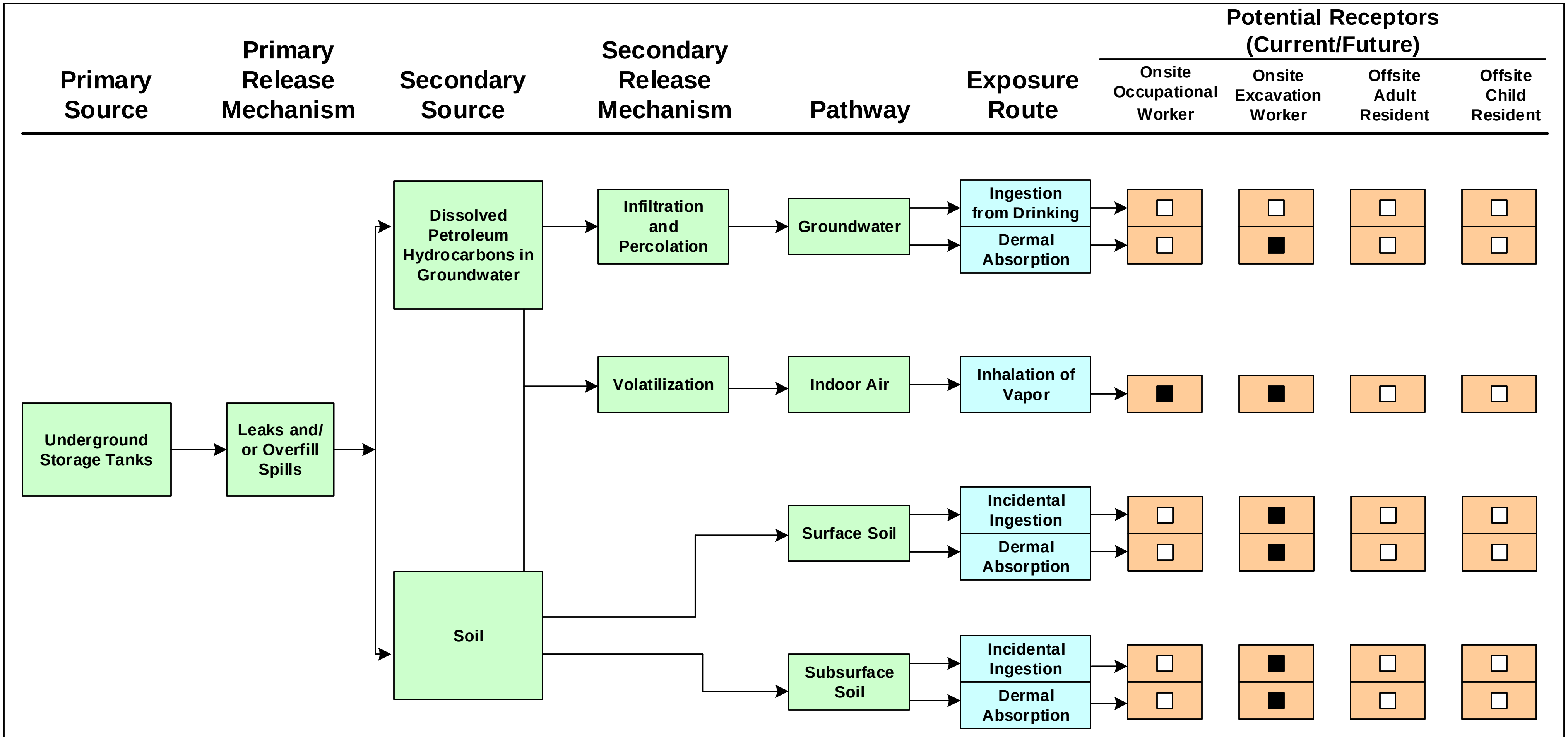

Figure depicts a preliminary assessment of potential exposure pathways.

Legend:

■ Potentially complete exposure pathway.

☐ Incomplete exposure pathway.

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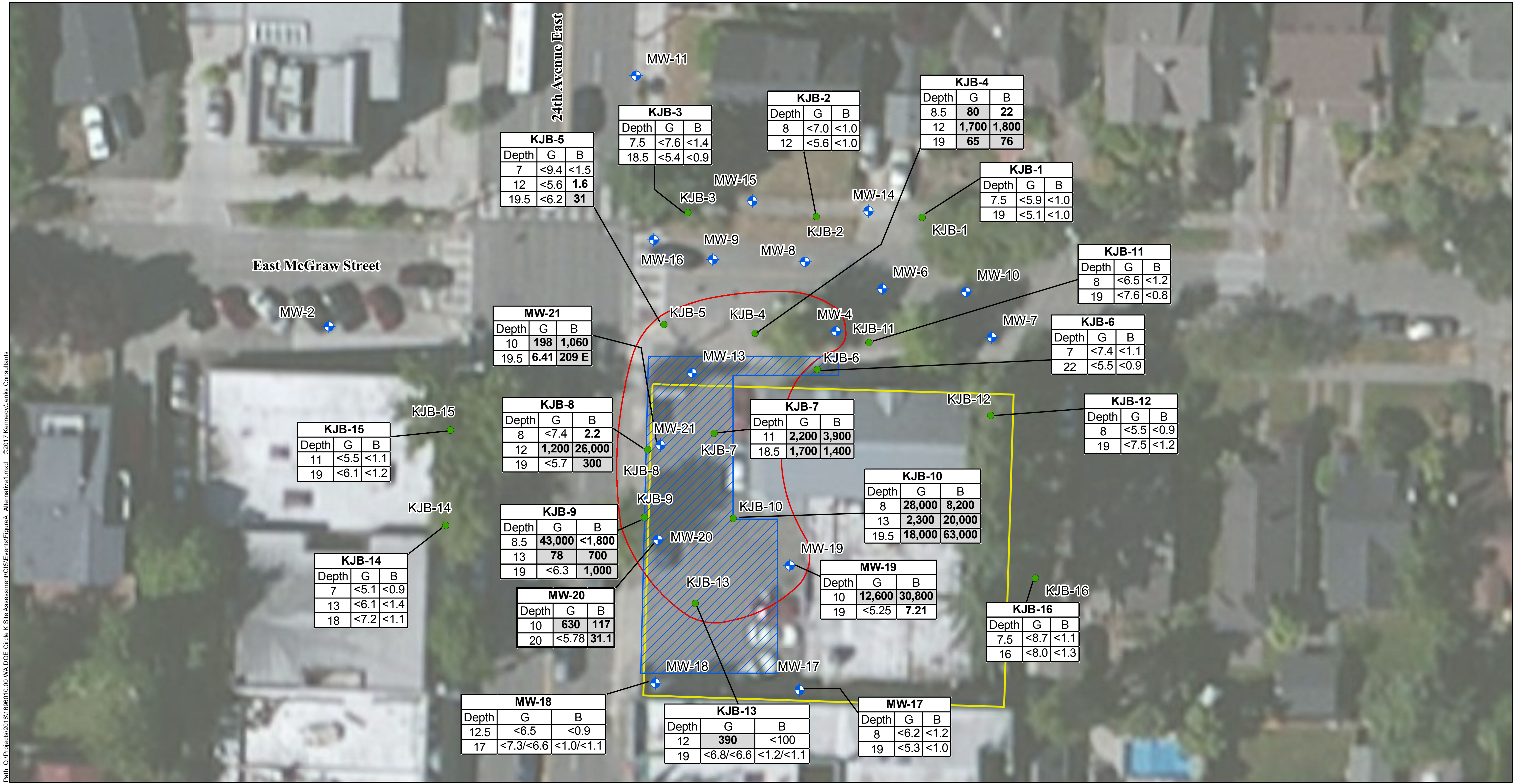
Seattle, Washington

Conceptual Site Exposure Model

K/J 1696059*00

Figure 14



KJB-4

Depth	G	B
8.5	**80**	**22**
12	**1,700**	**1,800**
19	**65**	**76**

KJB-2

Depth	G	B
8	<7.0	<1.0
12	<5.6	<1.0

KJB-3

Depth	G	B
7.5	<7.6	<1.4
18.5	<5.4	<0.9

KJB-5

Depth	G	B
7	<9.4	<1.5
12	<5.6	**1.6**
19.5	<6.2	**31**

KJB-1

Depth	G	B
7.5	<5.9	<1.0
19	<5.1	<1.0

KJB-11

Depth	G	B
8	<6.5	<1.2
19	<7.6	<0.8

MW-21

Depth	G	B
10	**198**	**1,060**
19.5	**6.41**	**209 E**

KJB-6

Depth	G	B
7	<7.4	<1.1
22	<5.5	<0.9

KJB-8

Depth	G	B
8	<7.4	**2.2**
12	**1,200**	**26,000**
19	<5.7	**300**

KJB-7

Depth	G	B
11	**2,200**	**3,900**
18.5	**1,700**	**1,400**

KJB-12

Depth	G	B
8	<5.5	<0.9
19	<7.5	<1.2

KJB-15

Depth	G	B
11	<5.5	<1.1
19	<6.1	<1.2

KJB-10

Depth	G	B
8	**28,000**	**8,200**
13	**2,300**	**20,000**
19.5	**18,000**	**63,000**

KJB-9

Depth	G	B
8.5	**43,000**	**<1,800**
13	**78**	**700**
19	<6.3	**1,000**

KJB-14

Depth	G	B
7	<5.1	<0.9
13	<6.1	<1.4
18	<7.2	<1.1

MW-19

Depth	G	B
10	**12,600**	**30,800**
19	<5.25	**7.21**

MW-20

Depth	G	B
10	**630**	**117**
20	<5.78	**31.1**

KJB-16

Depth	G	B
7.5	<8.7	<1.1
16	<8.0	<1.3

MW-18

Depth	G	B
12.5	<6.5	<0.9
17	<7.3/<6.6	<1.0/<1.1

KJB-13

Depth	G	B
12	**390**	<100
19	<6.8/<6.6	<1.2/<1.1

MW-17

Depth	G	B
8	<6.2	<1.2
19	<5.3	<1.0

Path: Q:\Projects\2016\1696010.00 WA DOE Circle K Site Assessment\GIS\Events\FigureA_Alternative1.mxd

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

⊕ Monitoring Well

● Soil Boring

▨ Proposed Excavation Area

☐ Approximate Extent of Gasoline-Range Organics/Benzene in Soil above MTCA Method A Cleanup Levels

☐ Parcel Boundary

Boring ID →

Sample Depth in feet →

MW-17

Depth	G	B
8	<6.2	<1.2
19	<5.3	<1.0

All concentrations in mg/kg.
Concentrations are bolded where detected.
Shaded concentrations are above the MTCA Method A cleanup level.

Notes:

1. All locations are approximate.
2. mg/kg = milligrams per kilogram.
3. G = gasoline-range organics.
4. B = benzene.

N

0 15 30

Scale: Feet

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Alternative 1: Excavation and Offsite Disposal

K/J 1696010*00

Figure 15

Path: Q:\Projects\2016\1696010.00 WA DOE Circle K Site Assessment\GIS\Events\FigureB_Alternative2.mxd ©2017 Kennedy/Jenks Consultants

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- ⊕ Proposed Vapor Extraction Well
- ⊕ Proposed Air Sparge Well (Alternative 3 only)
- ⊕ Remediation Well
- ⊕ Monitoring Well
- ⊕ Abandoned Well
- ⊕ Landau Monitoring Well
- ● Boring
- ○ Landau Boring
- Sewer Line
- Water Line
- ▭ Estimated Radius of Influence for Soil Vapor Extraction Wells
- ▨ Proposed Treatment System Location
- ▭ Approximate Extent of Gasoline-Range Organics/Benzene in Soil above MTCA Method A Cleanup Levels
- ▭ Parcel Boundary

Notes:

1. All locations are approximate.
2. Sewer and water line locations are based on available site information and not appropriate for construction purposes.

N

0 12.5 25

Scale: Feet

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Seattle, Washington

Alternative 2: Soil Vapor Extraction and Alternative 3: Soil Vapor Extraction with Air Sparging

K/J 1696010*00

Figure 16

Path: Q:\Projects\2016\1696010.00 WA DOE Circle K Site Assessment\GIS\Events\FigureC_Alternative4.mxd

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- ⊕ Proposed Multi-Purpose Remediation Well
- ⊕ RW-7 Existing Multi-Purpose Remediation Well
- ⊕ Monitoring Well
- ● Soil Boring
- ● Soil Boring Location with Gasoline-Range Organics above the MTCA Method A Cleanup Level for Soil
- ▬ Possible Future Horizontal Well
- ▇ Estimated Gasoline-Range Organics Isoconcentration (>1,000 µg/L)
- ▇ Estimated Gasoline-Range Organics Isoconcentration (>50,000 µg/L)

Note:
1. All locations are approximate.
2. µg/L = micrograms per liter.

N

0 12.5 25
Scale: Feet

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Seattle, Washington

Alternative 4: In Situ Chemical Oxidation and Alternative 5: In Situ Bioremediation

K/J 1696010*00

Figure 17

Figure 18. Benfit/Cost Ratio

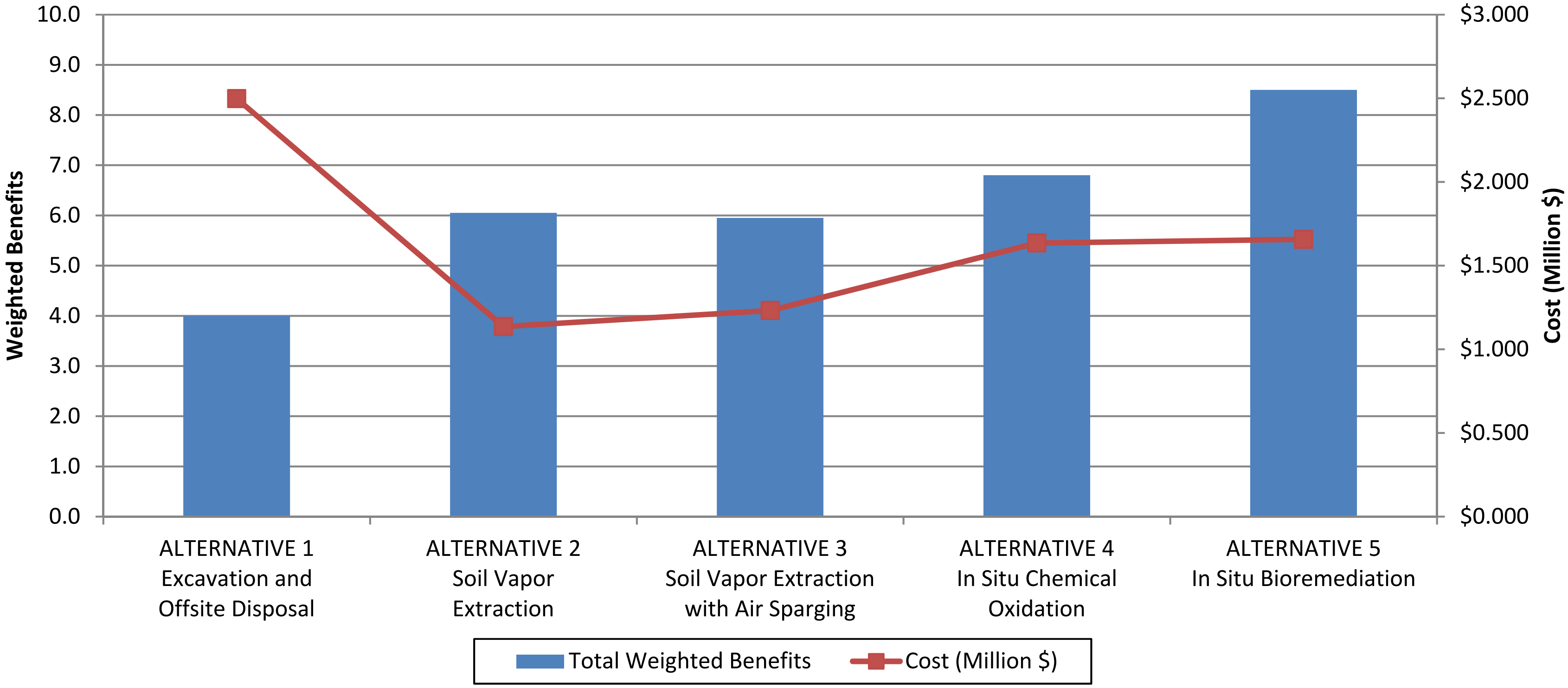
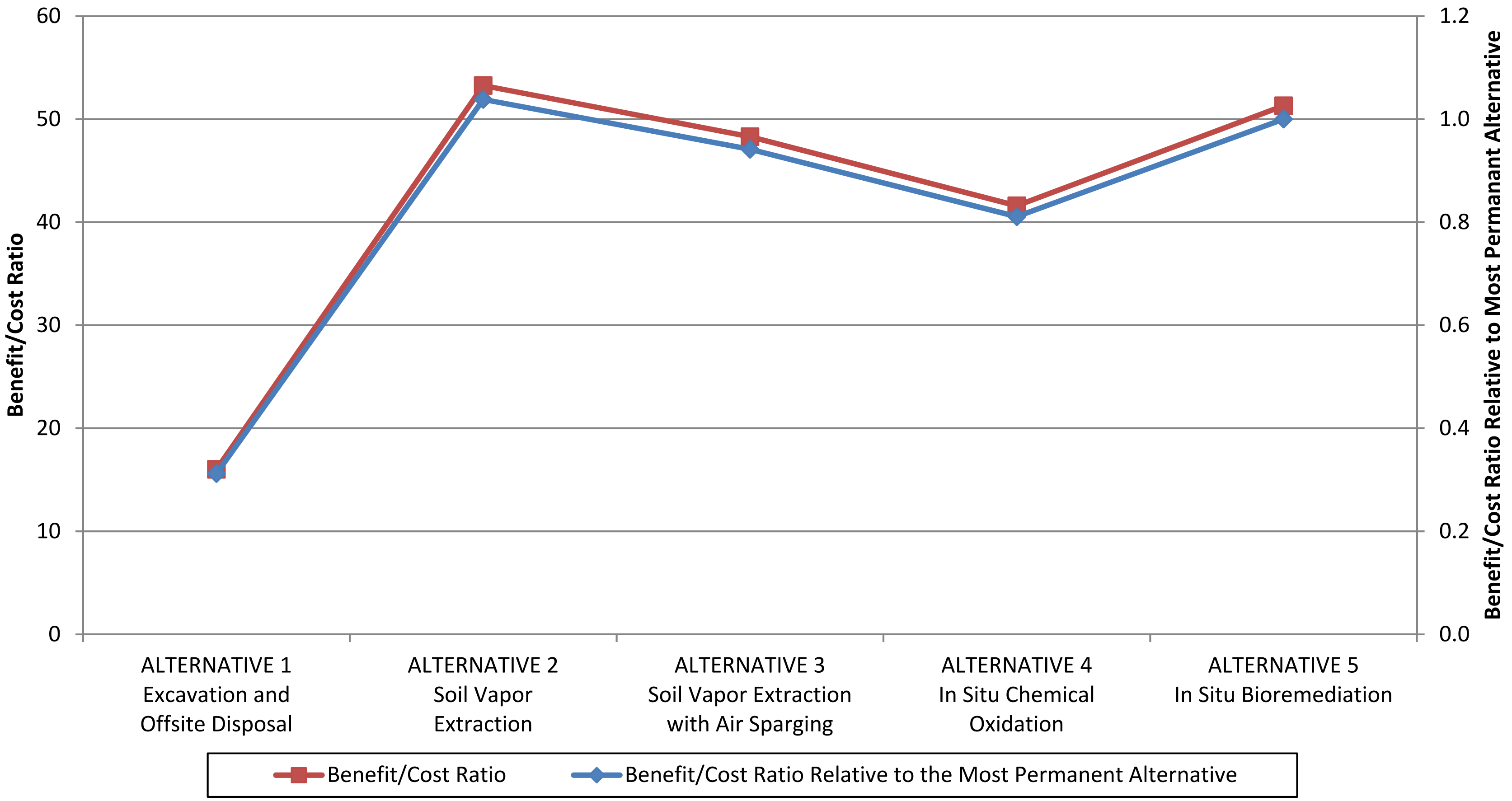


Figure 19. Benefit/Cost Ratios Relative to Most Permanant Alternative



Appendix A

1989 Underground Storage Tank Excavation Confirmation Sample Summary Tables

TABLE 5
SUMMARY OF GROUND WATER QUALITY DATA, MONITOR WELL SAMPLES

		EPA Method 602				EPA Method 418.1
Monitor Well Number	Sample Date	Benzene (ppb)	Ethyl–Benzene (ppb)	Toluene (ppb)	Total Xylenes (ppb)	TPH (ppm)
MW-1	09/13/89	1.5	ND	1.9	1.6	ND
MW-5	09/13/89	1.1	ND	2.5	2.6	ND
MW-6	10/09/89	250	ND	3.2	110	NA
MW-7	10/09/89	2.8	ND	1.4	ND	NA
MW-10	10/09/89	1.2	ND	ND	ND	NA
MW-11	10/09/89	2.6	ND	ND	3.0	NA
MW-12	10/09/89	ND	ND	ND	ND	NA
MW-13	12/21/89	13,000	1,700	20,000	8,800	NA
MW-14	12/21/89	1.1	1.9	5.7	13	NA
MW-15	12/21/89	7,300	1,000	9,000	5,800	NA
MW-16	12/21/89	4.3	7.1	20	36	NA

Notes:

"ppb" = parts per billion

"ppm" = parts per million

"ND" = "not detected"; see laboratory data sheets in Appendix C for analyte detection limits

"NA" = not analyzed

TABLE 6
SUMMARY OF SOIL SAMPLE ANALYTICAL DATA, WASTE OIL AND HEATING OIL TANK EXCAVATIONS

Tank Excavation	Sample Number	Sample Date	Location	Depth (feet)	TPH (ppm)
Waste Oil Tank	WO-2	10/11/89	Excavation floor	8.0	76
	WO-6	10/12/89	Excavation floor	11.0	2
	WO-7	10/12/89	North wall	10.0	<1
	WO-8	10/12/89	East wall	9.5	6
	WO-9	10/12/89	South wall	10.0	1
	WO-10	10/12/89	West wall	9.5	<1
Heating Oil Tank	HO-2	10/13/89	North wall	6.0	8
	HO-3	10/13/89	East wall	7.0	1
	HO-4	10/13/89	South wall	6.5	2
	HO-5	10/13/89	West wall	6.5	110
	HO-6	10/13/89	Excavation floor	8.5	14

Notes:

"TPH" = Total Petroleum Hydrocarbons by EPA Method 418.1

"ppm" = parts per million

TABLE 7

SUMMARY OF SOIL SAMPLE ANALYTICAL DATA, GASOLINE TANK AND RECOVERY TRENCH EXCAVATIONS

			EPA Method 8020				Modified EPA Method 8015	
Sample Number	Sample Date	Depth (feet)	Benzene (ppb)	Ethyl-Benzene (ppb)	Toluene (ppb)	Total Xylenes (ppb)	Gasoline (ppm)	Diesel (ppm)
EW-1	10/20/89	10.0	ND	ND	ND	ND	ND	ND
WW-1	10/20/89	13.0	1,300	9,700	20,000	53,000	270	600
NW-1	10/20/89	13.0	31,000	55,000	140,000	300,000	1,700	4,100
SW-1	10/20/89	9.0	1,000	1,600	6,300	10,000	360	ND
NW-2	10/23/89	10.0	1,300	12,000	17,000	57,000	230	400
WT-1	10/26/89	12.0	110	390	1,000	3,500	59	150
MT-1	10/26/89	10.0	ND	74	250	610	11	55
ET-3	10/27/89	10.0	140	ND	190	310	ND	7

Notes:

"ppb" = parts per billion

"ppm" = parts per million

"ND" = not detected; see laboratory data sheets in Appendix D for analyte detection limits

Sample locations shown in Figure 6

Appendix B

Boring and Well Construction Logs

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVEL MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND MORE THAN 50% OF COARSE FRACTION PASSES NO. 4 SIEVE	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS MORE THAN 50% PASSES NO. 200 SIEVE	SILT AND CLAY LIQUID LIMIT LESS THAN 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY LIQUID LIMIT 50 OR MORE	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-83.
2. Soil classification using laboratory tests is based on ASTM D2487-83.
3. Descriptions of soil density or consistency are based on interpretation of blowcount data, visual appearance of soils, and/or test data.

SOIL MOISTURE MODIFIERS:

Dry – Absence of moisture, dusty, dry to the touch

Moist – Damp, but no visible water

Wet – Visible free water or saturated, usually soil is obtained from below water table

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SOIL CLASSIFICATION SYSTEM

FIGURE A-1

LABORATORY TESTS:

CA Chemical Analysis

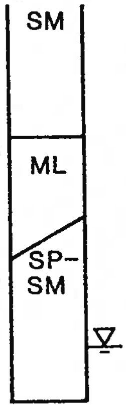
VAPOR CONCENTRATION DATA:

Vapor concentration given in parts per million

SHEEN CLASSIFICATION SYSTEM:

NS	No visible sheen
SS	Slight sheen
MS	Moderate sheen
HS	Heavy sheen

SOIL GRAPH:



Soil Group Symbol (See Note 2)

Distinct Contact Between Soil Strata

Gradual Change Between Soil Strata

Water Level

Bottom of Boring

BLOW-COUNT/SAMPLE DATA:

Blows required to drive a split-barrel sampler (2.4–inch I.D.) 12 inches or other indicated distances using 300 pound hammer falling 30 inches.	22 ■	Location of relatively undisturbed sample
	12 ☒	Location of disturbed sample
"P" indicates sampler pushed with weight of hammer or hydraulics of drill rig.	P ☐	Location of sampling attempt with no recovery
Blows required to drive a split-barrel sampler (1.5–inch I.D.) 12 inches or other indicated distances using 140 pound hammer falling 30 inches.	10 ◪	Location of sample attempt using Standard Penetration Test procedures

NOTES:

1. Information presented in the attached text and the Key To Boring Log Symbols is required to adequately explain the data on the boring logs.
2. Soil classification system is summarized in Figure A–1.
3. The reader must refer to the discussion in the report test as well as the exploration logs for a proper understanding of subsurface conditions.

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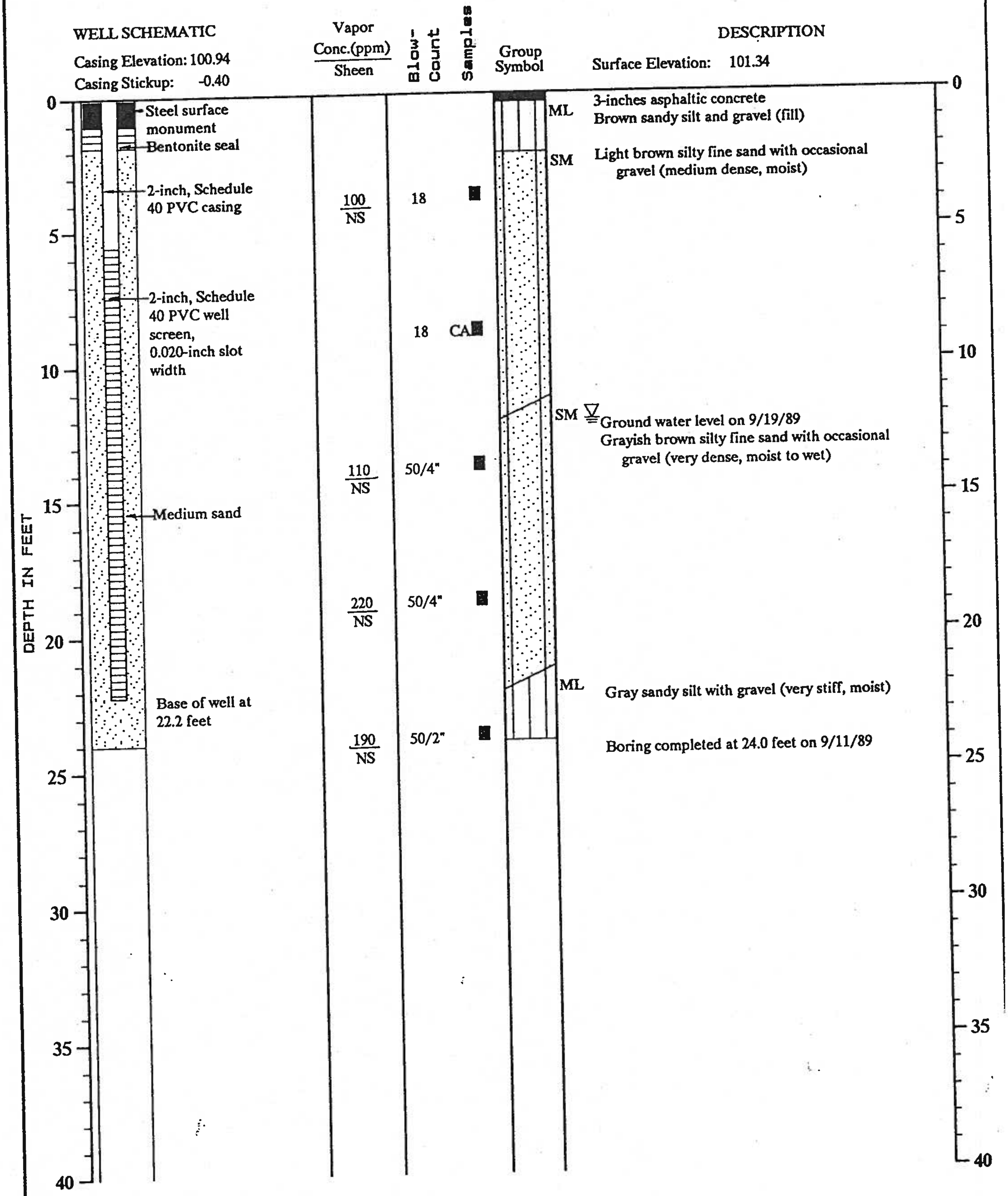
KEY TO BORING LOG SYMBOLS

FIGURE A–2

MONITOR WELL NO. MW-1



3-inches asphaltic concrete
Brown sandy silt and gravel (fill)

Light brown silty fine sand with occasional gravel (medium dense, moist)

Ground water level on 9/19/89
Grayish brown silty fine sand with occasional gravel (very dense, moist to wet)

Gray sandy silt with gravel (very stiff, moist)

Boring completed at 24.0 feet on 9/11/89

Note: See Figure A-2 for explanation symbols

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Log of Monitor Well

Figure A-3

1-001-B04 TEP:OKP:CDO 1/9/90

MONITOR WELL NO. MW-2

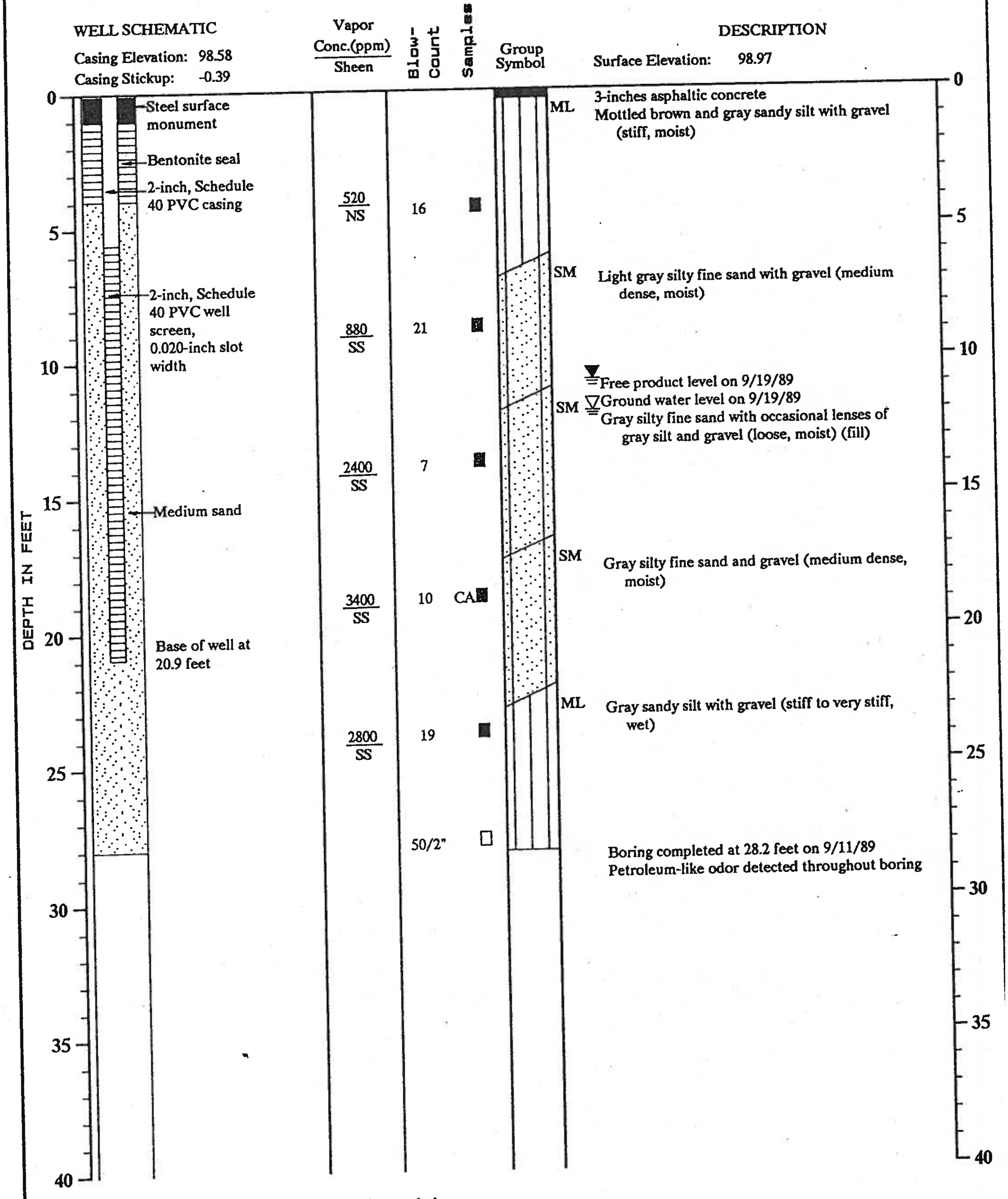
WELL SCHEMATIC

Casing Elevation: 98.58

Casing Stickup: -0.39

DESCRIPTION

Surface Elevation: 98.97



3-inches asphaltic concrete

Mottled brown and gray sandy silt with gravel (stiff, moist)

Light gray silty fine sand with gravel (medium dense, moist)

Free product level on 9/19/89

Ground water level on 9/19/89

Gray silty fine sand with occasional lenses of gray silt and gravel (loose, moist) (fill)

Gray silty fine sand and gravel (medium dense, moist)

Gray sandy silt with gravel (stiff to very stiff, wet)

Boring completed at 28.2 feet on 9/11/89

Petroleum-like odor detected throughout boring

Note: See Figure A-2 for explanation symbols

TEP:OKP:CDO 1/9/90

-001-B04

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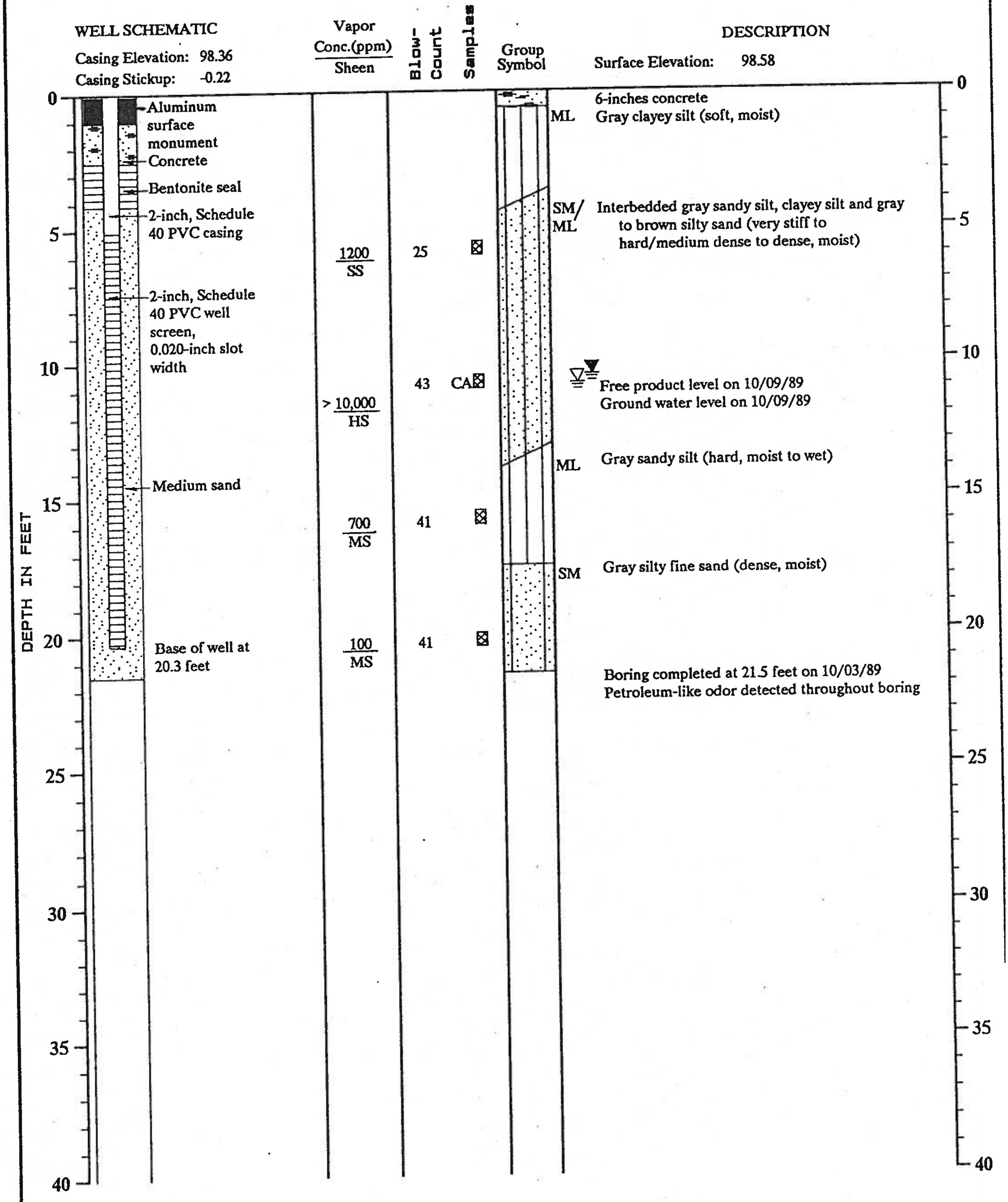
Log of Monitor Well

Figure A-4

MONITOR WELL NO. MW-8



6-inches concrete
Gray clayey silt (soft, moist)

Interbedded gray sandy silt, clayey silt and gray to brown silty sand (very stiff to hard/medium dense to dense, moist)

Free product level on 10/09/89
Ground water level on 10/09/89

Gray sandy silt (hard, moist to wet)

Gray silty fine sand (dense, moist)

Boring completed at 21.5 feet on 10/03/89
Petroleum-like odor detected throughout boring

Note: See Figure A-2 for explanation symbols

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Log of Monitor Well

Figure A-10

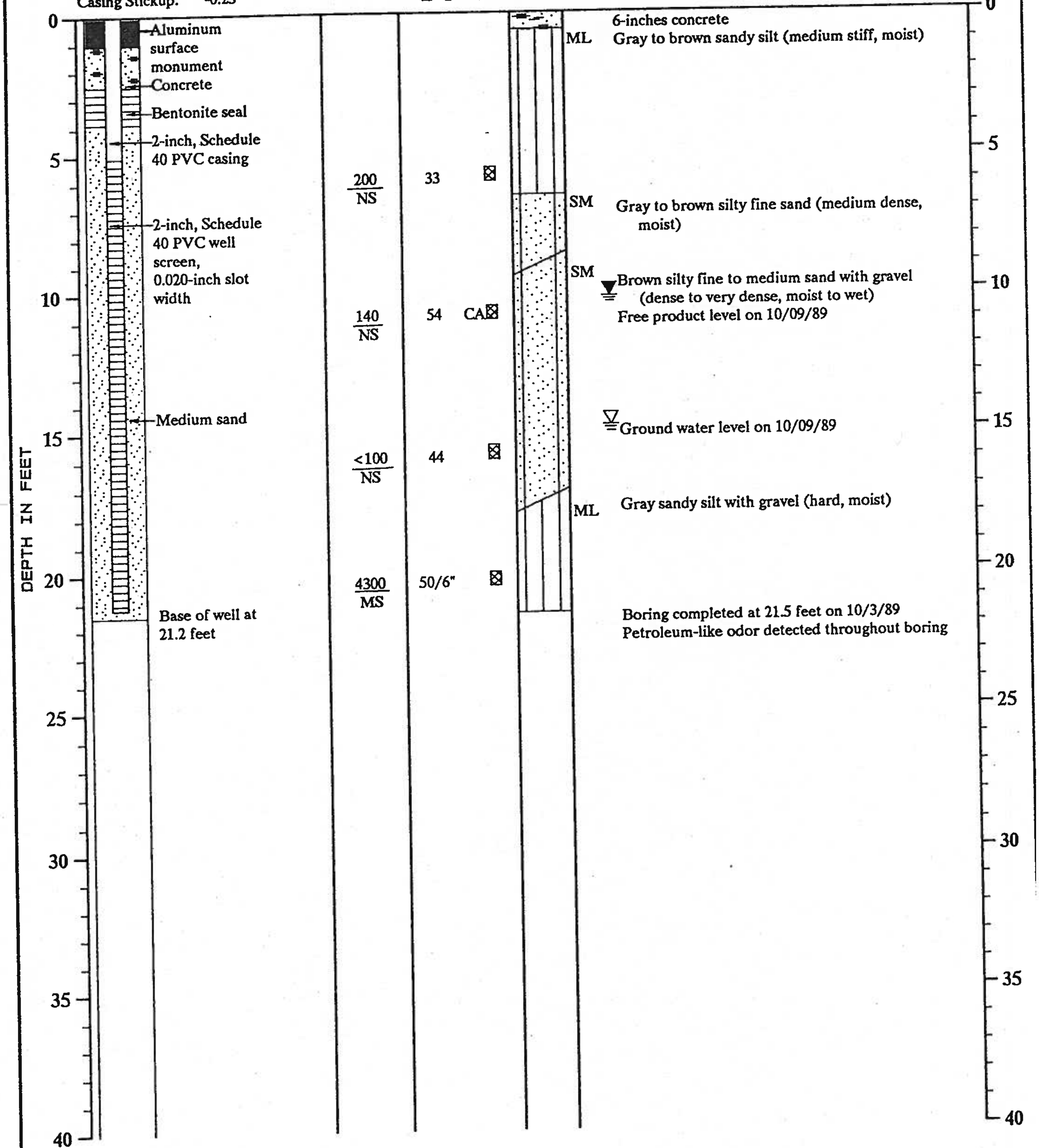
TEP:OKP:CDO 1/10/90

1-001-B04

MONITOR WELL NO. MW-9

WELL SCHEMATIC
Casing Elevation: 99.03
Casing Stickup: -0.23

DESCRIPTION
Surface Elevation: 99.26



Vapor Conc.(ppm) / Sheen	Blow-Count	Samples
200 / NS	33	☒
140 / NS	54	CA☒
<100 / NS	44	☒
4300 / MS	50/6"	☒

Group Symbol	DESCRIPTION
	6-inches concrete
ML	Gray to brown sandy silt (medium stiff, moist)
SM	Gray to brown silty fine sand (medium dense, moist)
SM	Brown silty fine to medium sand with gravel (dense to very dense, moist to wet)
ML	Gray sandy silt with gravel (hard, moist)

▼ Free product level on 10/09/89

▽ Ground water level on 10/09/89

Boring completed at 21.5 feet on 10/3/89
Petroleum-like odor detected throughout boring

Note: See Figure A-2 for explanation symbols

GeoEngineers

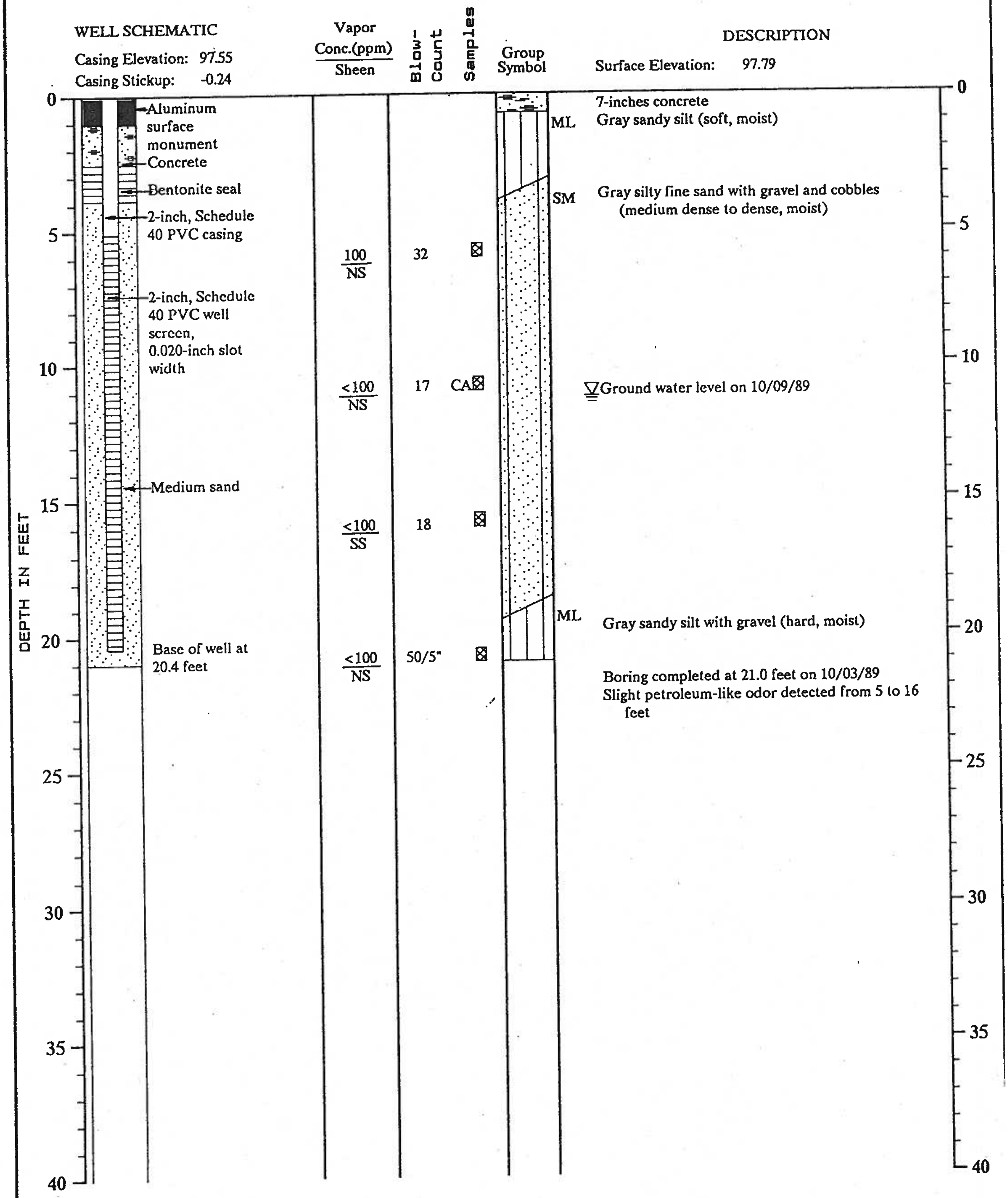
Log of Monitor Well

Figure A-11

TEP:OKP:CDO 1/10/90

1-001-B04

MONITOR WELL NO. MW-10



Note: See Figure A-2 for explanation symbols

TEP:OKP:CDO 2/8/90

-001-B04

GeoEngineers

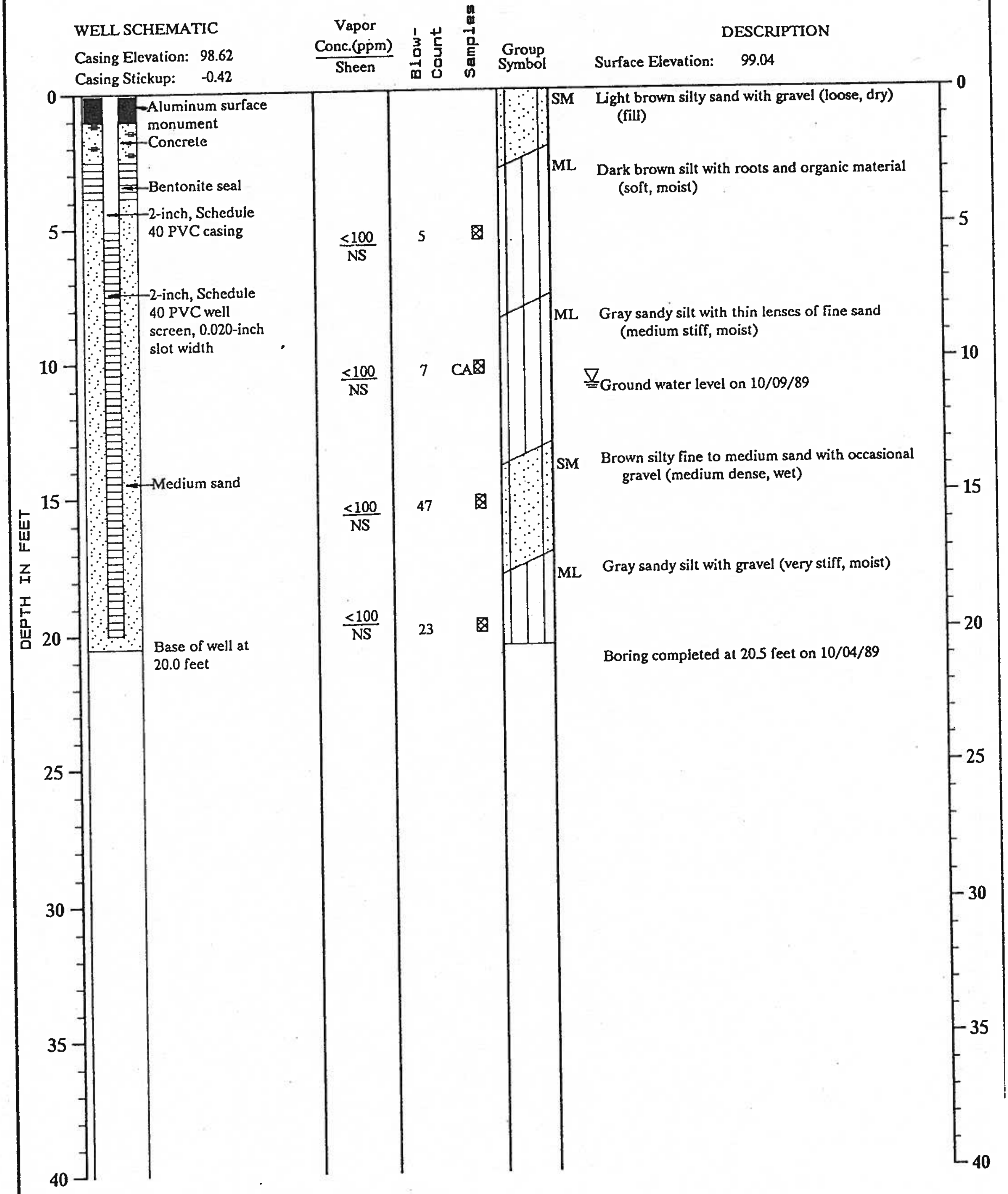
Log of Monitor Well

Figure A-12

MONITOR WELL NO. MW-11

WELL SCHEMATIC
Casing Elevation: 98.62
Casing Stickup: -0.42

DESCRIPTION
Surface Elevation: 99.04



SM Light brown silty sand with gravel (loose, dry) (fill)

ML Dark brown silt with roots and organic material (soft, moist)

ML Gray sandy silt with thin lenses of fine sand (medium stiff, moist)

∇ Ground water level on 10/09/89

SM Brown silty fine to medium sand with occasional gravel (medium dense, wet)

ML Gray sandy silt with gravel (very stiff, moist)

Boring completed at 20.5 feet on 10/04/89

Note: See Figure A-2 for explanation symbols

TEP:OKP:CDO 2/8/90

-001-B04

GeoEngineers

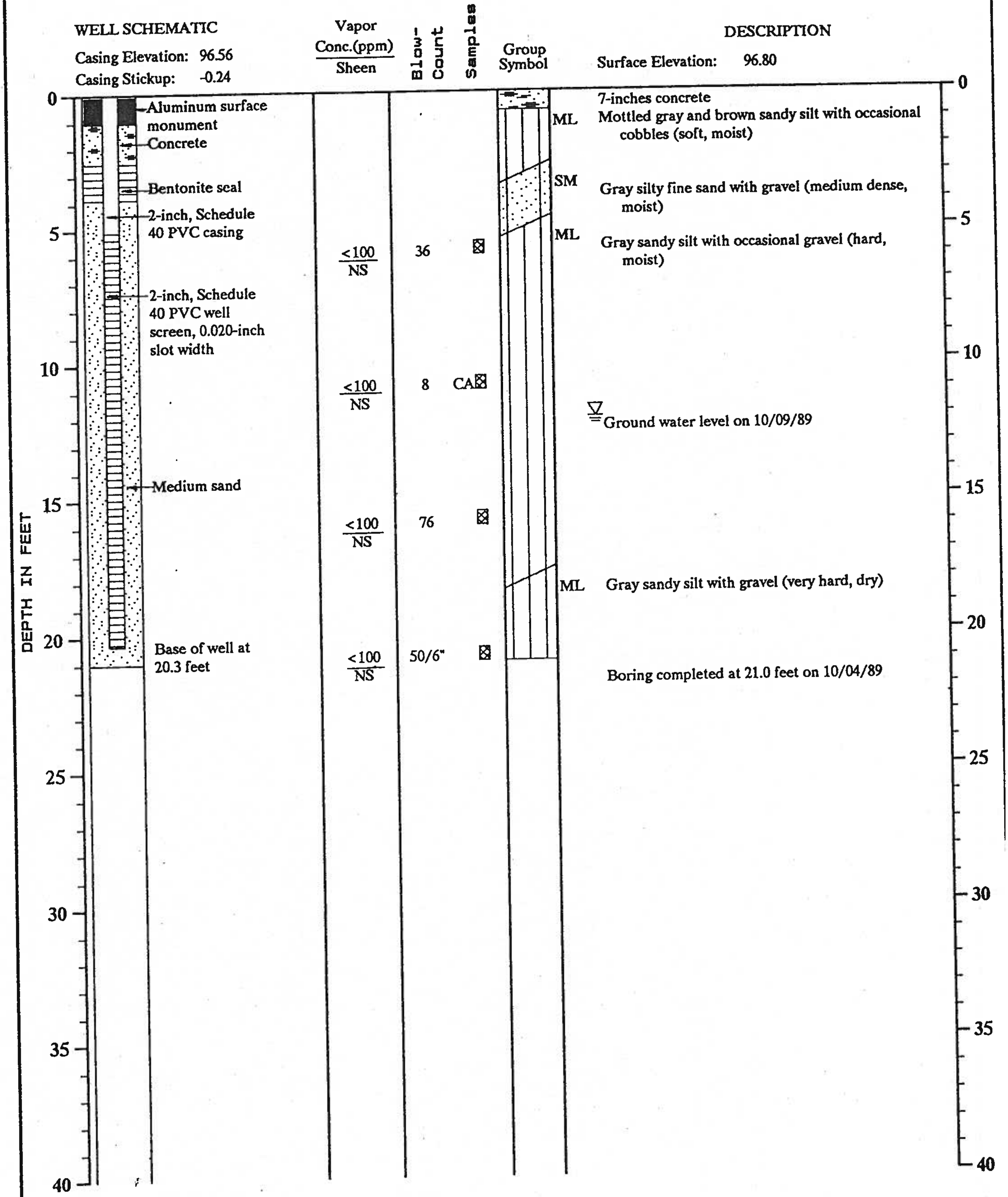
Log of Monitor Well

Figure A-13

MONITOR WELL NO. MW-12

WELL SCHEMATIC
Casing Elevation: 96.56
Casing Stickup: -0.24

DESCRIPTION
Surface Elevation: 96.80



7-inches concrete

Mottled gray and brown sandy silt with occasional cobbles (soft, moist)

Gray silty fine sand with gravel (medium dense, moist)

Gray sandy silt with occasional gravel (hard, moist)

Ground water level on 10/09/89

Gray sandy silt with gravel (very hard, dry)

Boring completed at 21.0 feet on 10/04/89

Note: See Figure A-2 for explanation symbols

TEP:OKP:CDO 1/9/90

GeoEngineers

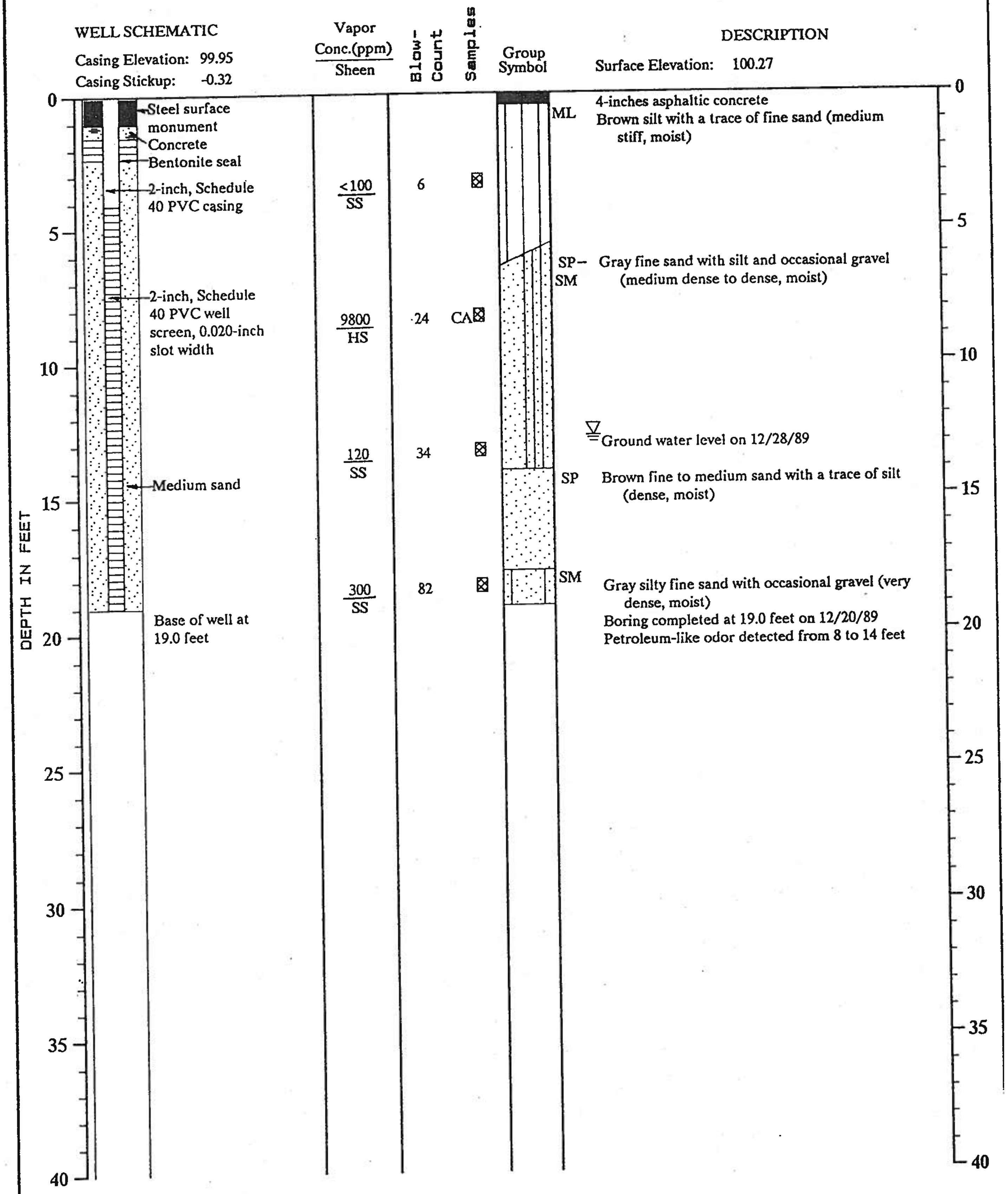
Log of Monitor Well

Figure A-14

MONITOR WELL NO. MW-13

WELL SCHEMATIC
Casing Elevation: 99.95
Casing Stickup: -0.32

DESCRIPTION
Surface Elevation: 100.27



<100 SS	6	☒	
9800 HS	24	CA ☒	
120 SS	34	☒	
300 SS	82	☒	

ML 4-inches asphaltic concrete
Brown silt with a trace of fine sand (medium stiff, moist)

SP-SM Gray fine sand with silt and occasional gravel (medium dense to dense, moist)

Ground water level on 12/28/89

SP Brown fine to medium sand with a trace of silt (dense, moist)

SM Gray silty fine sand with occasional gravel (very dense, moist)
Boring completed at 19.0 feet on 12/20/89
Petroleum-like odor detected from 8 to 14 feet

Note: See Figure A-2 for explanation symbols

GeoEngineers

Log of Monitor Well

Figure A-15

TEP:OKP:CDO 2/8/90

-001-B04

MONITOR WELL NO. MW-14

WELL SCHEMATIC

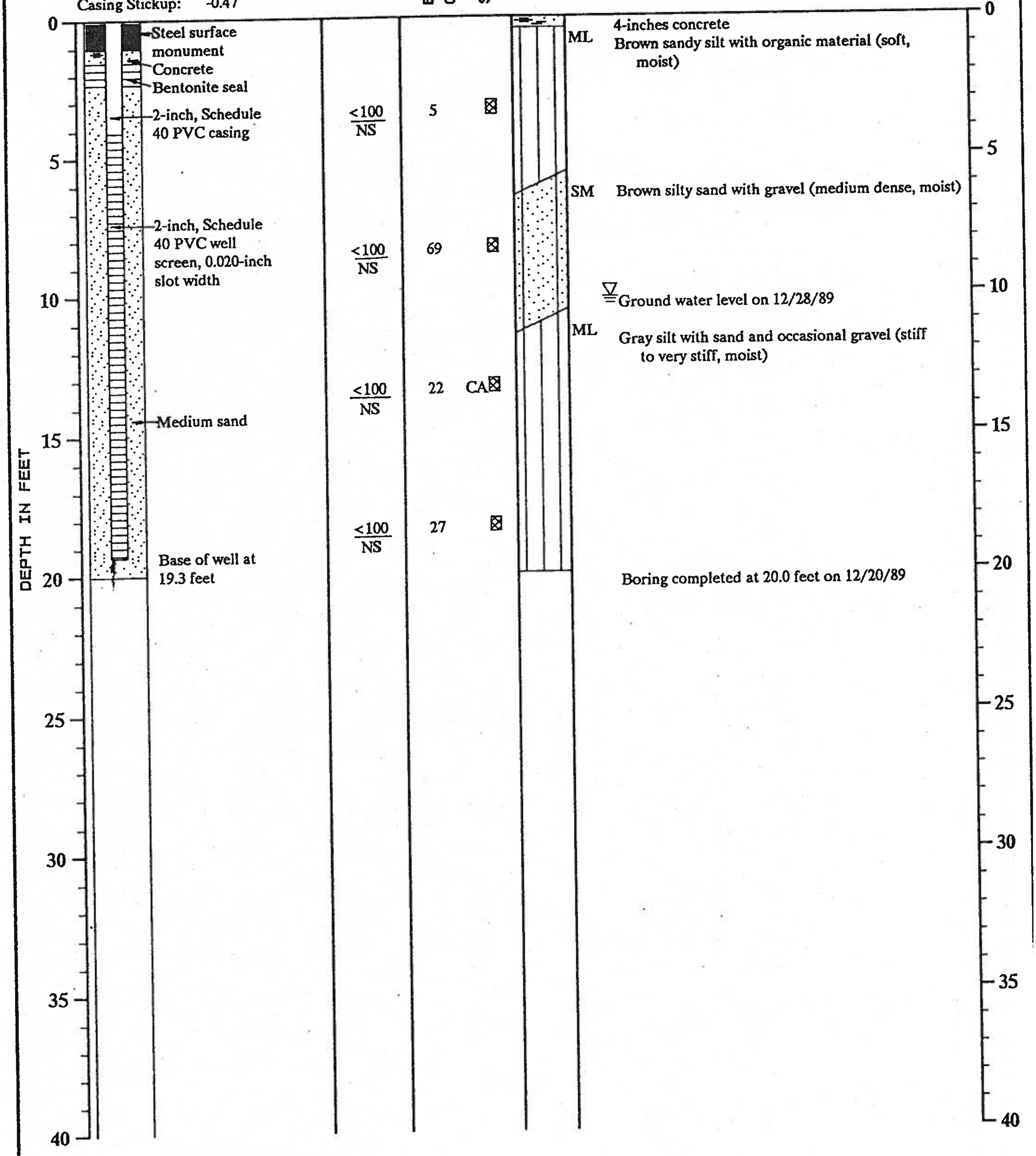
Casing Elevation: 98.07

Casing Stickup: -0.47

Vapor Conc.(ppm) / Sheen | Blow-Count | Samples | Group Symbol

DESCRIPTION

Surface Elevation: 98.54



4-inches concrete

ML Brown sandy silt with organic material (soft, moist)

SM Brown silty sand with gravel (medium dense, moist)

Ground water level on 12/28/89

ML Gray silt with sand and occasional gravel (stiff to very stiff, moist)

Boring completed at 20.0 feet on 12/20/89

Note: See Figure A-2 for explanation symbols

GeoEngineers

Log of Monitor Well

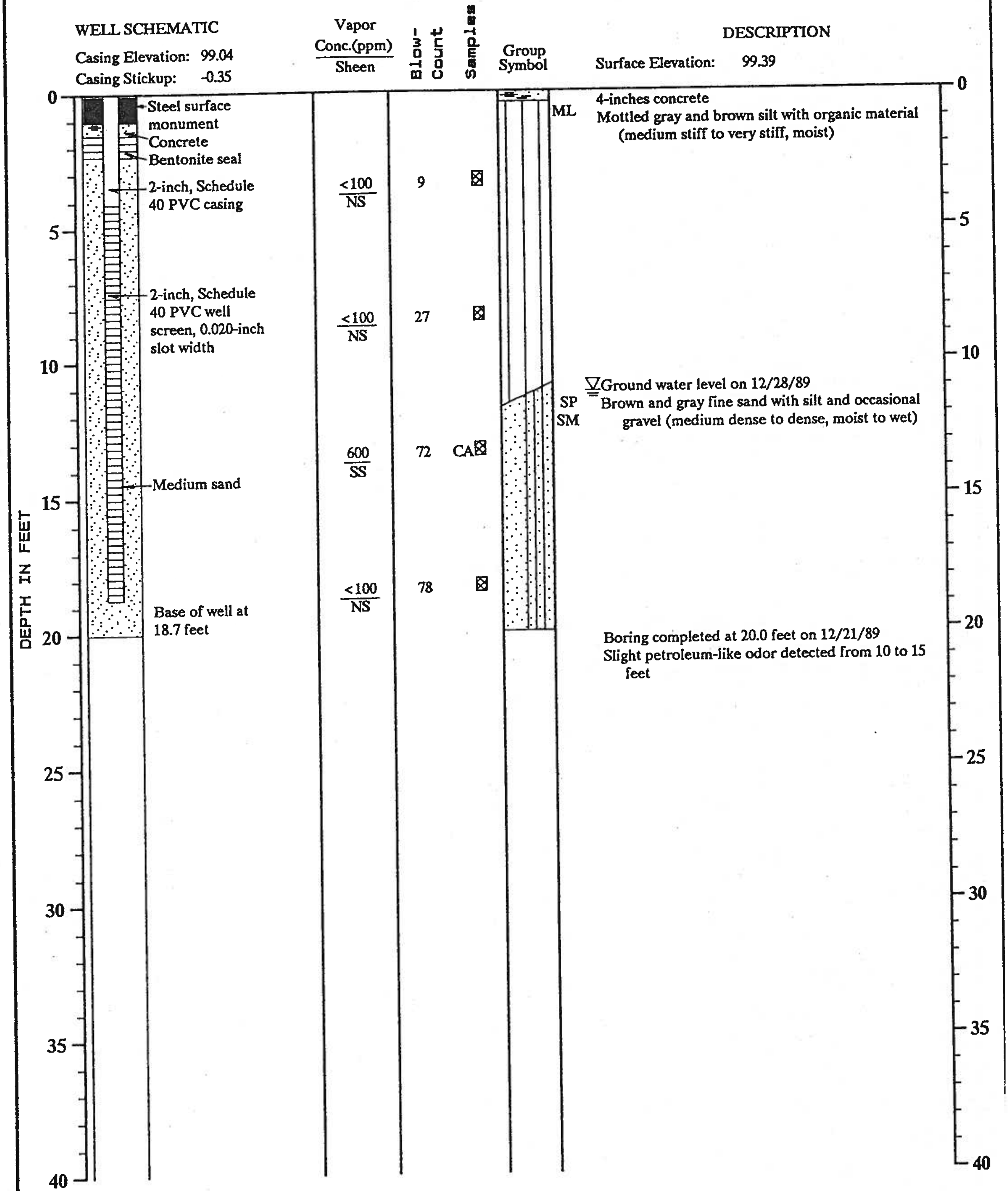
Figure A-16

TEP:OKP:CDO 1/10/90

-001-B04

1

MONITOR WELL NO. MW-15



4-inches concrete

Mottled gray and brown silt with organic material (medium stiff to very stiff, moist)

Ground water level on 12/28/89

Brown and gray fine sand with silt and occasional gravel (medium dense to dense, moist to wet)

Boring completed at 20.0 feet on 12/21/89

Slight petroleum-like odor detected from 10 to 15 feet

Note: See Figure A-2 for explanation symbols

TEP:OKP:CDO 1/10/90

-001-B04

GeoEngineers

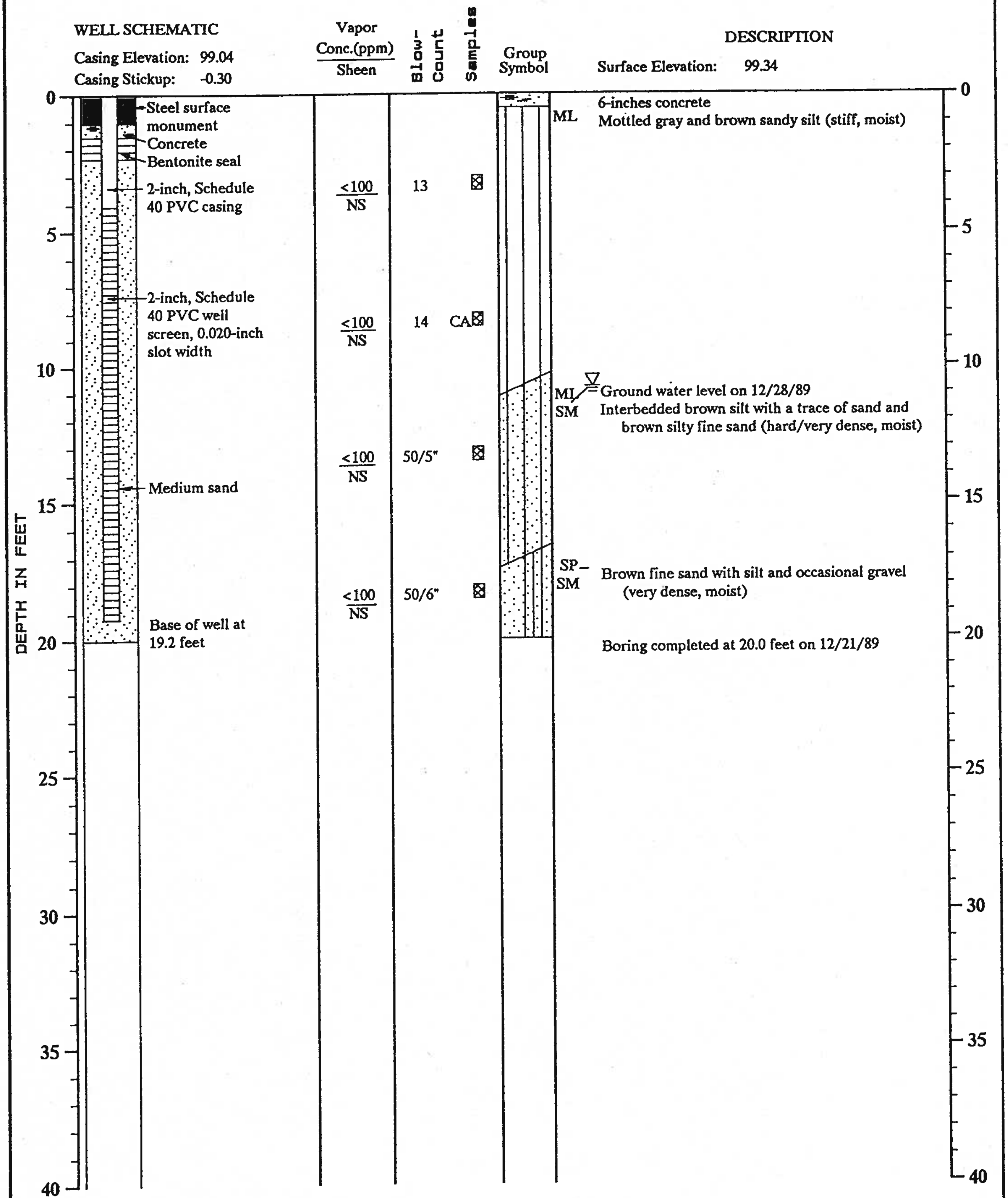
Log of Monitor Well

Figure A-17

MONITOR WELL NO. MW-16

WELL SCHEMATIC
Casing Elevation: 99.04
Casing Stickup: -0.30

DESCRIPTION
Surface Elevation: 99.34



Vapor Conc.(ppm) / Sheen	Blow-Count	Samples	Group Symbol	DESCRIPTION
				6-inches concrete
			ML	Mottled gray and brown sandy silt (stiff, moist)
<100 / NS	13	☒		
<100 / NS	14	CA☒		
			ML/SM	Ground water level on 12/28/89 Interbedded brown silt with a trace of sand and brown silty fine sand (hard/very dense, moist)
<100 / NS	50/5"	☒		
			SP-SM	Brown fine sand with silt and occasional gravel (very dense, moist)
<100 / NS	50/6"	☒		
				Boring completed at 20.0 feet on 12/21/89

Note: See Figure A-2 for explanation symbols

GeoEngineers

Log of Monitor Well

Figure A-18

TEP:OKP:CDO 1/10/90

1-001-B04

Boring Log

Kennedy/Jenks Consultants

BORING LOCATION: North side of E McGraw St

DRILLING COMPANY: Holt Services, Inc

DRILLER: Michael Running

DRILLING METHOD(S): Direct Push (Geoprobe 7822 DT)

DRILL BIT(S) SIZE: 2"

ISOLATION CASING: N/A — FROM N/A TO N/A FT.

BLANK CASING: N/A — FROM N/A TO N/A FT.

SLOTTED CASING: N/A — FROM N/A TO N/A FT.

SIZE AND TYPE OF FILTER PACK: N/A — FROM N/A TO N/A FT.

SEAL: 3/8" Hydrated Bentonite Chips — FROM 0 TO 20 FT.

GROUT: N/A — FROM N/A TO N/A FT.

Boring Name KJB-1

Project Name Ecology Circle K

Project Number 1696010.00

MEAURING PT. ELEVATION: bgs

TOTAL DEPTH: 20.0 ft. bgs

DATE STARTED: 5/18/16

DATE COMPLETED: 5/18/16

INITIAL WATER DEPTH (FT): 6.0

LOGGED BY: J. Schwarz

SAMPLING METHODS:

WELL COMPLETION
☐ SURFACE HOUSING
☐ STAND PIPE ______ FT.

SAMPLES TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
									Airknifed to 4 ft
			1						
			2						
			☒	KJB-1-2.5				ML	**Sandy SILT** Grayish brown (10 YR 5/2), some gravel, very hard, moist, no odor, no sheen
			3						
	1		4			0.1 0.1			
	4		5			0		SM	**Silty SAND** Brown (10 YR 5/3), some gravel, soft, moist, no odor, no sheen
			6		▽	0		ML	**Sandy SILT** Gray (10 YR 6/1), stiff, moist to wet, no odor, no sheen
			7			0			
			☒	KJB-1-7.5					
			8			0			
			9						
	5		10			0			At 10 ft, more silt, medium stiff
			11			0			At 11 ft, dry to moist, stiff to very stiff
			12			0			
			13 ☒	KJB-1-13		0			At 12 ft, moist, more sand than above, medium stiff
			14			0			
			15			0		SM	**Silty SAND** Gray (10 YR 6/1), stiff, moist to wet, no odor, no sheen
			16			0			
			17			0		ML	**SILT with sand** Gray (10 YR 6/1), some gravel, stiff to very stiff, wet, no odor, no sheen

KJ PNW BORINGLOGS_2016.GPJ KJ PNW.GDT 6/8/17

F-40.1
(6-87) (3-88) (8-90)

SHEET 1 OF 2

Project Name Ecology Circle K **Project Number** 1696010.00 **Boring Name** KJB-1

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
	4.5				▨				**SILT with sand**
			18			0		ML	Gray (10 YR 6/1), some gravel, stiff to very stiff, wet, no odor, no sheen ***(Continued)***
			☒ 19	KJB-1-19		0			
			20						

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Boring backfilled with bentonite and finished to match existing grade.

Boring Log

Kennedy/Jenks Consultants

BORING LOCATION: North side of E McGraw St
DRILLING COMPANY: Holt Services, Inc
DRILLER: Michael Running
DRILLING METHOD(S): Direct Push (Geoprobe 7822 DT)
DRILL BIT(S) SIZE: 2"
ISOLATION CASING: N/A FROM N/A TO N/A FT.
BLANK CASING: N/A FROM N/A TO N/A FT.
SLOTTED CASING: N/A FROM N/A TO N/A FT.
SIZE AND TYPE OF FILTER PACK: N/A FROM N/A TO N/A FT.
SEAL: 3/8" Hydrated Bentonite Chips FROM 0 TO 20 FT.
GROUT: N/A FROM N/A TO N/A FT.

Boring Name KJB-2
Project Name Ecology Circle K
Project Number 1696010.00
MEAURING PT. ELEVATION: bgs
TOTAL DEPTH: 20.0 ft. bgs
DATE STARTED: 5/18/16
DATE COMPLETED: 5/18/16
INITIAL WATER DEPTH (FT): 8.0
LOGGED BY: J. Schwarz
SAMPLING METHODS:
WELL COMPLETION
☐ SURFACE HOUSING
☐ STAND PIPE ______ FT.

SAMPLES TYPE	SAMPLES RECOV. (FEET)	SAMPLES PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
			0						**Airknifed to 4.5 ft**
			1						
			2						
			3	☒ KJB-2-3				ML	**Sandy SILT** Brown, trace fine gravel, moist, no odor, no sheen
			4						
	.5		4.5			0		SP/ SM	**Poorly graded SAND with silt** Brown (10 YR 5/3) to grayish brown, some gravel, soft, moist, no odor, no sheen
	4		5			0			
			6			0			
			7			0		ML	**Sandy SILT** Brown (10 YR 5/3), some grey mottling, medium stiff, moist to wet, no odor, no sheen
			8	☒ KJB-2-8	▽	0			
			9						
	5		10			0		SM	**Silty SAND** Brown (10 YR 5/3), poorly sorted sand, soft, wet, no odor, no sheen
			11			0			
			12	☒ KJB-2-12		0			
			13			0			
			14			0			
			15			0			Brown to grayish brown (10 YR 5/2), siltier with depth, wet, no odor, no sheen
			16			0			
			17						

Project Name Ecology Circle K **Project Number** 1696010.00 **Boring Name** KJB-2

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
	5		18		▨	0	▥	SM	
			☒ 19	KJB-2-19	▨	0 0	▥	ML	**SILT with sand** Gray (10 YR 5/1), some gravel and cobbles, stiff to very stiff, moist, no odor, no sheen
			20						

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Boring backfilled with bentonite and finished to match existing grade.

Boring Log

Kennedy/Jenks Consultants

BORING LOCATION North side of E McGraw St
DRILLING COMPANY Holt Services, Inc
DRILLER Michael Running
DRILLING METHOD(S) Direct Push (Geoprobe 7822 DT)
DRILL BIT(S) SIZE 2"
ISOLATION CASING N/A — FROM N/A TO N/A FT.
BLANK CASING N/A — FROM N/A TO N/A FT.
SLOTTED CASING N/A — FROM N/A TO N/A FT.
SIZE AND TYPE OF FILTER PACK N/A — FROM N/A TO N/A FT.
SEAL 3/8" Hydrated Bentonite Chips — FROM 0 TO 20 FT.
GROUT N/A — FROM N/A TO N/A FT.

Boring Name KJB-3
Project Name Ecology Circle K
Project Number 1696010.00
MEAURING PT. ELEVATION bgs
TOTAL DEPTH 20.0 ft. bgs
DATE STARTED 5/18/16
DATE COMPLETED 5/18/16
INITIAL WATER DEPTH (FT) N/A
LOGGED BY J. Schwarz
SAMPLING METHODS
WELL COMPLETION
☐ SURFACE HOUSING
☐ STAND PIPE ______ FT.

SAMPLES: TYPE	SAMPLES: RECOV. (FEET)	SAMPLES: PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
									Airknifed to 2 ft (refusal)
			1						
		☒	2	KJB-3-2				SM	**Silty SAND** Dark brown (10 YR 3/3), abundant organic material, moist, no odor, no sheen
	1.5		3						**Sandy SILT** Grayish brown (10 YR 5/2) mottled with brown (10 YR 5/3), very stiff, moist, no odor, no sheen
			4						
			5			0			
			6			0			
	5	☒	7	KJB-3-7.5		0			
			8			0		ML	
			9			0			stiff
			10			0			very stiff, color grades towards gray with depth, lenses with higher proportions of sand and silt, siltier from 10 to 12 ft, sandier from 12 to 12.5 ft
			11			0			
	5	☒	12	KJB-3-12.5		0			
			13			0			**Poorly graded SAND with silt** Gray (10 YR 5/1), medium to coarse sand with some cobbles, some grains visible within cobbles, grading to grayish brown (10 YR 5/2) with depth, no odor, no sheen
			14			0		SP/ SM	very stiff, grading to dark gray (10 YR 4/1), more silt
			15			0			
			16			0			**Silty SAND** Gray (10 YR 5/1), poorly graded sand, some gravel and cobbles, grading to grayish brown (10 YR 5/2) with depth, very stiff, wet, no odor, no sheen
			17					SM	

Project Name Ecology Circle K **Project Number** 1696010.00 **Boring Name** KJB-3

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
	4				▨	0		SM	
			18		▨				
			☒	KJB-3-18.5	▨	0		ML	**SILT with sand** Gray (10 YR 5/1), some gravel and cobbles, very stiff, moist, no odor, no sheen
			19		▨				
			20		▨				

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Boring backfilled with bentonite and finished to match existing grade.

Boring Log

Kennedy/Jenks Consultants

BORING LOCATION: E side of Mont's Market driveway, along S side of E McGraw St
DRILLING COMPANY: Holt Services, Inc
DRILLER: Michael Running
DRILLING METHOD(S): Direct Push (Geoprobe 7822 DT)
DRILL BIT(S) SIZE: 2"
ISOLATION CASING: N/A — FROM N/A TO N/A FT.
BLANK CASING: N/A — FROM N/A TO N/A FT.
SLOTTED CASING: N/A — FROM N/A TO N/A FT.
SIZE AND TYPE OF FILTER PACK: N/A — FROM N/A TO N/A FT.
SEAL: 3/8" Hydrated Bentonite Chips — FROM 0 TO 20 FT.
GROUT: N/A — FROM N/A TO N/A FT.

Boring Name KJB-4
Project Name Ecology Circle K
Project Number 1696010.00
MEAURING PT. ELEVATION: bgs
TOTAL DEPTH: 20.0 ft. bgs
DATE STARTED: 5/18/16
DATE COMPLETED: 5/18/16
INITIAL WATER DEPTH (FT): N/A
LOGGED BY: J. Schwarz
SAMPLING METHODS:
WELL COMPLETION: ☐ SURFACE HOUSING ☐ STAND PIPE ______ FT.

SAMPLES TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
									Airknifed to 4 ft
			1						
			2						
☒				KJB-4-2.5					**Sandy SILT** Gray (10 YR 5/1), fine to very fine sand, mottled with brown, stiff, moist, no odor, no sheen
			3						
								ML	
			4						
			5						**Poorly graded SAND with silt** Brown (10 YR 5/3) to gray, poorly graded fine to coarse sand, moderately stiff, moist, petroleum-like odor
						1.9			
			6						
						1.9			
			7						
	4					2.0			
			8						
☒				KJB-4-8.5		33.5			
			9						strong petroleum-like odor, moderate sheen
			10						Gray (10 YR 6/1), same as above with pockets of coarser sand, strong petroleum-like odor, moderate sheen
						650		SP/ SM	
			11			1762			
						1986			lens of coarse sand with silt
☒			12	KJB-4-12		538			
	4					243			
			13			52.5			silt with medium to fine sand (finer than above), some cobbles, moderately stiff, strong petroleum-like odor
			14						
			15			64			
						2259			
			16						
						246			**SILT with sand** Gray (10 YR 5/1), very stiff, wet, strong petroleum-like odor
			17					ML	

KJ PNW BORINGLOGS_2016.GPJ KJ PNW.GDT 6/8/17

F-40.1
(6-87) (3-88) (8-90)

Project Name Ecology Circle K **Project Number** 1696010.00 **Boring Name** KJB-4

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
	4.5				▨	366			**SILT with sand**
			18		▨	131		ML	Gray (10 YR 5/1), very stiff, wet, strong petroleum-like odor ***(Continued)***
☒			19	KJB-4-19	▨				
			20		▨				

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Boring backfilled with bentonite and finished to match existing grade.

Boring Log

Kennedy/Jenks Consultants

BORING LOCATION W side of Mont's Market driveway, along S side of E McGraw St

DRILLING COMPANY Holt Services, Inc

DRILLER Michael Running

DRILLING METHOD(S) Direct Push (Geoprobe 7822 DT)

DRILL BIT(S) SIZE 2"

ISOLATION CASING N/A — FROM N/A TO N/A FT.

BLANK CASING N/A — FROM N/A TO N/A FT.

SLOTTED CASING N/A — FROM N/A TO N/A FT.

SIZE AND TYPE OF FILTER PACK N/A — FROM N/A TO N/A FT.

SEAL 3/8" Hydrated Bentonite Chips — FROM 0 TO 20 FT.

GROUT N/A — FROM N/A TO N/A FT.

Boring Name KJB-5

Project Name Ecology Circle K

Project Number 1696010.00

MEAURING PT. ELEVATION bgs

TOTAL DEPTH 20.0 ft. bgs

DATE STARTED 5/18/16

DATE COMPLETED 5/18/16

INITIAL WATER DEPTH (FT) 8.0

LOGGED BY J. Schwarz

SAMPLING METHODS

WELL COMPLETION
☐ SURFACE HOUSING
☐ STAND PIPE______ FT.

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
									Airknifed to 4 ft
			1						
			2						
			3						
		☒		KJB-5-3.5					**SILT with sand** Brown (10 YR 5/3) to gray (10 YR 5/1), mottled color, very firm, moist, no odor, no sheen
			4						
	1								
			5						
						1.0			
			6						
						0.2		ML	
		☒	7	KJB-5-7					Some gravel and cobbles
	5					7.8			
			8		▽				
						0.9			
			9						
						0			**Silty SAND** Gray (10 YR 6/1), medium stiff to very stiff, moist to wet, no odor, no sheen
			10						
						0			
			11						
						1.0			
		☒	12	KJB-5-12					
	4					0.7			
			13						
						4.2		SM	
			14						
			15						Coarser sand than above, wet, slight petroleum-like odor
						31.0			
			16						
						10.6			
			17						

Project Name Ecology Circle K **Project Number** 1696010.00 **Boring Name** KJB-5

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
	5				▨	6.8	▥		**Silty SAND**
			18						Gray (10 YR 6/1), medium stiff to very stiff, moist to wet, no odor, no sheen ***(Continued)***
						2.7		SM	Finer sand than above, wet
			19						
			☒	KJB-5-19.5		0.2			
			20						

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Boring backfilled with bentonite and finished to match existing grade.

Boring Log

Kennedy/Jenks Consultants

BORING LOCATION
North of the Mont's Market building, within the former excavation area

DRILLING COMPANY
Holt Services, Inc

DRILLER
Michael Running

DRILLING METHOD(S)
Direct Push (Geoprobe 7822 DT)

DRILL BIT(S) SIZE
2"

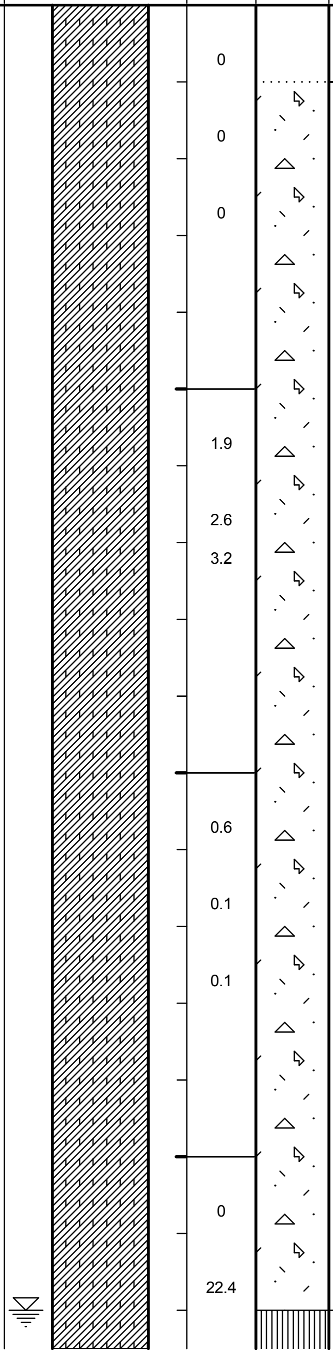
		FROM	TO	FT.
ISOLATION CASING	N/A	N/A	N/A	
BLANK CASING	N/A	N/A	N/A	
SLOTTED CASING	N/A	N/A	N/A	
SIZE AND TYPE OF FILTER PACK	N/A	N/A	N/A	
SEAL	3/8" Hydrated Bentonite Chips	0	25	
GROUT	N/A	N/A	N/A	

Boring Name KJB-6

Project Name Ecology Circle K

Project Number 1696010.00

MEAURING PT. ELEVATION bgs	TOTAL DEPTH 25.0 ft. bgs
DATE STARTED 5/18/16	DATE COMPLETED 5/18/16
INITIAL WATER DEPTH (FT) 17.0	
LOGGED BY J. Schwarz	
SAMPLING METHODS	WELL COMPLETION ☐ SURFACE HOUSING ☐ STAND PIPE_____ FT.



SAMPLES TYPE	SAMPLES RECOV. (FEET)	SAMPLES PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
						0			**Asphalt**
			1			0			**Well-graded GRAVEL** Pea gravel (assumed to be former excavation fill material), some rootlets, dry to moist, no odor, no sheen
	3		2			0			
			3						
			4 ☒	KJB-6-4					
			5			1.9			
			6			2.6			
	2.5		7 ☒	KJB-6-7		3.2			
			8						
			9					GW	
			10			0.6			
			11			0.1			
	3		12			0.1			
			13						
			14						
			15			0			
			16			22.4			
			17		▽			SM	***(See next page for lithology description)***

KJ PNW BORINGLOGS_2016.GPJ KJ PNW.GDT 6/8/17

F-40.1
(6-87) (3-88) (8-90)

Project Name Ecology Circle K **Project Number** 1696010.00 **Boring Name** KJB-6

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
	5		☒	KJB-6-17.5	▨	11.9	▥	SM	**Silty SAND** Gray (10 YR 5/1), fine to coarse sand with some gravel, stiff, moist to wet, petroleum-like odor, no sheen ***(Continued)***
			18						
						8.4			
			19						
						2.0			
			20						
						11.9			
			21			11.8			
						22.0			
			22						
	3		☒	KJB-6-22		1.1			
			23						
			24						
			25						

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Boring backfilled with bentonite and finished to match existing grade.

Boring Log

Kennedy/Jenks Consultants

BORING LOCATION 2350 24th Ave E Parking Lot			
DRILLING COMPANY Holt Services, Inc	DRILLER Michael Running		
DRILLING METHOD(S) Direct Push (Geoprobe 7822 DT)	DRILL BIT(S) SIZE 2"		
ISOLATION CASING N/A	FROM N/A	TO N/A	FT.
BLANK CASING N/A	FROM N/A	TO N/A	FT.
SLOTTED CASING N/A	FROM N/A	TO N/A	FT.
SIZE AND TYPE OF FILTER PACK N/A	FROM N/A	TO N/A	FT.
SEAL 3/8" Hydrated Bentonite Chips	FROM 0	TO 20	FT.
GROUT N/A	FROM N/A	TO N/A	FT.

Boring Name KJB-7

Project Name Ecology Circle K

Project Number 1696010.00

MEAURING PT. ELEVATION bgs	TOTAL DEPTH 20.0 ft. bgs
DATE STARTED 5/19/16	DATE COMPLETED 5/19/16
INITIAL WATER DEPTH (FT) 10.5	
LOGGED BY J. Schwarz	
SAMPLING METHODS	WELL COMPLETION ☐ SURFACE HOUSING ☐ STAND PIPE_____ FT.

SAMPLES TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID/Sheen Test	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
									Airknifed to 5 ft
			1						
			2 ☒	KJB-7-2					**Silty SAND** Gray (10 YR 6/1) mottled with brown (10 YR 5/3), medium stiff, moist, no odor, no sheen
			3						
			4						
			5						Brown, less gray, some gravel and cobbles
						0		SM	
			6						
						0			
			7						
	5					0 / NS			
			8						
						0			
			9						Gray (10 YR 6/1), some cobbles
			☒	KJB-7-9.5		206			**Poorly graded SAND with silt** Gray (10 YR 6/1), fine to medium sand, soft, moist to wet, petroleum-like odor, sheen
			10						
					▽	580 / MS			
			11 ☒	KJB-7-11					
						199 / MS			
			12						
	4					196 / SS		SP/ SM	
			13						
						32 / NS			
			14						
			15						
						7.2 / NS			
			16			55.6			**SILT with sand** Gray (10 YR 6/1), fine to medium sand, stiff to very stiff, moist to wet, strong petroleum-like odor
						18.2		ML	
			17						

KJ PNW BORINGLOGS_2016.GPJ KJ PNW.GDT 6/8/17

F-40.1
(6-87) (3-88) (8-90)

Project Name Ecology Circle K **Project Number** 1696010.00 **Boring Name** KJB-7

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID/Sheen Test	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
	4		18		▨	19.8 116.5 / SS		ML	**SILT with sand** Gray (10 YR 6/1), fine to medium sand, stiff to very stiff, moist to wet, strong petroleum-like odor ***(Continued)***
			☒ 19	KJB-7-18.5	▨	206 / NS			
			20		▨				

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Boring backfilled with bentonite and finished to match existing grade.

Boring Log

Kennedy/Jenks Consultants

BORING LOCATION 2350 24th Ave E Parking Lot			
DRILLING COMPANY Holt Services, Inc	DRILLER Michael Running		
DRILLING METHOD(S) Direct Push (Geoprobe 7822 DT)	DRILL BIT(S) SIZE 2"		
ISOLATION CASING N/A	FROM N/A	TO N/A	FT.
BLANK CASING N/A	FROM N/A	TO N/A	FT.
SLOTTED CASING N/A	FROM N/A	TO N/A	FT.
SIZE AND TYPE OF FILTER PACK N/A	FROM N/A	TO N/A	FT.
SEAL 3/8" Hydrated Bentonite Chips	FROM 0	TO 20	FT.
GROUT N/A	FROM N/A	TO N/A	FT.

Boring Name KJB-8

Project Name Ecology Circle K

Project Number 1696010.00

MEAURING PT. ELEVATION bgs	TOTAL DEPTH 20.0 ft. bgs
DATE STARTED 5/19/16	DATE COMPLETED 5/19/16
INITIAL WATER DEPTH (FT) N/A	
LOGGED BY J. Schwarz	
SAMPLING METHODS	WELL COMPLETION ☐ SURFACE HOUSING ☐ STAND PIPE_____ FT.

SAMPLES TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID/Sheen Test	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
									Airknifed to 4 ft
			1						
			2						
			☒	KJB-8-2.5					
			3						
			4					ML	**SILT with sand** Brown (10 YR 5/3), mottled with gray, stiff to very stiff, moist, no odor, no sheen
			5						**Silty SAND** Gray (10 YR 5/1), fine to coarse sand, some cobbles and gravel, some areas with more silt, stiff to medium stiff, moist, slight petroleum-like odor, no sheen
			6			0			
			7			0			
	5					3.9			
			8 ☒	KJB-8-8		7.8			
			9			9.6 / NS			
			10			85			
			11			458 / MS		SM	
	4		12 ☒	KJB-8-12		1801 / HS 882 / HS			
			13			986 / HS			
			14						Coarser sand with depth, soft, strong petroleum-like odor, heavy sheen
			15			370 / HS			
			16			59.8 / MS			Sheen visible on surface of soil core, wet
			17						

KJ PNW BORINGLOGS_2016.GPJ KJ PNW.GDT 6/8/17

Project Name Ecology Circle K **Project Number** 1696010.00 **Boring Name** KJB-8

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID/Sheen Test	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
	4.5				▨	35.8	▥		**Silty SAND** Gray (10 YR 5/1), fine to coarse sand, some cobbles and gravel, some areas with more silt, stiff to medium stiff, moist, slight petroleum-like odor, no sheen ***(Continued)***
			18		▨		▥	SM	
					▨	17.1	▥		
			19 ☒	KJB-8-19	▨		▥		lenses of coarser and finer sand
					▨	3.5 / NS			
			20						

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Boring backfilled with bentonite and finished to match existing grade.

Boring Log

Kennedy/Jenks Consultants

BORING LOCATION 2350 24th Ave E Parking Lot
DRILLING COMPANY Holt Services, Inc
DRILLER Michael Running
DRILLING METHOD(S) Direct Push (Geoprobe 7822 DT)
DRILL BIT(S) SIZE 2"
ISOLATION CASING N/A — FROM N/A TO N/A FT.
BLANK CASING N/A — FROM N/A TO N/A FT.
SLOTTED CASING N/A — FROM N/A TO N/A FT.
SIZE AND TYPE OF FILTER PACK N/A — FROM N/A TO N/A FT.
SEAL 3/8" Hydrated Bentonite Chips — FROM 0 TO 20 FT.
GROUT N/A — FROM N/A TO N/A FT.

Boring Name KJB-9
Project Name Ecology Circle K
Project Number 1696010.00
MEAURING PT. ELEVATION bgs
TOTAL DEPTH 20.0 ft. bgs
DATE STARTED 5/19/16
DATE COMPLETED 5/19/16
INITIAL WATER DEPTH (FT) 9.0
LOGGED BY J. Schwarz
SAMPLING METHODS
WELL COMPLETION
☐ SURFACE HOUSING
☐ STAND PIPE ______ FT.

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
									Airknifed to 3.5 ft
			1						
			2	KJB-9-2					**Silty SAND** Brown (10 YR 5/2), fine to coarse sand, some fine gravel, moist, no odor, no sheen
			3						
	1		4					SM	
			5						
						0.6			
			6						**Poorly graded SAND with silt** Grayish brown (10 YR 5/2), fine to coarse sand, some gravel and cobbles, soft to medium stiff, moist to wet, petroleum-like odor, sheen
						0			
			7						
	4.5					1.7			
			8						
				KJB-9-8.5		663			
			9		▽				
			10						Same as above, siltier with depth, wet, petroleum-like odor, sheen
						1431			
			11						
						122.7			
			12					SP/ SM	
	5					488			
			13	KJB-9-13					
						119.9			
			14						
						774.6			
			15						
						166			
			16						
						38.3			
			17						

Project Name Ecology Circle K **Project Number** 1696010.00 **Boring Name** KJB-9

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
	5		18		▨	5.6	▥	SM	**Silty SAND** Gray (10 YR 5/1), some cobbles and gravel, very stiff, wet, slight petroleum-like odor, no sheen
			☒ 19	KJB-9-19		5.3			
			20			23.2			

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Boring backfilled with bentonite and finished to match existing grade.

Boring Log

Kennedy/Jenks Consultants

BORING LOCATION: 2350 24th Ave E Parking Lot
DRILLING COMPANY: Holt Services, Inc
DRILLER: Michael Running
DRILLING METHOD(S): Direct Push (Geoprobe 7822 DT)
DRILL BIT(S) SIZE: 2"
ISOLATION CASING: N/A — FROM N/A TO N/A FT.
BLANK CASING: N/A — FROM N/A TO N/A FT.
SLOTTED CASING: N/A — FROM N/A TO N/A FT.
SIZE AND TYPE OF FILTER PACK: N/A — FROM N/A TO N/A FT.
SEAL: 3/8" Hydrated Bentonite Chips — FROM 0 TO 20 FT.
GROUT: N/A — FROM N/A TO N/A FT.

Boring Name KJB-10
Project Name Ecology Circle K
Project Number 1696010.00

MEAURING PT. ELEVATION: bgs
TOTAL DEPTH: 20.0 ft. bgs
DATE STARTED: 5/19/16
DATE COMPLETED: 5/19/16
INITIAL WATER DEPTH (FT): 12.0
LOGGED BY: J. Schwarz
SAMPLING METHODS:
WELL COMPLETION
☐ SURFACE HOUSING
☐ STAND PIPE ______ FT.

SAMPLES TYPE	SAMPLES RECOV. (FEET)	SAMPLES PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
			0						**Airknifed to 4 ft**
			1						
			2	☒ KJB-10-2					**Silty SAND** Dark gray (10 YR 4/1), mottled with brown, stiff, moist, no odor, no sheen
			3						
			4						
			5						Sandier, stiff with locally soft lenses
			6			5.8			
	4		7			165		SM	
			8	☒ KJB-10-8		403			Gradual color change to brown (10 YR 5/3), very stiff, slight sheen, petroleum-like odor
			9						
			10						
			11			212			
	5		12		▽	20.9			**Sandy SILT** Gray (10 YR 5/1), Poorly sorted fine to coarse sand, wet, no sheen, petroleum-like odor
			13	☒ KJB-10-13		26.3			
			14			137.1			
			15			144.8		ML	Sheen visible on surface
			16			10.3			
			17			20			

KJ PNW BORINGLOGS_2016.GPJ KJ PNW.GDT 6/8/17

F-40.1
(6-87) (3-88) (8-90)

SHEET 1 OF 2

Project Name Ecology Circle K **Project Number** 1696010.00 **Boring Name** KJB-10

SAMPLES									
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
	5				▨	472			**Sandy SILT** Gray (10 YR 5/1), Poorly sorted fine to coarse sand, wet, no sheen, petroleum-like odor ***(Continued)***
			18		▨				
					▨	801		ML	
			19		▨				
			☒ 20	KJB-10-19.5	▨				

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Boring backfilled with bentonite and finished to match existing grade.

Boring Log

Kennedy/Jenks Consultants

BORING LOCATION: NE corner of 3250 24th Ave E lot
DRILLING COMPANY: Holt Services, Inc
DRILLER: Michael Running
DRILLING METHOD(S): Direct Push (Geoprobe 7822 DT)
DRILL BIT(S) SIZE: 2"
ISOLATION CASING: N/A — FROM N/A TO N/A FT.
BLANK CASING: N/A — FROM N/A TO N/A FT.
SLOTTED CASING: N/A — FROM N/A TO N/A FT.
SIZE AND TYPE OF FILTER PACK: N/A — FROM N/A TO N/A FT.
SEAL: 3/8" Hydrated Bentonite Chips — FROM 0 TO 20 FT.
GROUT: N/A — FROM N/A TO N/A FT.

Boring Name KJB-11
Project Name Ecology Circle K
Project Number 1696010.00
MEAURING PT. ELEVATION: bgs
TOTAL DEPTH: 20.0 ft. bgs
DATE STARTED: 5/19/16
DATE COMPLETED: 5/19/16
INITIAL WATER DEPTH (FT): 8.5
LOGGED BY: J. Schwarz
SAMPLING METHODS:
WELL COMPLETION
☐ SURFACE HOUSING
☐ STAND PIPE______ FT.

SAMPLES									
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
									Airknifed to 5 ft
			1						
			2	KJB-11-2					**SILT** Grayish brown (10 YR 5/2), traces of fine sand, dense, low plasticity, moist, no odor, no sheen
			3					ML	
			4						
			5			1.4			**Sandy SILT** Pale brown (10 YR 6/3), fine to medium sand, some cobbles, very stiff, moist, no odor, no sheen Lens with more cobbles and gravel
			6			3.1			
	4		7			2.5		ML	
			8	KJB-11-8	▽	3.7			
			9						**Silty SAND** Brown (10 YR 5/3), stiff, wet, no odor, no sheen
			10			.8			
			11			.7			
	4		12			.7			Gradual change to gray (10 YR 6/1)
			13	KJB-11-13		.7		SM	2 inch lens with many cobbles
			14						
			15						Cobbles scattered throughout
			16			.4			
			17			.5		ML	***(See next page for lithology description)***

Project Name Ecology Circle K **Project Number** 1696010.00 **Boring Name** KJB-11

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
	5				▨				**Sandy SILT**
			18			.5		ML	Gray (10 YR 6/1), some cobbles, very stiff, moist to wet, no odor, no sheen ***(Continued)***
			☒ 19	KJB-11-19		.8			2 inch lens gray sand with silt
			20						

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Boring backfilled with bentonite and finished to match existing grade.

Boring Log

Kennedy/Jenks Consultants

BORING LOCATION Alley to the east of Mont's Market

DRILLING COMPANY Holt Services, Inc

DRILLER Michael Running

DRILLING METHOD(S) Direct Push (Geoprobe 7822 DT)

DRILL BIT(S) SIZE 2"

ISOLATION CASING N/A — FROM N/A TO N/A FT.

BLANK CASING N/A — FROM N/A TO N/A FT.

SLOTTED CASING N/A — FROM N/A TO N/A FT.

SIZE AND TYPE OF FILTER PACK N/A — FROM N/A TO N/A FT.

SEAL 3/8" Hydrated Bentonite Chips — FROM 0 TO 20 FT.

GROUT N/A — FROM N/A TO N/A FT.

Boring Name KJB-12

Project Name Ecology Circle K

Project Number 1696010.00

MEAURING PT. ELEVATION bgs

TOTAL DEPTH 20.0 ft. bgs

DATE STARTED 5/19/16

DATE COMPLETED 5/19/16

INITIAL WATER DEPTH (FT) 12.0

LOGGED BY J. Schwarz

SAMPLING METHODS

WELL COMPLETION
☐ SURFACE HOUSING
☐ STAND PIPE ______ FT.

SAMPLES TYPE	SAMPLES RECOV. (FEET)	SAMPLES PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
									Airknifed to 4.5 ft
			1						
			2	KJB-12-2				ML	**SILT with sand** Pale brown (10 YR 6/3), fine sand, medium stiff, some organic matter visible, low plasticity, moist, no odor, no sheen
			3						
			4						**Silty SAND** Grayish brown (10 YR 5/2), fine to medium sand with lenses of coarser sand, some organic matter visible, some gravel and cobbles throughout, medium stiff, moist, no odor, no sheen
			5			0			
			6			0			
	5		7			0			
			8	KJB-12-8		0			More cobbles, rounded to subrounded
			9			0			
			10			0		SM	
			11			0.1			
	1.5		12		▽				wet
			13						
			14						
			15	KJB-12-15		0			
			16			0			**SILT with sand** Gray (10 YR 5/1), primarily silt, very stiff, moist, but not as wet as above, no odor, no sheen
			17					ML	

Boring Log

Kennedy/Jenks Consultants

Project Name Ecology Circle K **Project Number** 1696010.00 **Boring Name** KJB-12

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
	4				▨	0			**SILT with sand** Gray (10 YR 5/1), primarily silt, very stiff, moist, but not as wet as above, no odor, no sheen ***(Continued)***
			18		▨				
					▨	0		ML	1 in lens of silt with sand, medium to coarse sand
			☒ 19	KJB-12-19	▨				
			20						

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Boring backfilled with bentonite and finished to match existing grade.
3. The 10 to 15 foot core was not sampled due to poor recovery. A rock was lodged in the bottom of the core, resulting in only 1.5 feet of recovery.

Boring Log

Kennedy/Jenks Consultants

BORING LOCATION
2350 24th Ave E Parking Lot

DRILLING COMPANY
Holt Services, Inc

DRILLER
Michael Running

DRILLING METHOD(S)
Direct Push (Geoprobe 7822 DT)

DRILL BIT(S) SIZE
2"

ISOLATION CASING N/A — FROM N/A TO N/A FT.

BLANK CASING N/A — FROM N/A TO N/A FT.

SLOTTED CASING N/A — FROM N/A TO N/A FT.

SIZE AND TYPE OF FILTER PACK N/A — FROM N/A TO N/A FT.

SEAL 3/8" Hydrated Bentonite Chips — FROM 0 TO 20 FT.

GROUT N/A — FROM N/A TO N/A FT.

Boring Name KJB-13

Project Name Ecology Circle K

Project Number 1696010.00

MEAURING PT. ELEVATION
bgs

TOTAL DEPTH
20.0 ft. bgs

DATE STARTED
5/19/16

DATE COMPLETED
5/19/16

INITIAL WATER DEPTH (FT)
11.0

LOGGED BY
J. Schwarz

SAMPLING METHODS

WELL COMPLETION
☐ SURFACE HOUSING
☐ STAND PIPE______ FT.

SAMPLES TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
									Airknifed to 4 ft
			1						
		☒	2	KJB-13-2				SM	**Silty SAND** Interbedded lenses of brown (10 YR 5/3) sand and brown to gray (10 YR 5/1) silty sand, lenses vary in thickness from 1 to 20 cm, primary matrix is silty sand, medium stiff, moist, no odor, no sheen
			3						
			4						
	3		5			0			
			6			0			
		☒	7	KJB-13-7		0.1			
			8						
			9						
	4		10			1.4			Grading from grayish brown (10 YR 5/2) to gray (10 YR 5/1), soft, wet, petroleum-like odor, no sheen
			11		▽	80.8			
		☒	12	KJB-13-12		30.3			
			13			1.8			
			14						
			15			61.8			
			16			16.1			
			17					ML	***(See next page for lithology description)***

KJ PNW BORINGLOGS_2016.GPJ KJ PNW.GDT 6/8/17

F-40.1
(6-87) (3-88) (8-90)

Project Name Ecology Circle K **Project Number** 1696010.00 **Boring Name** KJB-13

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
	5				▨	46.7		ML	**Sandy SILT** Gray (10 YR 5/1), some rounded to subrounded gravel and cobbles, very stiff, moist but not as wet as above, no odor, no sheen ***(Continued)***
			18						
						0.2			
			☒ 19	KJB-13-19					
						0.7			
			20						

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Boring backfilled with bentonite and finished to match existing grade.

Boring Log

Kennedy/Jenks Consultants

BORING LOCATION W side of 24th Ave E		**Boring Name**	KJB-14
DRILLING COMPANY Holt Services, Inc	DRILLER Michael Running	**Project Name**	Ecology Circle K
DRILLING METHOD(S) Direct Push (Geoprobe 7822 DT)	DRILL BIT(S) SIZE 2"	**Project Number**	1696010.00
ISOLATION CASING N/A	FROM N/A TO N/A FT.	MEAURING PT. ELEVATION bgs	TOTAL DEPTH 20.0 ft. bgs
BLANK CASING N/A	FROM N/A TO N/A FT.	DATE STARTED 8/1/16	DATE COMPLETED 8/1/16
SLOTTED CASING N/A	FROM N/A TO N/A FT.	INITIAL WATER DEPTH (FT) N/A	
SIZE AND TYPE OF FILTER PACK N/A	FROM N/A TO N/A FT.	LOGGED BY J. Schwarz	
SEAL 3/8" Hydrated Bentonite Chips	FROM 0 TO 20 FT.	SAMPLING METHODS	WELL COMPLETION ☐ SURFACE HOUSING ☐ STAND PIPE ______ FT.
GROUT N/A	FROM N/A TO N/A FT.		

SAMPLES TYPE	SAMPLES RECOV. (FEET)	SAMPLES PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID/Sheen Test	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
									Airknifed to 5 ft
			1						
			2						
			3						
			4						
			5						**Silty SAND with gravel** Brown (10 YR 5/3), fine to coarse sand, medium to large gray gravel with some cobbles, cobbles up to 2 in longest dimension, medium stiff to stiff at bottom, moist to wet, no odor, no sheen
						0			
			6						
						0			
		☒	7	KJB-14-7					
	4					0 / NS			
			8					SM	
						0			
			9						
			10						
						0			
			11						**SILT with sand** Gray (10 YR 5/1), very fine to medium sand, some cobbles, very stiff, moist but less wet than above, no odor, no sheen
						0			
			12						
	5					0 / NS			
		☒	13	KJB-14-13				ML	
						0			
			14						
						0			
			15						**Silty SAND** Gray (10 YR 5/1) with layers of brown, some gravel and cobbles, medium stiff, moist, no odor, no sheen
						0			
			16					SM	
						0			
			17					ML	***(See next page for lithology description)***

Boring Log **Kennedy/Jenks Consultants**

Project Name Ecology Circle K **Project Number** 1696010.00 **Boring Name** KJB-14

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID/Sheen Test	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
	5				▨	0 / NS			**SILT with sand** Gray (10 YR 5/1), very fine to coarse sand, some gravel and cobbles, very stiff, moist, no odor, no sheen ***(Continued)***
		☒	18	KJB-14-18	▨				
					▨	0		ML	
			19		▨				
					▨	0			
			20						

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Boring backfilled with bentonite and finished to match existing grade.
3. Temporary well placed with screen from 5 - 20 feet (measured as 19.84 ft btoc). Static water level in temporary well at 19.24 ft btoc, with the top of casing at ground surface. No reconnaissance groundwater sample collected due to lack of groundwater.

Boring Log

Kennedy/Jenks Consultants

BORING LOCATION: W side of 24th Ave E

DRILLING COMPANY: Holt Services, Inc

DRILLER: Michael Running

DRILLING METHOD(S): Direct Push (Geoprobe 7822 DT)

DRILL BIT(S) SIZE: 2"

ISOLATION CASING: N/A — FROM N/A TO N/A FT.

BLANK CASING: N/A — FROM N/A TO N/A FT.

SLOTTED CASING: N/A — FROM N/A TO N/A FT.

SIZE AND TYPE OF FILTER PACK: N/A — FROM N/A TO N/A FT.

SEAL: 3/8" Hydrated Bentonite Chips — FROM 0 TO 20 FT.

GROUT: N/A — FROM N/A TO N/A FT.

Boring Name KJB-15

Project Name Ecology Circle K

Project Number 1696010.00

MEAURING PT. ELEVATION: bgs

TOTAL DEPTH: 20.0 ft. bgs

DATE STARTED: 8/1/16

DATE COMPLETED: 8/1/16

INITIAL WATER DEPTH (FT): 10.0

LOGGED BY: J. Schwarz

SAMPLING METHODS:

WELL COMPLETION

☐ SURFACE HOUSING

☐ STAND PIPE ______ FT.

SAMPLES TYPE	SAMPLES RECOV. (FEET)	SAMPLES PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID/Sheen Test	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
			0						**Airknifed to 3 ft**
			1						
			2						
			3						**Sandy SILT** Brown (10 YR 5/3) to grayish brown (10 YR 5/2) in thin layers, some gravel and cobbles, organics (roots), stiff, moist, no odor, no sheen
	2		4			0 0 / NS		ML	
			5			0			1 ft same as above with more gravel and cobbles with sand
			6			0			**Poorly graded SAND with silt** Brown (10 YR 5/3), fine to very coarse sand, some gravel and cobbles, localized areas (1 in) of coarser sand, medium stiff, moist, no odor, no sheen
	3	☒	7.5	KJB-15-7.5		0			
			8					SP/ SM	
			9						
			10		▽				Coarser sand than above, soft, wet
		☒	11	KJB-15-11.5		0			**Silty SAND** Brown (10 YR 5/3), fine to coarse sand, some gravel, few cobbles, stiff, moist, no odor, no sheen
	4.5		12			0 0 / NS			
			13			0			
			14			0		SM	
			15						
			16			0			
			17					ML	***(See next page for lithology description)***

Project Name Ecology Circle K **Project Number** 1696010.00 **Boring Name** KJB-15

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID/Sheen Test	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
	5					0 / NS			**SILT with sand** Gray (10 YR 5/1), some gravel, very stiff, moist, no odor, no sheen ***(Continued)***
			18			0		ML	
			☒ 19	KJB-15-19		0			
			20						

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Boring backfilled with bentonite and finished to match existing grade.
3. Temporary well placed with screen from 5 - 20 feet. Static water level in temporary well at 15.60 ft btoc, with the top of casing approximately 1 ft above ground surface. Reconnaissance groundwater sample KJB-15 collected at 1150 on 1 August 2016.

Boring Log

Kennedy/Jenks Consultants

BORING LOCATION
Driveway of 2415 McGraw Ave E

DRILLING COMPANY
Holt Services, Inc

DRILLER
Michael Running

DRILLING METHOD(S)
Direct Push (Geoprobe 7822 DT)

DRILL BIT(S) SIZE
2"

Boring Name KJB-16

Project Name Ecology Circle K

Project Number 1696010.00

ISOLATION CASING N/A	FROM N/A	TO N/A	FT.
BLANK CASING N/A	FROM N/A	TO N/A	FT.
SLOTTED CASING N/A	FROM N/A	TO N/A	FT.
SIZE AND TYPE OF FILTER PACK N/A	FROM N/A	TO N/A	FT.
SEAL 3/8" Hydrated Bentonite Chips	FROM 0	TO 20	FT.
GROUT N/A	FROM N/A	TO N/A	FT.

MEAURING PT. ELEVATION bgs

TOTAL DEPTH 20.0 ft. bgs

DATE STARTED 8/1/16

DATE COMPLETED 8/1/16

INITIAL WATER DEPTH (FT) 9.0

LOGGED BY J. Schwarz

SAMPLING METHODS

WELL COMPLETION
☐ SURFACE HOUSING
☐ STAND PIPE______ FT.

SAMPLES									
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID/Sheen Test	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
									Airknifed to 4.5 ft
			1						
			2						
			3						
			4						
	.5					0			**SILT with sand**
			5					ML	Brown (10 YR 5/3) with sections of gray (10 YR 5/1), medium stiff, moist, no odor, no sheen
						0			
			6						**Poorly graded SAND with silt** Brown (10 YR 5/3), fine to coarse sand, some gravel, moist, no odor, no sheen
						0			
			7						
	5	☒		KJB-16-7.5		0 / NS			Lenses of reddish brown and yellowish red sand, surrounded by lenses of gray sand
			8						
						0			
			9		▽				Wet
						0			
			10						
						0		SP/ SM	
			11						Same as above with lenses of siltier material
						0			
			12						
	2								
			13						
			14						
			15						**Sandy SILT** Gray (10 YR 5/1), some large sand grains, mostly very fine sand, soft, wet, no odor, no sheen
						0			
		☒	16	KJB-16-16				ML	
						0			
			17						

F-40.1
(6-87) (3-88) (8-90)

Project Name Ecology Circle K **Project Number** 1696010.00 **Boring Name** KJB-16

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	BACKFILL DETAILS	PID/Sheen Test	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
	5				▨	0 / NS			**Sandy SILT**
			18		▨				Gray (10 YR 5/1), some large sand grains, mostly very fine sand, soft, wet, no odor, no sheen ***(Continued)***
					▨	0		ML	Same as above but some cobbles, very stiff, moist
			19		▨				
					▨	0			
			20						

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Boring backfilled with bentonite and finished to match existing grade.
3. Temporary well placed with screen from 4 - 19 feet. No water observed in temporary well, no recharge observed after 15 minutes.

Boring & Well Construction Log

Kennedy/Jenks Consultants

BORING LOCATION SE corner 2350 24th Ave E parking lot

DRILLING COMPANY Holt Services, Inc

DRILLER Michael Running

DRILLING METHOD(S) Direct Push (Geoprobe 7822 DT)

DRILL BIT(S) SIZE 2"

ISOLATION CASING N/A FROM N/A TO N/A FT.

BLANK CASING Schedule 40 PVC (2 in.) FROM 0 TO 4 FT.

SLOTTED CASING Pre-Pack FROM 4 TO 19 FT.

SIZE AND TYPE OF FILTER PACK Colorado 10/20 Sand FROM 3 TO 19 FT.

SEAL Medium Bentonite Chips FROM 1.5 TO 3 FT.

GROUT Quikrete Concrete FROM 0 TO 1.5 FT.

Well Name MW-17

Project Name Ecology Circle K

Project Number 1696010.00

MEAURING PT. ELEVATION bgs

TOTAL DEPTH 20.0 ft. bgs

DATE STARTED 8/1/16

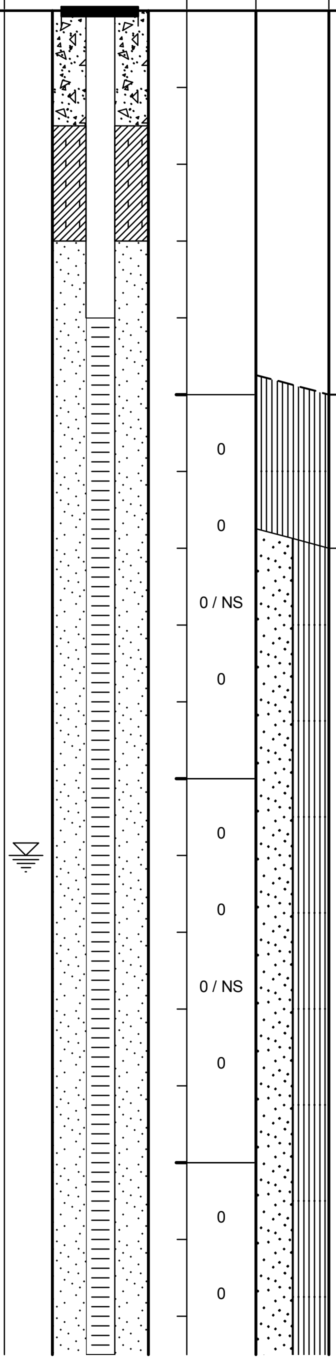
DATE COMPLETED 8/1/16

INITIAL WATER DEPTH (FT) 11.0

LOGGED BY J. Schwarz

SAMPLING METHODS

WELL COMPLETION
■ SURFACE HOUSING
☐ STAND PIPE ______ FT.



SAMPLES TYPE	SAMPLES RECOV. (FEET)	SAMPLES PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	WELL CONSTRUCTION	PID/Sheen Test	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
									Airknifed to 5 ft
			1						
			2						
			3						
			4						
			5			0			**Silty SAND** Brown (10 YR 5/3), lenses of coarser and finer sand, grading sandier with depth, soft, moist, no odor, no sheen
			6			0		SM	
	4		7			0 / NS			**Poorly graded SAND with silt** Brown (10 YR 5/3), fine to very coarse sand, lenses of coarser and finer sand, soft, moist, no odor, no sheen
☒			8	MW-17-8		0			
			9						
			10			0			
☒			11	MW-17-11		0			Wet
	4		12			0 / NS		SP/ SM	4 inches reddish brown sand
			13			0			
			14						
			15			0			
			16			0			
			17						

KJ PNW BORINGLOGS_2016.GPJ KJ PNW.GDT 6/8/17

F-40.1
(6-87) (3-88) (8-90)

Boring & Well Construction Log

Kennedy/Jenks Consultants

Project Name Ecology Circle K **Project Number** 1696010.00 **Well Name** MW-17

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	WELL CONSTRUCTION	PID/Sheen Test	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
	5		18			0 / NS		SP/ SM	
						0		ML	**Sandy SILT** Gray (10 YR 5/1), some gravel and cobbles, very stiff, moist but not wet, no odor, no sheen
☒			19	MW-17-19					
						0			
			20						

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Ecology Well Tag ID BJX-251.

Boring & Well Construction Log

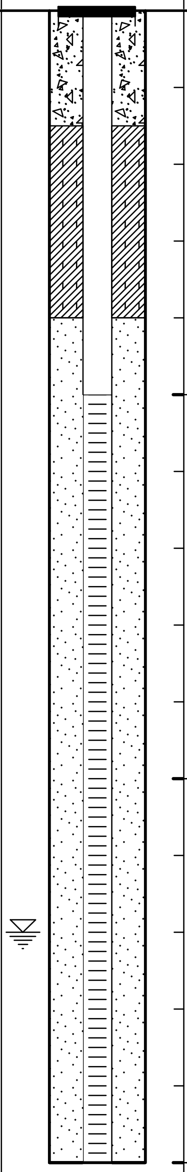
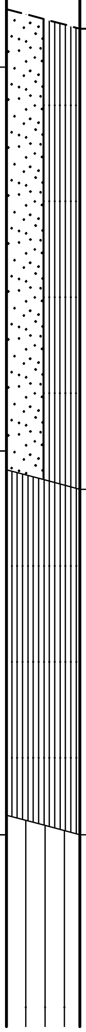
Kennedy/Jenks Consultants

BORING LOCATION: SW corner 2350 24th Ave E parking lot
DRILLING COMPANY: Holt Services, Inc
DRILLER: Michael Running
DRILLING METHOD(S): Direct Push (Geoprobe 7822 DT)
DRILL BIT(S) SIZE: 2"

		FROM	TO	FT.
ISOLATION CASING	N/A	N/A	N/A	
BLANK CASING	Schedule 40 PVC (2 in.)	0	5	
SLOTTED CASING	Pre-Pack	5	15	
SIZE AND TYPE OF FILTER PACK	Colorado 10/20 Sand	4	15	
SEAL	Medium Bentonite Chips	1.5	4	
GROUT	Quikrete Concrete	0	1.5	

Well Name MW-18
Project Name Ecology Circle K
Project Number 1696010.00

MEAURING PT. ELEVATION: bgs
TOTAL DEPTH: 20.0 ft. bgs
DATE STARTED: 8/1/16
DATE COMPLETED: 8/1/16
INITIAL WATER DEPTH (FT): 12.0
LOGGED BY: J. Schwarz
SAMPLING METHODS:
WELL COMPLETION:
■ SURFACE HOUSING
☐ STAND PIPE ______ FT.

SAMPLES TYPE	SAMPLES RECOV. (FEET)	SAMPLES PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	WELL CONSTRUCTION	PID/Sheen Test	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
									**Airknifed to 4.5 ft**
			1						
			2						
			3						
			4						
									Poorly graded SAND with silt Brown (10 YR 5/3) with lenses of gray, fine to coarse sand, some gravel and cobbles, coarser sand and fewer gravel and cobbles with depth, soft, moist, no odor, no sheen
			5						
			6			0			
	3.5		☒ 7	MW-18-7		0		SP/ SM	
			8			0 / NS			
			9						
			10						
									Silty SAND Brown (10 YR 5/3), same as above, but siltier with depth, grading towards silty sand, no odor, no sheen
			11			0			
			12		▽	0			more silt with depth, wet
	4		☒ 13	MW-18-13		0 / NS		SM	
			14			0			
			15						**Sandy SILT with gravel** Gray (10 YR 5/1), some cobbles, very stiff, moist but not wet, no odor, no sheen
			16			0		ML	
			☒ 17	MW-18-17		0			

Project Name Ecology Circle K **Project Number** 1696010.00 **Well Name** MW-18

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	WELL CONSTRUCTION	PID/Sheen Test	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
	5					0 / NS			**Sandy SILT with gravel** Gray (10 YR 5/1), some cobbles, very stiff, moist but not wet, no odor, no sheen ***(Continued)***
			18						
						0		ML	
			19						
						0			
			20						

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Ecology Well Tag ID BJX-252.
3. 2 in soil boring to 20 ft bgs, but 3 in boring to install permanent monitoring well hit refusal at 15 ft bgs.

Boring & Well Construction Log

Kennedy/Jenks Consultants

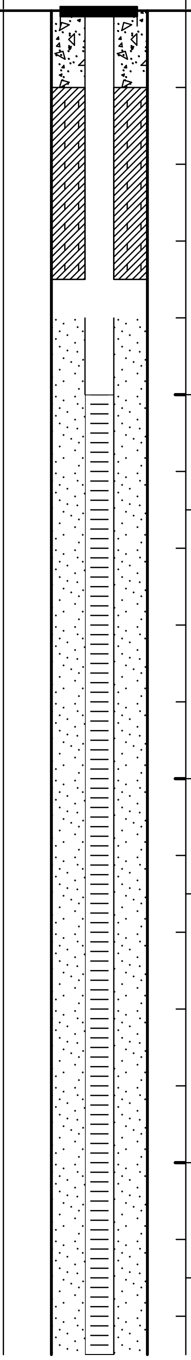
BORING LOCATION 2350 24th Ave E parking lot			
DRILLING COMPANY Holt Services, Inc	DRILLER Abe Causeland		
DRILLING METHOD(S) Hollow Stem Auger	DRILL BIT(S) SIZE 2"		
ISOLATION CASING N/A	FROM N/A	TO N/A	FT.
BLANK CASING Schedule 40 PVC (2 in.)	FROM 0	TO 5	FT.
SLOTTED CASING 20-slot Schedule 40 PVC	FROM 5	TO 20	FT.
SIZE AND TYPE OF FILTER PACK 10/20 Colorado Silica Sand	FROM 4	TO 20	FT.
SEAL Hydrated Medium Bentonite Chips	FROM 1	TO 3.5	FT.
GROUT Quikrete Concrete	FROM 0	TO 1	FT.

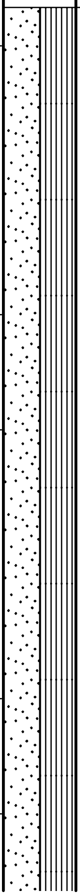
Well Name MW-19

Project Name Ecology Circle K

Project Number 1696010.00

MEAURING PT. ELEVATION bgs	TOTAL DEPTH 20.0 ft. bgs
DATE STARTED 9/23/16	DATE COMPLETED 9/23/16
INITIAL WATER DEPTH (FT) N/A	
LOGGED BY J. Schwarz	
SAMPLING METHODS	WELL COMPLETION ■ SURFACE HOUSING ☐ STAND PIPE ______ FT.





SAMPLES TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	PID	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
							Airknifed to 6 feet
			1				
			2				
			3				
			4				
SS	1.5	6 10 10	5				
			6		10.4		**Poorly graded SAND with silt** Gray (10YR 6/1), color grading to grayish brown (10YR 5/1), firm, moist, no odor, no sheen Firmer than above, higher silt content, some gravel
			7				
			8				
			9				
SS	1.5	10 12 12	10	MW-19-10			Gray (10YR 6/1), fine to coarse sand, wet, strong petroleum-like odor, sheen
			11		1877		
			12			SP/ SM	
			13				
			14				
SS	1.5	10 9 11	15				Same as above but more medium to coarse sand, less fine sand, wet, strong petroleum-like odor, sheen
			16		69.1		
			17				

Project Name Ecology Circle K **Project Number** 1696010.00 **Well Name** MW-19

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	WELL CONSTRUCTION	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
			18					SP/ SM	**Poorly graded SAND with silt** Gray (10YR 6/1), color grading to grayish brown (10YR 5/1), firm, moist, no odor, no sheen ***(Continued)***
SS	1.5	8				50.1			Slight petroleum-like odor, no sheen
		6	19	MW-19-19		7.9		ML	**SILT with sand** Gray (10YR 6/1), some gravel and cobbles, hard, moist but not wet, no odor, no sheen
		9	20						

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Ecology Well Tag ID BKY-105.

KJ PNW BORINGLOGS_2016.GPJ KJ PNW.GDT 6/8/17

Boring & Well Construction Log

Kennedy/Jenks Consultants

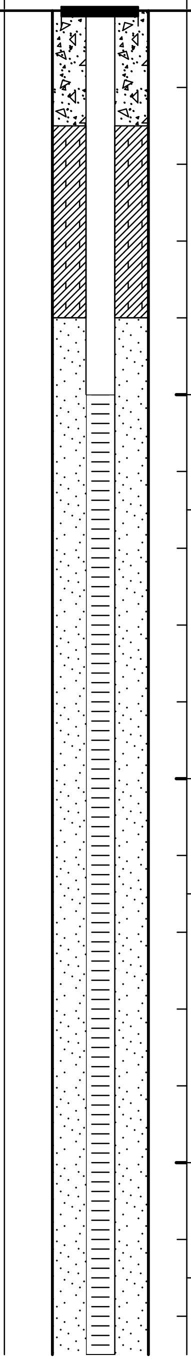
BORING LOCATION W side 2350 24th Ave E parking lot			
DRILLING COMPANY Holt Services, Inc	DRILLER Abe Causeland		
DRILLING METHOD(S) Hollow Stem Auger	DRILL BIT(S) SIZE 4"		
ISOLATION CASING N/A	FROM N/A	TO N/A	FT.
BLANK CASING Schedule 40 PVC (4 in.)	FROM 0	TO 5	FT.
SLOTTED CASING 20-slot Schedule 40 PVC	FROM 5	TO 20	FT.
SIZE AND TYPE OF FILTER PACK 10/20 Colorado Silica Sand	FROM 4	TO 20	FT.
SEAL Hydrated Medium Bentonite Chips	FROM 1.5	TO 4	FT.
GROUT Quikrete Concrete	FROM 0	TO 1.5	FT.

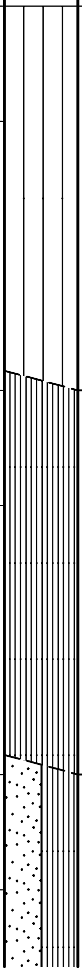
Well Name MW-20

Project Name Ecology Circle K

Project Number 1696010.00

MEAURING PT. ELEVATION bgs	TOTAL DEPTH 21.0 ft. bgs
DATE STARTED 9/23/16	DATE COMPLETED 9/23/16
INITIAL WATER DEPTH (FT) N/A	
LOGGED BY J. Schwarz	
SAMPLING METHODS	WELL COMPLETION ■ SURFACE HOUSING ☐ STAND PIPE ______ FT.





SAMPLES TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	WELL CONSTRUCTION	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
			1 2 3 4						**Airknifed to 5 feet**
SS	1.5	9 7 7	5 6 7 8 9			1.0		ML	**Sandy SILT** Grayish brown (10YR 5/2), color mottled with gray, very fine to coarse sand, some gravel, firm to hard, moist, no odor, no sheen
SS	1.5	4 8 15	10 11 12 13 14	MW-20-10		2485		SM	**Silty SAND** Gray (10YR 5/1), some mottling, very fine to coarse sand, firm to hard, moist, petroleum-like odor, slight sheen
SS	1.5	8 5 8	15 16 17			113.6		SP/ SM	**Poorly graded SAND with silt** Gray (10YR 5/1), fine to very coarse sand, soft, wet, petroleum-like odor, no sheen

KJ PNW BORINGLOGS_2016.GPJ KJ PNW.GDT 6/8/17

Boring & Well Construction Log

Kennedy/Jenks Consultants

Project Name Ecology Circle K

Project Number 1696010.00

Well Name MW-20

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	WELL CONSTRUCTION	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
			18 19					SP/ SM	**Poorly graded SAND with silt** Gray (10YR 5/1), fine to very coarse sand, soft, wet, petroleum-like odor, no sheen ***(Continued)***
SS	1	25 50	20 21	MW-20-20		34.9		ML	**Sandy SILT** Gray (10YR 5/1), very fine to medium sand, some cobbles, firm to hard, moist to wet, slight petroleum-like odor, no sheen

NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Ecology Well Tag ID BKY-106.

Boring & Well Construction Log

Kennedy/Jenks Consultants

BORING LOCATION W side 2350 24th Ave E parking lot

DRILLING COMPANY Holt Services, Inc

DRILLER Abe Causeland

DRILLING METHOD(S) Hollow Stem Auger

DRILL BIT(S) SIZE 4"

ISOLATION CASING N/A — FROM N/A TO N/A FT.

BLANK CASING Schedule 40 PVC (4 in.) — FROM 0 TO 5 FT.

SLOTTED CASING 20-slot Schedule 40 PVC — FROM 5 TO 20 FT.

SIZE AND TYPE OF FILTER PACK 10/20 Colorado Silica Sand — FROM 4 TO 20 FT.

SEAL Hydrated Medium Bentonite Chips — FROM 1.5 TO 4 FT.

GROUT Quikrete Concrete — FROM 0 TO 1.5 FT.

Well Name MW-21

Project Name Ecology Circle K

Project Number 1696010.00

MEAURING PT. ELEVATION bgs

TOTAL DEPTH 20.0 ft. bgs

DATE STARTED 9/23/16

DATE COMPLETED 9/23/16

INITIAL WATER DEPTH (FT) N/A

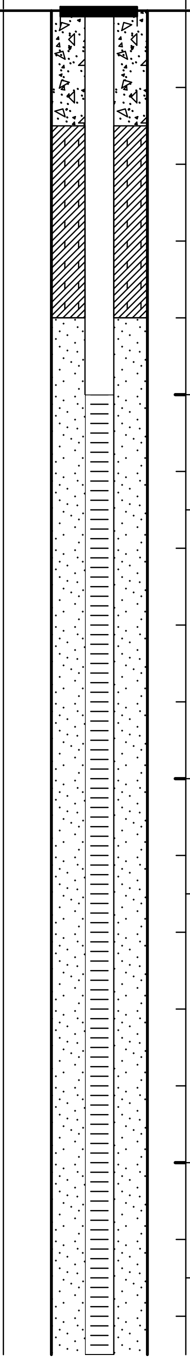
LOGGED BY J. Schwarz

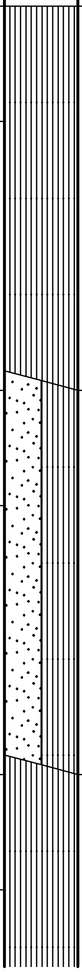
SAMPLING METHODS

WELL COMPLETION

■ SURFACE HOUSING

☐ STAND PIPE______ FT.

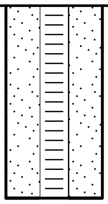
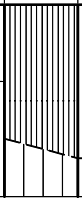




SAMPLES TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	PID	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
							Airknife to 5 feet
			1				
			2				
			3				
			4				
SS	1.5	8 11 13	5				**Silty SAND** Gray (10YR 5/1), fine to very coarse sand, some gravel, soft to firm, moist, no odor, no sheen
			6		0.1		
			7			SM	
			8				
			9				
SS	1.5	19 11 10	10	MW-21-10			**Poorly graded SAND with silt** Gray (10YR 5/1), fine to coarse sand, some gravel, soft, moist, slight petroleum-like odor, no sheen
			11		543		
			12			SP/ SM	
			13				
			14				
SS	1.5	8 12 14	15				**Silty SAND** Gray (10YR 5/1), fine to coarse sand, soft, wet, slight petroleum-like odor, no sheen
			16		188.2	SM	
			17				

KJ PNW BORINGLOGS_2016.GPJ KJ PNW.GDT 6/8/17

Project Name Ecology Circle K **Project Number** 1696010.00 **Well Name** MW-21

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	WELL CONSTRUCTION	PID	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
			18					SM	**Silty SAND** Gray (10YR 5/1), fine to coarse sand, soft, wet, slight petroleum-like odor, no sheen ***(Continued)***
SS	1	27 50	19	MW-21-19.5		14.9			
			20					ML	**Sandy SILT** Gray (10YR 5/1), very fine to very coarse sand, hard, moist to wet, no odor, no sheen

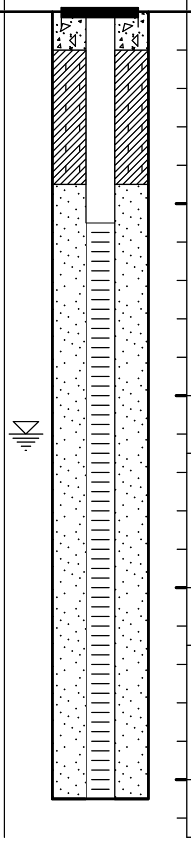
NOTES

1. PID = MiniRAE 2000 photoionization detector calibrated with 100 parts per million isobutylene standard.
2. Ecology Well Tag ID BKY-107.

Boring & Well Construction Log

Kennedy/Jenks Consultants

BORING LOCATION North of MW-18				**Well Name** RW-1
DRILLING COMPANY Holt Services, Inc.	DRILLER John Bennett			**Project Name** Ecology Circle K
DRILLING METHOD(S) CME 85 Hollow Stem Auger	DRILL BIT(S) SIZE 11"OD / 6.26"ID			**Project Number** 1696010.00
ISOLATION CASING N/A	FROM N/A	TO N/A	FT.	MEAURING PT. ELEVATION bgs
				TOTAL DEPTH 21.5 ft. bgs
BLANK CASING 4" Schedule 40 PVC	FROM 0	TO 5.5	FT.	DATE STARTED 2/7/17
				DATE COMPLETED 2/7/17
SLOTTED CASING Schedule 40 PVC - 20-Slot	FROM 5.5	TO 20.5	FT.	INITIAL WATER DEPTH (FT) 11.0
SIZE AND TYPE OF FILTER PACK 10/20 Colorado Silica Sand	FROM 4.5	TO 20.5	FT.	LOGGED BY J. Sawdey
SEAL 3/8" Hydrated Bentonite Chips	FROM 1	TO 4.5	FT.	SAMPLING METHODS Split Spoon
GROUT Concrete	FROM 0	TO 1	FT.	WELL COMPLETION ■ SURFACE HOUSING ☐ STAND PIPE______ FT.



SAMPLES TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	WELL CONSTRUCTION	PID / ST	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
									2.5Y 5/4, Air/vac clearance to 6' bgs - silt with sand, traces of gravel, yellowish brown, no odor, no sheen
						0.0 / NS			
			5						
								ML	**SILT with sand** 7.5YR 4/3, Fine to medium sand (~30%), traces of rounded gravel, brown, occasional increase in gravel and sand content, dry, no odor, no sheen
SS	0.5	6 9 10	10			0.0 / NS			Wet
SS	1	12 18 16	15			0.0 / NS			Same as above, except no gravel and increased silt content
SS	1	11 28 47	20			0.0 / NS		SP	**Poorly graded SAND** Gley 1 5/10GY, Sharp color change from yellowish brown to gray, poorly graded fine to medium sand, wet, no odor, no sheen
								ML	**Sandy SILT with gravel** Gley 1 5/10GY, Very dense silt, sand, and gravel, dry, no odor, no sheen

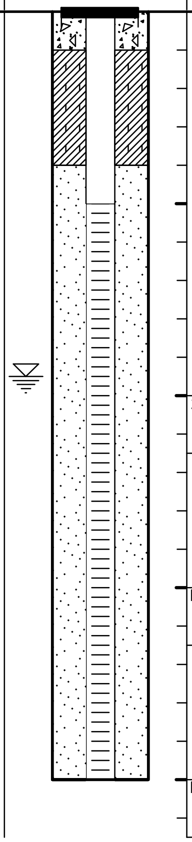
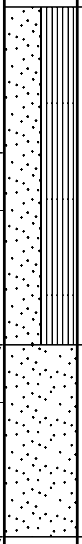
NOTES

1. ppm = parts per million
2. bgs = below ground surface
3. ST = sheen test; PID = photoionization detector (readings in ppm)
4. NS = no sheen, WS = weak sheen, MS = moderate sheen, SS = strong sheen
5. No petroleum hydrocarbon-like odor and/or sheen observed in boring
6. Added 14.5 bags Colorado Silica Sand to the annular

Boring & Well Construction Log

Kennedy/Jenks Consultants

BORING LOCATION Adjecent to North Sidewalk		**Well Name** RW-2
DRILLING COMPANY Holt Services, Inc.	DRILLER John Bennett	**Project Name** Ecology Circle K
DRILLING METHOD(S) CME 85 Hollow Stem Auger	DRILL BIT(S) SIZE 11"OD / 6.26"ID	**Project Number** 1696010.00
ISOLATION CASING N/A	FROM N/A TO N/A FT.	MEAURING PT. ELEVATION bgs TOTAL DEPTH 21.5 ft. bgs
BLANK CASING 4" Schedule 40 PVC	FROM 0 TO 5 FT.	DATE STARTED 2/9/17 DATE COMPLETED 2/9/17
SLOTTED CASING Schedule 40 PVC - 20-Slot	FROM 5 TO 20 FT.	INITIAL WATER DEPTH (FT) 9.5
SIZE AND TYPE OF FILTER PACK 10/20 Colorado Silica Sand	FROM 4 TO 20 FT.	LOGGED BY J. Sawdey
SEAL 3/8" Hydrated Bentonite Chips and Pellets	FROM 1 TO 4 FT.	SAMPLING METHODS Split Spoon
GROUT Concrete	FROM 0 TO 1 FT.	WELL COMPLETION ■ SURFACE HOUSING ☐ STAND PIPE ______ FT.

SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	WELL CONSTRUCTION	PID / ST	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
									Air/Vac clearance to 6' 2" bgs
						0.0 / NS			Stiff silt with sand from 1' to 4' bgs, damp to dry, no odor, no sheen
			5						Silt becoming less stiff with increased sand content, damp to dry, no odor, no sheen
									**Poorly graded SAND with silt** Fine to medium sand, traces of silt, stiff silt interbeds every 2" to 6" bgs, wet, strong petroleum hydrocarbon-like odor and sheen
SS	0.5	1 5 10	10			275 / SS		SP/ SM	
SS	1	5 8 10	15			NO PID / SS		SP	**Poorly graded SAND with gravel** Medium to coarse sand, some fine gravel up to 1/2" in diameter (up to 20%), wet, strong petroleum hydrocarbon-like odor and sheen
SS	0	8 50	20			NO PID / NS			No recovery 20' to 21.5' - assumed refusal on very dense silt, sand, gravel

NOTES

1. ppm = parts per million
2. bgs = below ground surface
3. ST = sheen test; PID = photoionization detector (readings in ppm)
4. NS = no sheen, WS = weak sheen, MS = moderate sheen, SS = strong sheen
5. Petroleum hydrocarbon-like odor and/or sheen observed in boring
6. Added 14 bags Colorado Silica Sand to the annular

Boring & Well Construction Log

Kennedy/Jenks Consultants

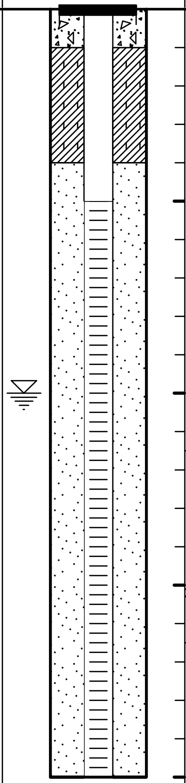
BORING LOCATION North End of Parking Lot			
DRILLING COMPANY Holt Services, Inc.	DRILLER John Bennett		
DRILLING METHOD(S) CME 85 Hollow Stem Auger	DRILL BIT(S) SIZE 11"OD / 6.26"ID		
ISOLATION CASING N/A	FROM N/A	TO N/A	FT.
BLANK CASING 4" Schedule 40 PVC	FROM 0	TO 5	FT.
SLOTTED CASING Schedule 40 PVC - 20-Slot	FROM 5	TO 20	FT.
SIZE AND TYPE OF FILTER PACK 10/20 Colorado Silica Sand	FROM 4	TO 20	FT.
SEAL 3/8" Hydrated Bentonite Chips and Pellets	FROM 1	TO 4	FT.
GROUT Concrete	FROM 0	TO 1	FT.

Well Name RW-3

Project Name Ecology Circle K

Project Number 1696010.00

MEAURING PT. ELEVATION bgs	TOTAL DEPTH 21.5 ft. bgs
DATE STARTED 2/9/17	DATE COMPLETED 2/9/17
INITIAL WATER DEPTH (FT) 10.0	
LOGGED BY J. Sawdey	
SAMPLING METHODS Split Spoon	WELL COMPLETION ■ SURFACE HOUSING ☐ STAND PIPE ______ FT.



SAMPLES TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	WELL CONSTRUCTION	PID / ST	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
						0.0 / NS		ML	**SILT with sand** 2.5Y 5/4, Air Vac clearance to 5.5' bgs: Fine to medium sand (up to 40%), traces of rounded gravel, low plasticity, dry, no odor, no sheen
			5						
SS	1	5 7 9	10			5,000+ / SS		SP/ SM	**Poorly graded SAND with silt** Gley 1 5/10GY, Fine to medium sand, traces of silt, abundant silt interbeds, greenish gray, poorly graded sand is soft and wet, silt interbeds are firm/stiff and damp, wet, strong petroleum-like odor and sheen
SS	0.5	3 7 9	15			30.7 / WS			Same as above, decresing odor and sheen
SS	1.5	10 10 12	20			12.1 / NS			Same as above, no petroleum hydrocarbon-like odor or sheen

NOTES

1. ppm = parts per million
2. bgs = below ground surface
3. ST = sheen test; PID = photoionization detector (readings in ppm)
4. NS = no sheen, WS = weak sheen, MS = moderate sheen, SS = strong sheen
5. Petroleum hydrocarbon-like odor and/or sheen observed in boring
6. Added 14 bags Colorado Silica Sand to the annular

Boring & Well Construction Log

Kennedy/Jenks Consultants

BORING LOCATION West Side of Mont's Mart

DRILLING COMPANY Holt Services, Inc.

DRILLER John Bennett

DRILLING METHOD(S) CME 85 Hollow Stem Auger

DRILL BIT(S) SIZE 11"OD / 6.26"ID

		FROM	TO	FT.
ISOLATION CASING	N/A	N/A	N/A	
BLANK CASING	4" Schedule 40 PVC	0	5	
SLOTTED CASING	Schedule 40 PVC - 20-Slot	5	20	
SIZE AND TYPE OF FILTER PACK	10/20 Colorado Silica Sand	4	20	
SEAL	3/8" Hydrated Bentonite Chips and Pellets	1	4	
GROUT	Concrete	0	1	

Well Name RW-4

Project Name Ecology Circle K

Project Number 1696010.00

MEAURING PT. ELEVATION bgs

TOTAL DEPTH 21.5 ft. bgs

DATE STARTED 2/8/17

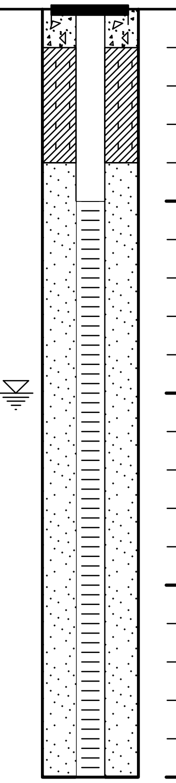
DATE COMPLETED 2/8/17

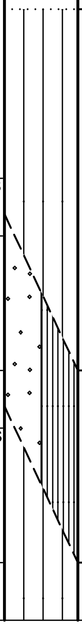
INITIAL WATER DEPTH (FT) 10.0

LOGGED BY J. Sawdey

SAMPLING METHODS Split Spoon

WELL COMPLETION
■ SURFACE HOUSING
☐ STAND PIPE ______ FT.





SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	WELL CONSTRUCTION	PID / ST	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
									Air Vac clearance to 5' 7" bgs Silt with angular gravel from 0' to 2' bgs (edge of excavation / fill), dry, no odor, no sheen Rounded gravels up to 6" in diameter with a sandy silt matrix from 2' to 3' bgs, dry, no odor, no sheen
			5			0.0 / NS			Silt with sand (native formation) from 3' to 5' 7", dry, no odor, no sheen
									Sandy SILT with gravel Fine to medium sand (~20%), some coarse sand, fine gravel (~20%), moderate plasticity, dry, no odor, no sheen
SS	0.5	20 50	10			397 / MS		ML	Gley 1 5/10Y, Color changes to greenish gray, wet, strong petroleum hydrocarbon-like odor and sheen
SS	1	6 21 21	15			5,000+ / SS (in sand) 393 / WS (in silt)		SW/ SM	**Well-graded SAND with silt and gravel** Gley 2 5/10BG, Fine to coarse sand, some fine gravel (up to 20%), some silt (up to 20%), occasional interbedded hard and dry silt, wet, strong petroleum hydrocarbon-like odor and sheen
SS	1	10 40 50	20			83 / WS 33 / NS		ML	**Sandy SILT with gravel** Gley 1 5/10GY, Very dense silt, sand, and gravel, dry, no odor, no sheen

NOTES

1. ppm = parts per million
2. bgs = below ground surface
3. ST = sheen test; PID = photoionization detector (readings in ppm)
4. NS = no sheen, WS = weak sheen, MS = moderate sheen, SS = strong sheen
5. Petroleum hydrocarbon-like odor and/or sheen observed in boring
6. Added 13.5 bags Colorado Silica Sand to the annular

Boring & Well Construction Log

Kennedy/Jenks Consultants

BORING LOCATION
Near KJB-10

DRILLING COMPANY
Holt Services, Inc.

DRILLER
John Bennett

DRILLING METHOD(S)
CME 85 Hollow Stem Auger

DRILL BIT(S) SIZE
11"OD / 6.26"ID

Well Name RW-5

Project Name Ecology Circle K

Project Number 1696010.00

		FROM	TO	FT.
ISOLATION CASING	N/A	N/A	N/A	
BLANK CASING	4" Schedule 40 PVC	0	5	
SLOTTED CASING	Schedule 40 PVC - 20-Slot	5	20	
SIZE AND TYPE OF FILTER PACK	10/20 Colorado Silica Sand	4	20	
SEAL	3/8" Hydrated Bentonite Chips and Pellets	1	4	
GROUT	Concrete	0	1	

MEAURING PT. ELEVATION
bgs

TOTAL DEPTH
21.5 ft. bgs

DATE STARTED
2/8/17

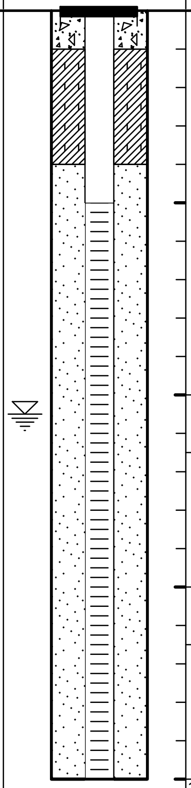
DATE COMPLETED
2/8/17

INITIAL WATER DEPTH (FT)
10.5

LOGGED BY
J. Sawdey

SAMPLING METHODS
Split Spoon

WELL COMPLETION
■ SURFACE HOUSING
☐ STAND PIPE ______ FT.



SAMPLES			DEPTH (FEET)	SAMPLE NUMBER	WELL CONSTRUCTION	PID / ST	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"							
						0.0 / NS			Air/Vac clearance to 6'1" bgs. Silt with sand, traces of rounded gravel, dry, no odor, no sheen
			5						
									SILT with sand Gley 1 5/10Y, Fine to medium sand, trace rounded fine gravel/coarse sand, greenish gray, soft, low plasticity, wet, strong petroleum hydrocarbon-like odor and moderate sheen
SS	1	1 6 11	10			1,108 / MS		ML	
SS	1	4 7 9	15			3,732 / SS		SP	**Poorly graded SAND** Gley 1 5/5GY, Fine to medium sand, traces of silt, greenish gray, soft, wet, strong petroleum hydrocarbon-like odor and sheen
SS	1.5	27 38 50	20			12.3 / NS		ML	**Sandy SILT with gravel** Gley 1 5/10Y, Very dense silt, sand, and gravel, gray, dry, no odor, no sheen

NOTES

1. ppm = parts per million
2. bgs = below ground surface
3. ST = sheen test; PID = photoionization detector (readings in ppm)
4. NS = no sheen, WS = weak sheen, MS = moderate sheen, SS = strong sheen
5. Petroleum hydrocarbon-like odor and/or sheen observed in boring
6. Added 14 bags Colorado Silica Sand to the annular

Boring & Well Construction Log

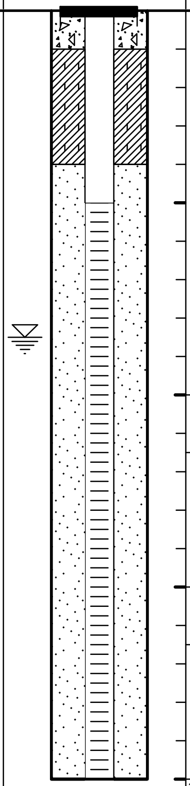
Kennedy/Jenks Consultants

BORING LOCATION: McGraw Street Right-of-Way
DRILLING COMPANY: Holt Services, Inc.
DRILLER: John Bennett
DRILLING METHOD(S): CME 85 Hollow Stem Auger
DRILL BIT(S) SIZE: 11"OD / 6.26"ID

		FROM	TO	FT.
ISOLATION CASING	N/A	N/A	N/A	
BLANK CASING	4" Schedule 40 PVC	0	5	
SLOTTED CASING	Schedule 40 PVC - 20-Slot	5	20	
SIZE AND TYPE OF FILTER PACK	10/20 Colorado Silica Sand	4	20	
SEAL	3/8" Hydrated Bentonite Chips and Pellets	1	4	
GROUT	Concrete	0	1	

Well Name RW-6
Project Name Ecology Circle K
Project Number 1696010.00

MEAURING PT. ELEVATION: bgs
TOTAL DEPTH: 21.5 ft. bgs
DATE STARTED: 2/10/17
DATE COMPLETED: 2/10/17
INITIAL WATER DEPTH (FT): 8.5
LOGGED BY: J. Sawdey
SAMPLING METHODS: Split Spoon
WELL COMPLETION: ■ SURFACE HOUSING ☐ STAND PIPE ______ FT.



SAMPLES TYPE	SAMPLES RECOV. (FEET)	SAMPLES PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	WELL CONSTRUCTION	PID / ST	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
									Air/Vac clearance to 5' bgs
						0.0 / NS			Sand with silt, traces of gravel, dry, no odor, no sheen
			5						**Poorly graded SAND with silt** Gley 1 5/10GY, fine to medium sand, up to 20% silt, traces of fine gravel, wet, strong petroleum hydrocarbon-like odor and sheen
SS	1	5 9 10	10			1,375 / SS		SP/ SM	
SS	1.5	5 9 14	15			347 / NS			**Sandy SILT with gravel** Gley 1 5/10GY, fine to coarse sand (up to 10%), fine gravel up to 1" in diameter, moderately stiff, low plasticity, wet, strong petroleum hydrocarbon-like odor, no sheen
								ML	
SS	1.5	10 14 20	20			12.1 / NS			Gley 1 4/10Y, Same as above, except becoming more stiff,, weak petroleum hydrocarbon-like odor, no sheen

NOTES

1. ppm = parts per million
2. bgs = below ground surface
3. ST = sheen test; PID = photoionization detector (readings in ppm)
4. NS = no sheen, WS = weak sheen, MS = moderate sheen, SS = strong sheen
5. Petroleum hydrocarbon-like odor and/or sheen observed in boring
6. Added 14.5 bags Colorado Silica Sand to the annular

Boring & Well Construction Log

Kennedy/Jenks Consultants

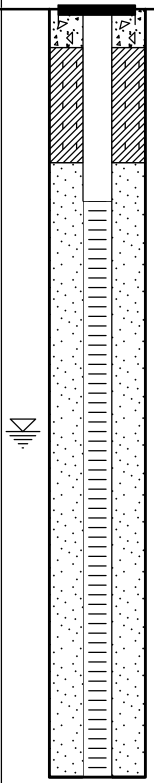
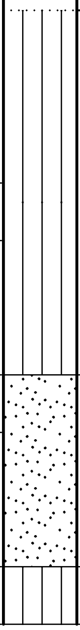
BORING LOCATION Adjacent (to the South) of MW-19			
DRILLING COMPANY Holt Services, Inc.	DRILLER John Bennett		
DRILLING METHOD(S) CME 85 Hollow Stem Auger	DRILL BIT(S) SIZE 11"OD / 6.26"ID		
ISOLATION CASING N/A	FROM N/A	TO N/A	FT.
BLANK CASING 4" Schedule 40 PVC	FROM 0	TO 5	FT.
SLOTTED CASING Schedule 40 PVC - 20-Slot	FROM 5	TO 20	FT.
SIZE AND TYPE OF FILTER PACK 10/20 Colorado Silica Sand	FROM 4	TO 20	FT.
SEAL 3/8" Hydrated Bentonite Chips	FROM 1	TO 4	FT.
GROUT Concrete	FROM 0	TO 1	FT.

Well Name RW-7

Project Name Ecology Circle K

Project Number 1696010.00

MEAURING PT. ELEVATION bgs	TOTAL DEPTH 21.5 ft. bgs
DATE STARTED 2/7/17	DATE COMPLETED 2/7/17
INITIAL WATER DEPTH (FT) 11.0	
LOGGED BY J. Sawdey	
SAMPLING METHODS Split Spoon	WELL COMPLETION ■ SURFACE HOUSING ☐ STAND PIPE ______ FT.

SAMPLES									
TYPE	RECOV. (FEET)	PENETR. RESIST. BLOWS/6"	DEPTH (FEET)	SAMPLE NUMBER	WELL CONSTRUCTION	PID / ST	LITHOLOGY	USCS LOG	SAMPLE DESCRIPTION AND DRILLING REMARKS
									Air/Vac clearance to 5' 6" bgs.
						0.0 / NS			5Y 5/2, Silt with fine to medium sand, light grayish brown, dry, no odor, no sheen
			5						**SILT with sand** Gley 1 4/10Y, Fine to medium sand (up to 30%), traces of fine gravel/coarse sand, pockets of increased sand and gravel content, dark greenish gray, very firm, low plasticity, damp to wet, strong petroleum hydrocarbon-like odor, weak sheen
SS	1	2 8 10	10			1,265 / WS		ML	
SS	0.5	1 6 11	15			396 / NS		SP	**Poorly graded SAND** Gley 2 5/10BG, Fine to medium with some coarse sand, traces of silt, rounded to well rounded grains, soft, wet, strong petroleum hydrocarbon-like odor, no sheen
SS	1	6 6 5	20			0.7 / NS		ML	**Sandy SILT with gravel** 7.5YR 4/1, Color changes to brown gray, very dense silt, sand, and gravel, very hard, dry, no odor, no sheen

NOTES

1. ppm = parts per million
2. bgs = below ground surface
3. ST = sheen test; PID = photoionization detector (readings in ppm)
4. NS = no sheen, WS = weak sheen, MS = moderate sheen, SS = strong sheen
5. Petroleum hydrocarbon-like odor and/or sheen observed in boring
6. Added 14 bags Colorado Silica Sand to the annular

MW-3

SAMPLE DATA

Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)
■	a2	53	28.8
■	a2	55	12.4
■	a2	30	0.8
■	a2	51	0.4
■	a2	100	0.3
■	a2	70	0.4
■	a2	50/ 6"	0.7
■	a2	50/ 6"	0.0
■	a2	50/ 6"	0.0
■	a2	50/ 6"	0.0

Depth (ft): 0, 10, 20, 30, 40, 50

SOIL PROFILE

Drilling Method: Hollow-Stem Auger

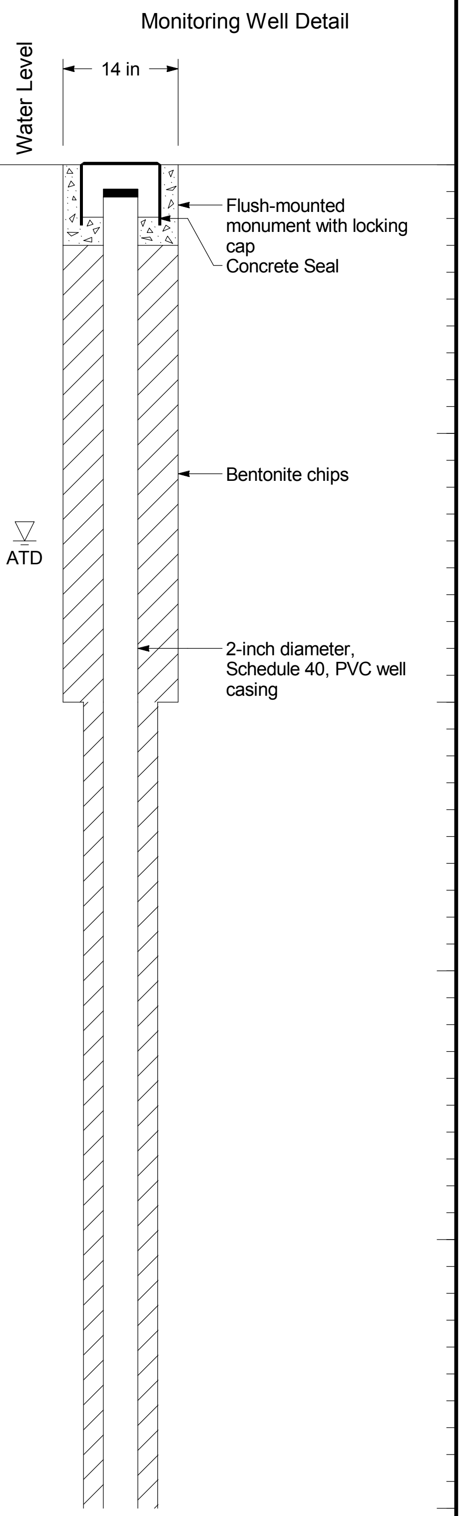
Ground Elevation (ft): 64.08

USCS Symbol	Description
	No samples collected between 0-12 ft bgs
SP-SM	Gray, fine to medium SAND with silt and gravel (gasoline-like odor, no sheen) (medium dense, wet)
	grading to silty, fine SAND to SILT with fine sand and gravel
ML	Gray SILT with fine sand and gravel (no odor, no sheen) (very stiff to hard, moist)

GROUNDWATER

Water Level: ▽ ATD

Monitoring Well Detail



Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

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Montlake Neighborhood
Former Dry Cleaner
Seattle, Washington

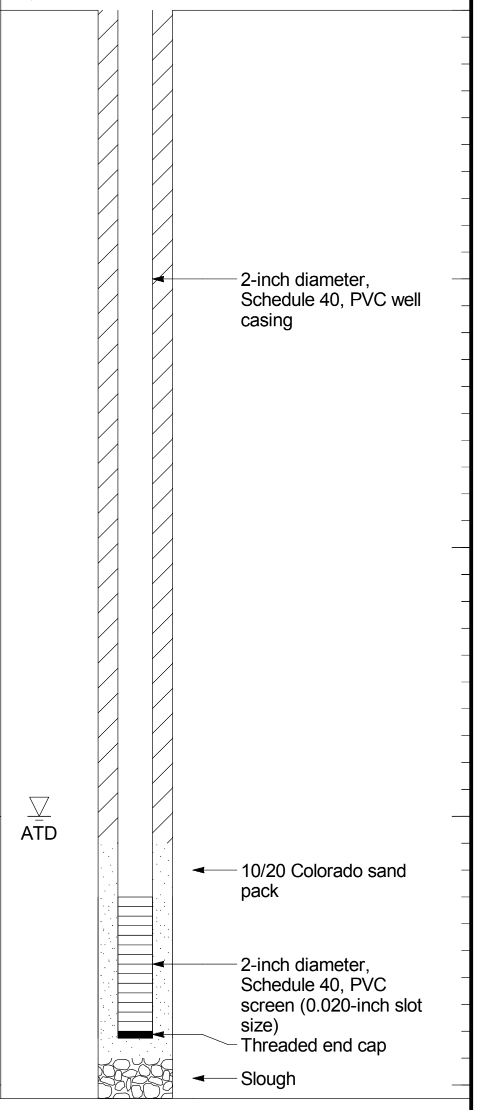
Log of Monitoring Well MW-3

Figure
A-10
(1 of 2)

MW-3

SAMPLE DATA					SOIL PROFILE		GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	USCS Symbol	Drilling Method: Hollow-Stem Auger Ground Elevation (ft): 64.08	Water Level
50	■	a2	50/ 6"	0.0	ML	Gray SILT with fine sand and gravel (no odor, no sheen) (very stiff to hard, moist)	
	■	a2	50/ 6"	0.0			
	■	a2	50/ 6"	0.4			
60	■	a2	50/ 6"	0.0			
	■	a2	50/ 6"	0.0			
70	■	a2	50/ 6"	0.0			
	■	a2	50/ 6"	0.0			
80	■	a2	45	0.0	SP	Gray, fine to medium SAND (no odor, no sheen) (medium dense, moist)	ATD
	■	a2	62	0.0			
90	■	a2	50/ 6"	0.0	ML	Gray SILT with fine sand (no odor, no sheen) (hard, moist)	
100							

Monitoring Well Detail



Boring Completed 04/01/13
Total Depth of Boring = 90.5 ft.

Elevation at Top of Monitoring Well Casing = 63.75 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Montlake Neighborhood
Former Dry Cleaner
Seattle, Washington

Log of Monitoring Well MW-3

Figure
A-10
(2 of 2)

Appendix C

Groundwater Purge and Sampling Records

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 4/20/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: DKR
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1420
Purge Depth (ft): ~16ft
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather: sunny, 75-80°F

Well Number: **MW-4**
Monument Type: Stickup: ______ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition:
Total Casing Depth (ft): 18.8 / 17.9
Screened Interval (ft): 4-18.8
Depth to Groundwater (ft): 9.19
Depth to LNAPL (ft):
Water Column (ft):
Reference: BGS or TOC

Water Quality Meter(s)	Model	Calibration Date/Time
Temp/pH/SC/ORP/DO:	YSI 556 MPS	4/19/16 1430
Turbidity:	MicroTPI/TPW	4/19/16 1440
Other:		

QA/QC Samples		
Type	Sample ID	Time

Sample ID	Sample Containers No.	Type	Pres.	Vol.	Field Filtered	Turbidity/ Color	Analysis Requested	MS/MSD & Comments
MW-4	3	A	HCl	40 ml	N			

1350 Time	1355	1400	1405	1410	1415			
Parameter (every 5 min)	5 min	10 min	15 min	20 min	25 min	~~30~~ DKR min	min	min
Flow Rate (LPM)								
Volume Purged (L)	2	2.5	3.0	3.5	3.75			
Water Depth (ft)	10.64	10.68	10.77	10.81	10.83			
Temperature (Celsius)	14.82	14.61	14.54	14.38	14.34			
pH	6.47	6.32	6.29	6.29	6.30			
Sp. Conductance (uS/cm)	0.260	0.259	0.262	0.263	0.266			
DO (mg/L)	1.65	1.25	1.09	1.04	1.11			
ORP (mV)	-46.2	-42.3	-41.7	-41.8	-40.1			
Turbidity (NTU)	106.8	104.8	68.03	49.84	42.35			
Color	Clear/gray	—	Clear w/black particles	—	—			
Odor/Evidence of LNAPL	MB-SS/StrongO	—	SS/SO	—	—			

Notes: (i.e. actions taken if well dewaters, difficulties in sampling through LNAPL, problems during purging/sampling, etc.)

6 bailers - full purged during surge.
Moderate sheen ; strong odor observed during bailing.

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 4/20/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: DKL
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1030
Purge Depth (ft): ~17 ft (bailer drawdown, WL@ 137ft)
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather: Sunny, 75°F

Well Number: **MW-6**
Monument Type: Stickup: X (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition: Okay – Bolts stripped.
Total Casing Depth (ft): 20.4 / 20.33
Screened Interval (ft): 5-20.4
Depth to Groundwater (ft): 11.54
Depth to LNAPL (ft): N/A
Water Column (ft):
Reference: BGS or TOC

Water Quality Meter(s)	Model	Calibration Date/Time
Temp/pH/SC/ORP/DO:	YSI 556 MPS	4/19/16 1430
Turbidity:	MicroTPI/TPW	4/19/16 1440
Other:		

QA/QC Samples		
Type	Sample ID	Time
☒	☒	☒

Sample ID	Sample Containers No.	Type	Pres.	Vol.	Field Filtered	Turbidity/ Color	Analysis Requested	MS/MSD & Comments
MW-6	3	A	HCl	40 ml	N		NWTPH-G/BETX	

0945 Time	0950	0955	1000	1005	1010	1015	1020	1025	1030
Parameter (every 5 min)	5 min	10 min	15 min	20 min	25 min	30 min	35 min	40 min	45
Flow Rate (LPM)									
Volume Purged ~~(L)~~ Gal	3.5	4.0	4.5	4.75	5.0	5.25	5.6	6.0	6.25
Water Depth (ft)	14.16	14.37	14.64	15.21	15.81	16.07	16.19	16.38	16.62
Temperature (Celsius)	14.30	14.12	13.77	13.80	13.86	13.93	13.98	13.97	13.96
pH	6.85	7.00	7.07	7.01	7.00	6.99	6.97	6.99	6.99
Sp. Conductance (mS/cm)	0.671	0.674	0.674	0.662	0.666	0.668	0.672	0.671	0.671
DO (mg/L)	1.82	2.10	2.30	1.84	1.66	1.64	1.46	1.48	1.52
ORP (mV)	-54.8	-55.1	-62.1	-75.1	-74.4	-75.5	-82.3	-83.3	-83.7
Turbidity (NTU)	898.3	188.4	85.93	84.36	71.40	54.25	64.81	70.21	66.32
Color	Orange →	Lt. orange →	/ Clear-Lt orange →		Clear →				
Odor/Evidence of LNAPL	No O/S →								

Notes: (i.e. actions taken if well dewaters, difficulties in sampling through LNAPL, problems during purging/sampling, etc.)

Pulled 5 bailer-fulls of water from well in pre-purge surge. ~2-5 gal.
Orange – Light brown w/ fine particles and large floating orange material.

*NOTE: ~~Big~~ Med to high flow rate for development; sampled @ 45min into purge, per SOG

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 4/20/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: JES
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1435
Purge Depth (ft): ~15
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Well Number: **MW-7**
Monument Type: Stickup: ______ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition:
Total Casing Depth (ft): 20.2
Screened Interval (ft): 5-20.2
Depth to Groundwater (ft): 8.45
Depth to LNAPL (ft):
Water Column (ft):

Reference: BGS or TOC

Water Quality Meter(s)	**Model**	**Calibration Date/Time**
Temp/pH/SC/ORP/DO:	YSI 556 MPS	4/19/16 1430
Turbidity:	MicroTPI/TPW	4/19/16 1440
Other:		

QA/QC Samples		
Type	**Sample ID**	**Time**
☒	☒	☒

Sample ID	**Sample Containers**				**Field Filtered**	**Turbidity/ Color**	**Analysis Requested**	**MS/MSD & Comments**
	No.	**Type**	**Pres.**	**Vol.**				
MW-7	3	A	HCl	40 ml	N		NWTPH-G/BETX	

1350 Time	1355	1400	1405	1410	1415	1420	1425	1430
Parameter (every 5 min)	5 min	10 min	15 min	20 min	25 min	30 min	35 min	40 min
Flow Rate (LPM)	300	300	300	300	300	300	300	300
Volume Purged (L)								
Water Depth (ft)	9.91	10.21	10.54	10.79	10.99	11.14	11.23	11.31
Temperature (Celsius)	13.91	13.65	13.71	13.84	13.85	13.91	14.06	14.11
pH	6.32	6.11	6.06	6.07	6.08	6.09	6.09	6.11
Sp. Conductance (mS/cm)	0.448	0.446	0.455	0.458	0.461	0.466	0.469	0.465
DO (mg/L)	4.87	4.81	4.69	4.54	4.37	4.22	4.51	4.46
ORP (mV)	79.4	91.5	98.5	100.9	102.7	104.7	104.0	104.2
Turbidity (NTU)	893.7	605.5	251.0	181.6	181.4	160.8	155.7	144.9
Color	lt. brown	—	—	—	—	—	—	—
Odor/Evidence of LNAPL	no o/s	—	—	—	—	—	—	—

137.6

Notes: (i.e. actions taken if well dewaters, difficulties in sampling through LNAPL, problems during purging/sampling, etc.)

TD=20.20 (same as constructed)
removed 4 bailers of water while redeveloping

a

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 4/20/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: JES
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1245
Purge Depth (ft): ~15 ft
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Well Number: **MW-8**
Monument Type: Stickup: ______ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition:
Total Casing Depth (ft): 20.3
Screened Interval (ft): 5-20.3
Depth to Groundwater (ft): 9.60 ~~(20.07)~~
Depth to LNAPL (ft): sl. sheen
Water Column (ft):

Reference: BGS or TOC

Water Quality Meter(s)	Model	Calibration Date/Time
Temp/pH/SC/ORP/DO:	YSI 556 MPS	4/19/16 1430
Turbidity:	MicroTPI/TPW	4/19/16 1440
Other:		

QA/QC Samples		
Type	Sample ID	Time

Sample ID	Sample Containers				Field Filtered	Turbidity/ Color	Analysis Requested	MS/MSD & Comments
	No.	Type	Pres.	Vol.				
MW-8	3	A	HCl	40 ml	N		NWTPH-G/BETX	

1200 Time	1205	1210	1215	1220	1225	1230	1235	1240
Parameter (every 5 min)	5 min	10 min	15 min	20 min	25 min	30 min	35 min	40 min
Flow Rate (LPM)	200	200	200	250	250	250	250	250
Volume Purged (L)								
Water Depth (ft)	10.88	10.81	10.91	11.00	11.03	11.08	11.14	11.17
Temperature (Celsius)	15.69	15.47	15.16	14.98	14.97	15.05	14.90	14.94
pH	6.79	6.61	6.53	6.52	6.52	6.52	6.54	6.54
Sp. Conductance (uS/cm)	0.445	0.442	0.440	0.439	0.440	0.445	0.447	0.447
DO (mg/L)	1.33	1.12	1.04	0.94	0.87	0.88	0.93	0.91
ORP (mV)	-68.4	-64.5	-63.9	-65.4	-67.3	-66.1	-63.1	-65.6
Turbidity (NTU)	593.2	607.5	549.1	303.4	217.1	192.1	142.4	123.8
Color	grey							
Odor/Evidence of LNAPL	odor							

Notes: (i.e. actions taken if well dewaters, difficulties in sampling through LNAPL, problems during purging/sampling, etc.)

TD=19.40 before development
removed 7 bailers of water wh redeveloping

HVA Sabina Insd

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 4/20/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: DKR
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time:
Purge Depth (ft): ~18 ft.
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Well Number: **MW-9**
Monument Type: Stickup: X (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition: Aluminum Lid - difficult to open. Bolt Broke. *
Total Casing Depth (ft): 21.2 / 20.23
Screened Interval (ft): 5-21.2 -
Depth to Groundwater (ft): 9.43
Depth to LNAPL (ft): N/A, Strong odor.
Water Column (ft):
Reference: BGS or TOC

Water Quality Meter(s)	Model	Calibration Date/Time
Temp/pH/SC/ORP/DO:	YSI 556 MPS	4/19/16 1430
Turbidity:	MicroTPI/TPW	4/19/16 1440
Other:		

QA/QC Samples		
Type	Sample ID	Time
☒	☒	☒
☒	☒	☒

Sample ID	Sample Containers				Field Filtered	Turbidity/ Color	Analysis Requested	MS/MSD & Comments
	No.	Type	Pres.	Vol.				
MW-9	3	A	HCl	40 ml	N		NWTPH-G/BETX	

1200 Time	1205	1210						
Parameter (every 5 min)	5 min	10 min	15 min	20 min	25 min	30 min	35 min	min
Flow Rate (LPM)								
Volume Purged ~~(L)~~ gal.	3	3.5	4.0	4.25	4.5	5.0	5.5	
Water Depth (ft) 10.08	10.19	10.27	10.32	10.36	10.37	10.38	10.38	
Temperature (Celsius)	15.82	15.44	15.54	15.59	15.60	15.58	15.48	
pH	6.61	6.56	6.55	6.55	6.54	6.55		
Sp. Conductance (uS/cm)	0.546	0.543	0.540	0.539	0.538	0.537	0.536	
DO (mg/L)	1.30	1.16	1.11	1.09	1.05	1.05	1.09	
ORP (mV)	-79.4	-81.5	-72.6	-77.1	-79.5	-79.8	-81.6	
Turbidity (NTU)	216.4	184.9	113.9	82.6	58.6	52.17	48.2	
Color	cloudy white/gray			Clear/white				
Odor/Evidence of LNAPL	NoS/strong O.							

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

w/ bailers surged ~ 2 gal.

* North side bolt sheared in half, only able to close one side.

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 4/20/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: JES
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1035
Purge Depth (ft): ~12 to 14
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Well Number: **MW-10**
Monument Type: Stickup: ______ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition:
Total Casing Depth (ft): 20.4
Screened Interval (ft): 5-20.4
Depth to Groundwater (ft): 9.61
Depth to LNAPL (ft):
Water Column (ft):
Reference: BGS or TOC

Water Quality Meter(s)	Model	Calibration Date/Time
Temp/pH/SC/ORP/DO:	YSI 556 MPS	4/19/16 14:30
Turbidity:	MicroTPI/TPW	4/19/16 1440
Other:		

QA/QC Samples		
Type	Sample ID	Time

Sample ID	Sample Containers No.	Type	Pres.	Vol.	Field Filtered	Turbidity/ Color	Analysis Requested	MS/MSD & Comments
MW-10	3	A	HCl	40 ml	N		NWTPH-G/BETX	

0945 Time	0950	0955	1000	1005	1010	~~1027~~1015	1020	1025	1030
Parameter (every 5 min)	5 min	10 min	15 min	20 min	25 min	30 min	35 min	40 min	45
Flow Rate (LPM)	500	300	300	300	300	300	250	250	250
Volume Purged (L)									
Water Depth (ft)	11.75	12.02	12.42	12.53	12.64	~~14.54~~ 12.81	12.91	1306	13.10
Temperature (Celsius)	14.65	14.64	14.56	14.49	14.56	14.59	14.63	14.66	14.73
pH	6.37	6.46	6.59	6.63	6.63	6.70	6.74	6.78	6.82
Sp. Conductance (mS/cm)	0.687	0.687	0.688	0.689	0.690	0.696	0.705	0.710	0.715
DO (mg/L)	2.64	2.47	1.58	1.19	1.16	0.83	0.80	0.69	0.82
ORP (mV)	114.0	105.7	64.5	57.8	44.6	13.5	1.5	-11.4	-25.8
Turbidity (NTU)	355.4	93.26	86.05	93.16	65.71	106.4	64.09	57.47	57.82
Color	lt-brown	lt-brown							
Odor/Evidence of LNAPL	no o/s								

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

TD 20.22 (to TOC), purged ~~4~~ 7 bailers while using surging action
0955 turned rate down and increased purge depth b/c wasn't drawing up water

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 4/20/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: DKR
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1636
Purge Depth (ft): ~15 ft
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather: Sunny, 84°F

Well Number: **MW-11**
Monument Type: Stickup: ~~[illegible]~~ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition: Good
Total Casing Depth (ft): 20.0
Screened Interval (ft): 5-20.0
Depth to Groundwater (ft): 7.85
Depth to LNAPL (ft): N/A
Water Column (ft):

Reference: BGS or **TOC**

Water Quality Meter(s)	Model	Calibration Date/Time
Temp/pH/SC/ORP/DO:	YSI 556 MPS	4/19/16 1430
Turbidity:	MicroTPI/TPW	4/19/16 1440
Other:		

QA/QC Samples		
Type	Sample ID	Time
☒	☒	☒

Sample ID	Sample Containers				Field Filtered	Turbidity/ Color	Analysis Requested	MS/MSD & Comments
	No.	Type	Pres.	Vol.				
MW-11	3	A	HCl	40 ml	N		NWTPH-G/BETX	

1625 ~~[illegible]~~ Time	1628 ~~[illegible]~~	1631 ~~0431~~	1634 ~~0434~~					
Parameter (every 5 min)	3 min	6 min	9 min	min	min	min	min	min
Flow Rate (LPM)								
Volume Purged (L)	1.5	2	2.5					
Water Depth (ft)	8.56	8.87	9.14					
Temperature (Celsius)								
pH								
Sp. Conductance (uS/cm)					Not collected.			
DO (mg/L)								
ORP (mV)								
Turbidity (NTU)	61.03	46.04	31.45					
Color	Clear							
Odor/Evidence of LNAPL	No O/S.*							

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

* slight sulfurous odor.

Groundwater Purge and Sample Form (Minimal Drawdown)

Kennedy/Jenks Consultants

Date: 4/20/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: JES
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1705
Purge Depth (ft): ~16ft
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Well Number: **MW-13**
Monument Type: Stickup: ______ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition:
Total Casing Depth (ft): 19.0
Screened Interval (ft): 4-19.0
Depth to Groundwater (ft): 10.21 (sheen)
Depth to LNAPL (ft):
Water Column (ft):

Reference: BGS or **TOC**

Water Quality Meter(s)	Model	Calibration Date/Time
Temp/pH/SC/ORP/DO:	YSI 556 MPS	4/19/16 1430
Turbidity:	MicroTPI/TPW	4/19/16 1440
Other:		

QA/QC Samples		
Type	Sample ID	Time

Sample ID	Sample Containers No.	Type	Pres.	Vol.	Field Filtered	Turbidity/ Color	Analysis Requested	MS/MSD & Comments
MW-13	3	A	HCl	40 ml	N		NWTPH-G/BETX	

1635 Time	1640	1645	1650	1655	~~16~~ 55 1700	1705		
Parameter (every 5 min)	5 min	10 min	15 min	20 min	25 min	min	min	min
Flow Rate (LPM)	200	200	200	200	200			
Volume Purged (L)								
Water Depth (ft)	13.42	13.00	13.02	13.02	13.03	13.03		
Temperature (Celsius)	15.44	15.80	15.76	15.41	15.41	15.41		
pH	6.38	6.35	6.35	6.36	6.36	6.36		
Sp. Conductance (uS/cm)	0.728	0.708	0.708	0.708	0.706	0.705		
DO (mg/L)	1.97	1.66	1.36	1.09	1.05	1.02		
ORP (mV)	-57.4	-51.8	-50.2	-48.1	-47.1	-48.4		
Turbidity (NTU)	234.8	153.4	86.96	70.62	56.68	55.13		
Color	lt. brown	—	—	—	—			
Odor/Evidence of LNAPL	visible sheen odor	—	odor	—	—			

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

TD 18.65 btoc
bailed 5 bailers worth, roots in casing, DTW 13.50
1645 turned down flowrate because there was significant air being pulled up.

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 4/20/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: JES
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1605
Purge Depth (ft): ~12
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Well Number: **MW-14**
Monument Type: Stickup: ____ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition:
Total Casing Depth (ft): 19.3
Screened Interval (ft): 4-19.3
Depth to Groundwater (ft): 7.18
Depth to LNAPL (ft):
Water Column (ft):

Reference: BGS or TOC

Water Quality Meter(s)	Model	Calibration Date/Time
Temp/pH/SC/ORP/DO:	YSI 556 MPS	4/19/16 1430
Turbidity:	MicroTPI/TPW	4/19/16 1440
Other:		

QA/QC Samples		
Type	Sample ID	Time
☒	☒	☒

Sample ID	Sample Containers				Field Filtered	Turbidity/ Color	Analysis Requested	MS/MSD & Comments
	No.	Type	Pres.	Vol.				
MW-14	3	A	HCl	40 ml	N		NWTPH-G/BETX	

1545 Time	1551	1555	1600	1605				
Parameter (every 5 min)	5 min	10 min	15 min	20 min	min	min	min	min
Flow Rate (mLPM)	150	150	150	150				
Volume Purged (L)								
Water Depth (ft)	11.09	11.12	11.25					
Temperature (Celsius)	15.79	15.76	15.75	15.67				
pH	7.15	6.46	6.62	6.88				
Sp. Conductance (uS/cm)	0.847	0.851	0.855	0.855				
DO (mg/L)	4.02	2.02	1.42	1.21				
ORP (mV)	-60.0	-44.5	-42.6	-43.7				
Turbidity (NTU)	262.1	152.2	154.8	155.8				
Color	lt. brown	—	—					
Odor/Evidence of LNAPL	no o/s	—	—					

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

13.70 to bottom; some resistance starting at 13.0 ft BTOC; dedicated tubing (removed) had sediment on it
~~purge~~ bailed ~5 gallons, very high turbidity, following bailing water at 11.29, TD at 15.50, Not doing full purge due to low water level and amount of screen exposed.

Groundwater Purge and Sample Form (Minimal Drawdown)

Kennedy/Jenks Consultants

Date: 4/20/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: DKR
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1600 / Duplicate DUP-1-042016
Purge Depth (ft): ~16 ft
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather: Sunny, 80°F

Well Number: MW-15
Monument Type: Stickup: ______ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition: OK. 1 bolt female broken in monument.
Total Casing Depth (ft): 18.7 / 16.45 / 16.75
Screened Interval (ft): 4-18.7
Depth to Groundwater (ft): 8.73
Depth to LNAPL (ft): N/A ; Slight sheen.
Water Column (ft):
Reference: BGS or TOC

Water Quality Meter(s)	Model	Calibration Date/Time
Temp/pH/SC/ORP/DO:	YSI 556 MPS	4/19/16 1430
Turbidity:	MicroTPI/TPW	4/19/16 1440
Other:		

QA/QC Samples		
Type	Sample ID	Time

Sample ID	Sample Containers				Field Filtered	Turbidity/ Color	Analysis Requested	MS/MSD & Comments
	No.	Type	Pres.	Vol.				
MW-15	3	A	HCl	40 ml	N		NWTPH-G/BETX	
+Duplicate	(DUP-1	-042016)						

1520 Time	1525	1530	1535	1540	1545	1550	1555	1600 DKR 1605
Parameter (every 5 min)	5 min	10 min	15 min	20 min	25 min	30 min	35 min	~~40~~ 45 min
Flow Rate (LPM)								
Volume Purged (L)	3.5	3.75	4.0	4.25	4.75	5.0	5.25	
Water Depth (ft)	10.86	10.88	11.03	11.07	11.15	11.27	11.32	
Temperature (Celsius)	15.17	14.78	14.80	14.78	14.77	14.86	14.80	
pH	5.49	5.49	5.52	5.49	5.48	5.46	5.45	
Sp. Conductance (uS/cm)	0.143	0.146	0.145	0.145	0.143	0.141	0.140	
DO (mg/L)	1.39	1.89	1.41	1.41	1.48	1.47	1.48	
ORP (mV)	176.2	182.4	190.1	200.3	197.1	203.0	204.4	
Turbidity (NTU)	784.1	227.6	120.8	104.8	94.09	83.12	79.12	
Color	Lt brown	Cloudy/lt brown	—	—	Clear/Cloudy	—	—	
Odor/Evidence of LNAPL	SS/SO	SS/SO	NS/SO	—	—	—	—	

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

8 bailers full surged ~3 gallons. - TD after surge 16.75. slight sheen observed. Light brown, very fine silty sand accumulated at bottom (observed on probe). Water light brown with suspended sediment.

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 12/7/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: DKR KDH
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1430
Purge Depth (ft): ~12 ft
Total Discharge (L): -
Water Disposal: 55-gallon drum
Weather: Sunny, 34°F

Well Number: MW-2 (Landau).
Monument Type: Stickup: ______ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition: Good
Total Casing Depth (ft): 16.5
Screened Interval (ft): ?, ? 16.5 - 6.5 ??
Depth to Groundwater (ft): 9.75
Depth to LNAPL (ft): N/A
Water Column (ft):

Reference: BGS or TOC

Water Quality Meter(s)	Model	Calibration Date/Time
Temp/pH/SC/ORP/DO:	~~YSI 556 MPS~~ Horiba	12/7/16 1640
Turbidity:	MicroTPI/TPW	
Other:		

QA/QC Samples		
Type	Sample ID	Time

Sample ID	Sample Containers				Field Filtered	Turbidity/ Color	Analysis Requested	MS/MSD & Comments
	No.	Type	Pres.	Vol.				
~~NWTPH-Gx/~~	3	HCl	VOA	40ml	No	clear	NWTPH-Gx/BTEX.	
~~BTEX~~								
MW-2-161207								

1410 Time	1415	1420	1425	1430				
Parameter (every 5 min)	min	min	min	min	min	min	min	min
Flow Rate (LPM)	0.2	0.2	0.2	0.2				
Volume Purged (L)	1	2	3	4				
Water Depth (ft)	10.49	10.80	10.85	10.91				
Temperature (Celsius)	13.5	14.3	13.6	13.2				
pH	6.56	6.50	6.46	6.43				
Sp. Conductance (uS/cm)	0.264	0.270	0.270	0.268				
DO (mg/L)			1.26	1.28				
ORP (mV)	209	204	203	204				
Turbidity (NTU)	9	9	8.7	5.4				
Color	clear	→	→	→				
Odor/Evidence of LNAPL	no O/S	→	→	→				

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 12/8/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: JES
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1600
Purge Depth (ft): ~13 ft
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Well Number: MW-4
Monument Type: Stickup: ______ (ft PVC) Flush: X
Well Diameter (in):
Well Condition:
Total Casing Depth (ft): 18.8
Screened Interval (ft): 4-18.8
Depth to Groundwater (ft): 8.53
Depth to LNAPL (ft):
Water Column (ft):

Reference: BGS or TOC

Water Quality Meter(s)	**Model**	**Calibration Date/Time**
Temp/pH/SC/ORP/DO:	YSI 556 MPS	
Turbidity:	MicroTPI/TPW	
Other:		

QA/QC Samples		
Type	**Sample ID**	**Time**

Sample ID	**Sample Containers**				**Field Filtered**	**Turbidity/ Color**	**Analysis Requested**	**MS/MSD & Comments**
	No.	**Type**	**Pres.**	**Vol.**				
Q	2	A	HCl	40 ml	N		NWTPH-G/BETX	
MW-4-161208								

1525 Time	1530	1535	1540	1545	1550	1555		
Parameter (every 5 min)	5 min	10 min	15 min	20 min	25 min	30 min	min	min
Flow Rate (LPM)	0.2							
Volume Purged (L)	1	2	3	4	5	6		
Water Depth (ft)	8.72	8.75	8.90	8.95	9.00	9.01		
Temperature (Celsius)	13.04	13.06	13.07	12.99	13.04	13.01		
pH	6.39	6.38	6.36	6.34	6.34	6.34		
Sp. Conductance (~~µ~~mS/cm)	0.352	0.350	0.353	0.351	0.348	0.347		
DO (mg/L)	0.60	0.51	0.34	0.30	0.26	0.25		
ORP (mV)	-74.8	-75.8	-78.6	-79.7	-80.3	-80.8		
Turbidity (NTU)	0.60	2.00	0.10	0.07	0.09	0.10		
Color	clear							
Odor/Evidence of LNAPL	petroleum odor, NS							

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 12/7/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: JES
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1145
Purge Depth (ft): ~16 ft
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Well Number: **MW-6**
Monument Type: Stickup: ______ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition: Bolts don't hold lid
Total Casing Depth (ft): 20.4
Screened Interval (ft): 5-20.4
Depth to Groundwater (ft): 11.55 (1105)
Depth to LNAPL (ft):
Water Column (ft):

Reference: BGS or **TOC**

Water Quality Meter(s)	Model	Calibration Date/Time
Temp/pH/SC/ORP/DO:	YSI 556 MPS	12/6/16
Turbidity:	MicroTPI/TPW	12/7/16
Other:		

QA/QC Samples		
Type	Sample ID	Time

Sample ID	Sample Containers				Field Filtered	Turbidity/ Color	Analysis Requested	MS/MSD & Comments
	No.	Type	Pres.	Vol.				
MW-6	2	A	HCl	40 ml	N		NWTPH-G/BETX	

1115 Time	1120	1125	1130	1135	1140	1145		
Parameter (every 5 min)	5 min	10 min	15 min	20 min	25 min	30 min	min	min
Flow Rate (LPM)	200mL							
Volume Purged (L)	1	2	3	4	5	6		
Water Depth (ft)	11.95	12.08	12.21	12.34	12.41	12.49		
Temperature (Celsius)	13.39	13.21	13.31	13.08	13.35	13.32		
pH	7.15	7.16	7.16	7.16	7.15	7.15		
Sp. Conductance (mS/cm)	0.731	0.733	0.732	0.729	0.725	0.724		
DO (mg/L)	0.60	0.35	0.31	0.25	0.23	0.24		
ORP (mV)	-61.2	-67.6	-71.1	-75.9	-77.7	-78.5		
Turbidity (NTU)	25.41	15.24	15.21	12.45	11.85	11.42		
Color	clear							
Odor/Evidence of LNAPL	none/s							

Notes: (i.e. actions taken if well dewaters, difficulties in sampling through LNAPL, problems during purging/sampling, etc.)

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date:	12/8/16	Well Number:	**MW-7**
Project Name:	Ecology Circle K 1461	Monument Type:	Stickup: ______ (ft PVC) Flush: X
Project Number:	1696010*00	Well Diameter (in):	2
Sampling Personnel:	JES	Well Condition:	good, missing 1 bolt
Water Level Meter:	Geotech IFP	Total Casing Depth (ft):	20.2
Purging Equipment:	Peristaltic	Screened Interval (ft):	5-20.2
Sampling Equipment:	Peristaltic	Depth to Groundwater (ft):	6-30
Sampling Time:	0845	Depth to LNAPL (ft):	n/a
Purge Depth (ft):	~13 ft	Water Column (ft):	
Total Discharge (L):			
Water Disposal:	55-gallon drum		
Weather:			

Reference: BGS or [✓ TOC]

Water Quality Meter(s)	**Model**	**Calibration Date/Time**
Temp/pH/SC/ORP/DO:	YSI 556 MPS	12/6/16
Turbidity:	MicroTPI/TPW	12/7/16
Other:		

QA/QC Samples

Type	**Sample ID**	**Time**

Sample ID	**Sample Containers**				**Field Filtered**	**Turbidity/ Color**	**Analysis Requested**	**MS/MSD & Comments**
	No.	**Type**	**Pres.**	**Vol.**				
MW-7	2	A	HCl	40 ml	N		NWTPH-G/BETX	

0818 Time	0823	0828	0833	0838	0840	0843		
Parameter (every 5 min)	5 min	10 min	15 min	20 min	22 min	25 min	min	min
Flow Rate (LPM)	0.2[illegible]	0.2						
Volume Purged (L)	1	2	3	4	4.2	5		
Water Depth (ft)	6.49	6.64	6.75	6.81	6.83	6.85		
Temperature (Celsius)	11.49	11.96	11.76	12.01	12.00	11.49		
pH	6.22	6.20	6.19	6.18	6.18	6.19		
Sp. Conductance (mS/cm)	0.357	0.370	0.372	0.377	0.378	0.380		
DO (mg/L)	3.98	3.63	3.53	3.49	3.43	3.41		
ORP (mV)	135.4	139.0	141.6	144.3	145.1	146.4		
Turbidity (NTU)	0.55	0.36	0.44	0.28	0.34	0.19		
Color	clear							
Odor/Evidence of LNAPL	no o/s							

Notes: (i.e. actions taken if well dewaters, difficulties in sampling through LNAPL, problems during purging/sampling, etc.)

Groundwater Purge and Sample Form (Minimal Drawdown) — **Kennedy/Jenks Consultants**

Date: 12/7/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: DKK/TDH
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 0955
Purge Depth (ft): ~~[illegible]~~ ~12ft
Total Discharge (L): 5L
Water Disposal: 55-gallon drum
Weather:

Well Number: **MW-8**
Monument Type: Stickup: ______ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition: Good
Total Casing Depth (ft): 20.3
Screened Interval (ft): 5-20.3
Depth to Groundwater (ft):
Depth to LNAPL (ft):
Water Column (ft):

Reference: BGS or **TOC**

Water Quality Meter(s)	**Model**	**Calibration Date/Time**
Temp/pH/SC/ORP/DO:	Horiba ~~YSI 556~~ MPS	12/6/16 1640
Turbidity:	MicroTPI/TPW	
Other:		

QA/QC Samples		
Type	**Sample ID**	**Time**

Sample ID	**Sample Containers**				**Field Filtered**	**Turbidity/ Color**	**Analysis Requested**	**MS/MSD & Comments**
	No.	**Type**	**Pres.**	**Vol.**				
MW-8	2	A	HCl	40 ml	N		NWTPH-G/BETX	

0930 Time	0935	0940	0945	0950				
Parameter (every 5 min)	min	min	min	min	min	min	min	min
Flow Rate (LPM)	0.2	0.2						
Volume Purged (L)	1	2	3	4				
Water Depth (ft)	8.91	9.01	9.06	9.09				
Temperature (Celsius)	13.4	13.1	13.7	13.7				
pH ±0.1	6.40	6.41	6.40	6.42				
Sp. Conductance (uS/cm) 3%	0.423	0.421	0.416	0.420				
DO (mg/L) [illegible]	—	0.17	0.18	0.22				
ORP (mV) ±10mV	-2	-8	-14	-24				
Turbidity (NTU) ±10%	12.2	2.1	0.78	3.17				
Color	Clear							
Odor/Evidence of LNAPL	Odor & Slight Sheen.							

Notes: (i.e. actions taken if well dewaters, difficulties in sampling through LNAPL, problems during purging/sampling, etc.)

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 12/7/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: DKR/TDH
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1035
Purge Depth (ft): ~13 ft
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Well Number: **MW-9**
Monument Type: Stickup: ______ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition: Good
Total Casing Depth (ft): 21.2
Screened Interval (ft): 5-21.2
Depth to Groundwater (ft): 8.31
Depth to LNAPL (ft): 8.31 (<0.01 film).
Water Column (ft):

Reference: BGS or **TOC**

Water Quality Meter(s)	**Model**	**Calibration Date/Time**
Temp/pH/SC/ORP/DO: Horiba	~~YSI 556 MPS~~	12/6/16 [illegible]
Turbidity:	MicroTPI/TPW	
Other:		

QA/QC Samples		
Type	**Sample ID**	**Time**

Sample	**Sample Containers**				**Field**	**Turbidity/**	**Analysis**	**MS/MSD &**
ID	**No.**	**Type**	**Pres.**	**Vol.**	**Filtered**	**Color**	**Requested**	**Comments**
MW-9	2	A	HCl	40 ml	N		NWTPH-G/BETX	

1010 Time	1015	1020	1025	1030				
Parameter (every 5 min)	min	min	min	min	min	min	min	min
Flow Rate (LPM)	0.2	—	—	—				
Volume Purged (L)	1	2	3	4				
Water Depth (ft)	8.59	8.67	8.72	8.81				
Temperature (Celsius)	14.6	15.1	15.0	15.0				
pH	6.51	6.50	6.58	6.50				
Sp. Conductance (uS/cm)	0.503	0.498	0.496	0.495				
DO (mg/L)	—	0.38	0.38	0.44				
ORP (mV)	-48	-58	-63	-76				
Turbidity (NTU)	4.13	6.88	6.50	3.56				
Color	Clear	—	—	—				
Odor/Evidence of LNAPL	Odor / slight sheen		—	—				

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 12/7/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel:
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1145
Purge Depth (ft): ~12
Total Discharge (L): ~4
Water Disposal: 55-gallon drum
Weather: sunny

Well Number: **MW-10**
Monument Type: Stickup: ________ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition: good
Total Casing Depth (ft): 20.4
Screened Interval (ft): 5-20.4
Depth to Groundwater (ft): 8.81
Depth to LNAPL (ft): N/A
Water Column (ft):
Reference: BGS or [✓ TOC]

Water Quality Meter(s)	**Model**	**Calibration Date/Time**
Temp/pH/SC/ORP/DO:	~~YSI 556 MPS~~ Horiba	
Turbidity:	MicroTPI/TPW	
Other:		

QA/QC Samples		
Type	**Sample ID**	**Time**

Sample ID	**Sample Containers**				**Field Filtered**	**Turbidity/ Color**	**Analysis Requested**	**MS/MSD & Comments**
	No.	**Type**	**Pres.**	**Vol.**				
MW-10	2	A	HCl	40 ml	N		NWTPH-G/BETX	

1110 Time								
Parameter (every 5 min)	1115 min	1120 min	1125 min	1130 min	1135 min	1140 min	min	min
Flow Rate (LPM)	0.1	0.1	0.1	0.1	0.1	0.1		
Volume Purged (L)	0.5	1.0	1.5	2.0	2.5	3.0		
Water Depth (ft)	9.09	9.33	9.51	9.63	9.73	9.70		
Temperature (Celsius)	13.4	13.8	13.7	13.9	13.9	13.9		
pH	7.22	7.10	6.85	6.73	6.63	6.69		
Sp. Conductance (uS/cm)	0.652	0.642	0.587	0.565	0.533	0.558		
DO (mg/L)	0.06	0.04	0.03	0.03	0.05	0.03		
ORP (mV)	-50	-34	17	37	55	59		
Turbidity (NTU)	50.86	17.25	10.92	5	3	2		
Color	Clear							
Odor/Evidence of LNAPL	No o/s							

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 12/7/16
Well Number: **MW-11**
Project Name: Ecology Circle K 1461
Monument Type: Stickup: ______ (ft PVC) Flush: X
Project Number: 1696010*00
Well Diameter (in): 2
Sampling Personnel:
Well Condition:
Water Level Meter: Geotech IFP
Total Casing Depth (ft): 20.0
Purging Equipment: Peristaltic
Screened Interval (ft): 5-20.0
Sampling Equipment: Peristaltic
Depth to Groundwater (ft): 1.92
Sampling Time: 1455
Depth to LNAPL (ft):
Purge Depth (ft): ~4 ft
Water Column (ft):
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Reference: BGS or TOC

Water Quality Meter(s)	**Model**	**Calibration Date/Time**
Temp/pH/SC/ORP/DO:	YSI 556 MPS	
Turbidity:	MicroTPI/TPW	
Other:		

QA/QC Samples		
Type	**Sample ID**	**Time**
☒	☒	☒

Sample ID	**Sample Containers No.**	**Type**	**Pres.**	**Vol.**	**Field Filtered**	**Turbidity/ Color**	**Analysis Requested**	**MS/MSD & Comments**
MW-11	2	A	HCl	40 ml	N		NWTPH-G/BETX	

1415 Time	1420	1425	1430	1435	1440	1445	1450	
Parameter (every 5 min)	5 min	10 min	15 min	20 min	25 min	30 min	35 min	min
Flow Rate (LPM)	0.2				150 mL			
Volume Purged (L)	1	2	3	4	~~5~~ 4.75	5.5	6.25	
Water Depth (ft)	3.33	3.54	3.74	3.86	3.72	3.73	3.74	
Temperature (Celsius)	13.32	13.40	13.44	13.48	13.18	~~12.78~~ 13.80	13.01	
pH	6.06	6.07	6.05	6.04	6.02	6.00	5.99	
Sp. Conductance M (µS/cm)	0.170	0.169	0.171	0.175	0.178	0.181	0.182	
DO (mg/L)	1.06	0.79	0.44	0.32	0.29	6.25	6.24	
ORP (mV)	105.7	102.2	91.7	81.1	70.7	62.9	61.4	
Turbidity (NTU)	35.97	37.23	33.09	35.32	29.67	29.42	29.01	
Color	clear							
Odor/Evidence of LNAPL	no/s							

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 12/8/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel:
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1355
Purge Depth (ft): ~15
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Well Number: **MW-13**
Monument Type: Stickup: ______ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition:
Total Casing Depth (ft): 19.0
Screened Interval (ft): 4-19.0
Depth to Groundwater (ft): 9.38
Depth to LNAPL (ft):
Water Column (ft):
Reference: BGS or [✓ TOC]

Water Quality Meter(s)	Model	Calibration Date/Time
Temp/pH/SC/ORP/DO:	YSI 556 MPS	
Turbidity:	MicroTPI/TPW	
Other:		

QA/QC Samples		
Type	Sample ID	Time
☒	☒	☒

Sample ID	Sample Containers				Field Filtered	Turbidity/ Color	Analysis Requested	MS/MSD & Comments
	No.	Type	Pres.	Vol.				
MW-13	2	A	HCl	40 ml	N		NWTPH-G/BETX	
+ DUP-1-161208								

1320 Time	1325	1330	1335	1340	1345			
Parameter (every 5 min)	5 min	10 min	15 min	20 min	25 min	min	min	min
Flow Rate (LPM)	0.2 —	—	150 mL —	—	—			
Volume Purged (L)	1	2	3	3.75	4.5			
Water Depth (ft)	10.61	10.81	10.92	10.81	10.78			
Temperature (Celsius)	15.25	14.95	14.99	14.46	14.42			
pH	6.53	6.53	6.50	6.49	6.49			
Sp. Conductance (~~µ~~mS/cm)	0.758	0.760	0.761	0.759	0.752			
DO (mg/L)	1.19	0.44	0.33	0.32	6.30			
ORP (mV)	-88.5	-108.5	-113.7	-115.8	-115.7			
Turbidity (NTU)	8.26	7.38	5.62	5.33	6.39			
Color	clear —	—	—	—	—			
Odor/Evidence of LNAPL	petroleum odor —	—	—	—	—			

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 12/7/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: JEJ
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1635
Purge Depth (ft): ~12ft
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Well Number: **MW-14**
Monument Type: Stickup: ______ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition: good
Total Casing Depth (ft): 19.3
Screened Interval (ft): 4-19.3
Depth to Groundwater (ft): 6.45
Depth to LNAPL (ft): n/a
Water Column (ft):
Reference: BGS or TOC

Water Quality Meter(s)	**Model**	**Calibration Date/Time**
Temp/pH/SC/ORP/DO:	YSI 556 MPS	
Turbidity:	MicroTPI/TPW	
Other:		

QA/QC Samples		
Type	**Sample ID**	**Time**
☒	☒	☒
☒	☒	☒

Sample ID	**Sample Containers**				**Field Filtered**	**Turbidity/ Color**	**Analysis Requested**	**MS/MSD & Comments**
	No.	**Type**	**Pres.**	**Vol.**				
MW-14	2	A	HCl	40 ml	N		NWTPH-G/BETX	

1607 Time	1612	1617	1622	1627	1632			
Parameter (every 5 min)	5 min	10 min	15 min	20 min	25 min	min	min	min
Flow Rate (LPM)	0.2							
Volume Purged (L)	1	2	3	4	5			
Water Depth (ft)	6.51	6.53	6.56	6.57	6.57			
Temperature (Celsius)	13.03	13.35	13.36	13.31	13.28			
pH	6.70	6.67	6.64	6.64	6.64			
Sp. Conductance (~~µ~~mS/cm)	0.579	0.576	0.563	0.569	0.559			
DO (mg/L)	0.32	0.33	0.31	0.29	0.28			
ORP (mV)	-91.4	-105.7	-110.5	-117.2	-117.3			
Turbidity (NTU)	26.74	17.10	14.21	14.30	12.16			
Color	clear							
Odor/Evidence of LNAPL	sl. sulfur odor, NS							

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 12/7/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: JES
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1540
Purge Depth (ft): ~10.5
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Well Number: **MW-15**
Monument Type: Stickup: ______ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition: good
Total Casing Depth (ft): 18.7
Screened Interval (ft): 4-18.7
Depth to Groundwater (ft): 3.28
Depth to LNAPL (ft):
Water Column (ft):
Reference: BGS or TOC

Water Quality Meter(s)	Model	Calibration Date/Time
Temp/pH/SC/ORP/DO:	YSI 556 MPS	
Turbidity:	MicroTPI/TPW	
Other:		

QA/QC Samples		
Type	Sample ID	Time

Sample ID	Sample Containers No.	Type	Pres.	Vol.	Field Filtered	Turbidity/ Color	Analysis Requested	MS/MSD & Comments
MW-15	2	A	HCl	40 ml	N		NWTPH-G/BETX	

1510 Time	1515	1520	1525	1530	1535	1540		
Parameter (every 5 min)	5 min	10 min	15 min	20 min	25 min	30 min	min	min
Flow Rate (LPM)	0.2							
Volume Purged (L)	1	2	3	4	5			
Water Depth (ft)	3.42	3.58	3.71	3.78	3.81			
Temperature (Celsius)	11.32	11.49	11.48	11.55	11.52			
pH	5.26	5.28	5.28	5.27	5.28			
Sp. Conductance (uS/cm)	0.115	0.115	0.114	0.114	0.115			
DO (mg/L)	1.19	0.65	0.39	0.36	0.36			
ORP (mV)	183.8	183.2	185.0	186.1	186.7			
Turbidity (NTU)	7.84	6.98	5.67	5.41	5.32			
Color	clear							
Odor/Evidence of LNAPL	no o/s							

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 12/7/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: JES
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 0950 1038
Purge Depth (ft): ~12 ft
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Well Number: **MW-16**
Monument Type: Stickup: ____ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition: poor, full of dirt, no bolts working
Total Casing Depth (ft): 19.2 18.71
Screened Interval (ft): 4-19.2
Depth to Groundwater (ft): 6.62
Depth to LNAPL (ft):
Water Column (ft):
Reference: BGS or TOC

Water Quality Meter(s)	Model	Calibration Date/Time
Temp/pH/SC/ORP/DO:	YSI 556 MPS	12/6/16
Turbidity:	MicroTPI/TPW	12/7/16
Other:		

QA/QC Samples		
Type	Sample ID	Time
☒	☒	☒
☒	☒	☒

Sample ID	Sample Containers				Field Filtered	Turbidity/ Color	Analysis Requested	MS/MSD & Comments
	No.	Type	Pres.	Vol.				
MW-16 -161207-PRE	2	A	HCl	40 ml	N		NWTPH-G/BETX	@950
	Predevelopment						POST	@ 1038
MW-16-161207-POST								

0911 Time	0921	0926	0931	0936	0941	0946	post development		
Parameter (every 5 min)	5 min	10 min	15 min	20 min	25 min	30 min	5 min	10 min	
Flow Rate (LPM)	0.2						200		
Volume Purged (L)	1	2	3	4	5	6	1	2	3
Water Depth (ft)	7.06	7.31	7.59	7.81	7.91	8.00	8.34	8.36	8.37
Temperature (Celsius)	12.15	11.96	12.07	12.73	12.63	12.50	13.42	13.54	13.56
pH	6.12	6.11	6.10	6.08	6.08	6.07	6.09	6.10	6.13
Sp. Conductance (mS/cm)	0.396	0.397	0.398	0.404	0.400	0.403	0.393	0.392	0.390
DO (mg/L)	2.23	1.72	1.27	0.86	0.94	0.86	1.12	0.94	0.83
ORP (mV)	182.1	177.0	172.3	168.2	167.1	165.8	187.3	164.2	151.1
Turbidity (NTU)	32.91	28.93	22.64	13.50	9.44	8.16	72.4	143.0	123.2
Color	clear								
Odor/Evidence of LNAPL	sl. odor, NS								

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

well had not previously been developed; will collect sample, develop, & then possibly recollect sample. Collected sample at 0950 due to water dropping. Developed well using peristaltic & bailer, Post development turbidity 72.4. Removed approx 6 gallons.
sl. sheen in bucket following development.

Groundwater Purge and Sample Form (Minimal Drawdown)

Kennedy/Jenks Consultants

Date: 12/7/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel:
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1610
Purge Depth (ft):
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Well Number: MW-17
Monument Type: Stickup: ____ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition:
Total Casing Depth (ft): 20
Screened Interval (ft): 5-20
Depth to Groundwater (ft):
Depth to LNAPL (ft):
Water Column (ft):

Reference: BGS or TOC

Water Quality Meter(s)	**Model**	**Calibration Date/Time**
Temp/pH/SC/ORP/DO:	YSI 556 MPS	
Turbidity:	MicroTPI/TPW	
Other:		

QA/QC Samples		
Type	**Sample ID**	**Time**

Sample ID	**Sample Containers**				**Field Filtered**	**Turbidity/ Color**	**Analysis Requested**	**MS/MSD & Comments**
	No.	**Type**	**Pres.**	**Vol.**				
MW-17	2	A	HCl	40 ml	N		NWTPH-G/BETX	

1545 Time	1550	1555	1600	1605				
Parameter (every 5 min)	min	min	min	min	min	min	min	min
Flow Rate (LPM)	0.1	0.1	0.1	0.1				
Volume Purged (L)	0.5	1.0	1.5	2.0				
Water Depth (ft)	10.20	10.23	10.24	10.25				
Temperature (Celsius)	13.0	13.5	13.9	14.1				
pH	6.49	6.39	6.37	6.36				
Sp. Conductance (uS/cm)	0.097	0.096	0.096	0.096				
DO (mg/L)								
ORP (mV)	259	271	277	284				
Turbidity (NTU)	15	12	9	8				
Color	clear							
Odor/Evidence of LNAPL	no O/S							

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 12/7/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel:
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1515
Purge Depth (ft):
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Well Number: **MW-18**
Monument Type: Stickup: ______ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition:
Total Casing Depth (ft): 15
Screened Interval (ft): 5-15
Depth to Groundwater (ft):
Depth to LNAPL (ft):
Water Column (ft):

Reference: BGS or [✓ TOC]

Water Quality Meter(s)	**Model**	**Calibration Date/Time**
Temp/pH/SC/ORP/DO:	YSI 556 MPS	
Turbidity:	MicroTPI/TPW	
Other:		

QA/QC Samples

Type	**Sample ID**	**Time**
☒	☒	☒
☒	☒	☒

Sample ID	**Sample Containers**				**Field Filtered**	**Turbidity/ Color**	**Analysis Requested**	**MS/MSD & Comments**
	No.	**Type**	**Pres.**	**Vol.**				
MW-18	2	A	HCl	40 ml	N		NWTPH-G/BETX	

1445 Time	1450	1455	1500	1505	1510			
Parameter (every 5 min)	min	min	min	min	min	min	min	min
Flow Rate (LPM)	0.1	0.1	0.1	0.1	0.1			
Volume Purged (L)	0.5	1.0	1.5	2.0	2.5			
Water Depth (ft)	11.85	1208	12.28	12.39	12.48			
Temperature (Celsius)	13.9	14.1	14.5	14.4	13.6			
pH	6.49	6.47	6.46	6.46	6.40			
Sp. Conductance (uS/cm)	0.445	0.447	0.447	0.447	0.453			
DO (mg/L)								
ORP (mV)	252	254	256	258	256			
Turbidity (NTU)	4.2	3.8	5	4	1			
Color	Clear							
Odor/Evidence of LNAPL	NO O/S							

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

Q:\Projects\2016\1696010.00 WA DOE Circle K Site Assessment\Field\TEMPLATE Purge Forms.xls

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 12/8/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel:
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 1215
Purge Depth (ft): ~15.5
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Well Number: **MW-19**
Monument Type: Stickup: ____ (ft PVC) Flush: X
Well Diameter (in): 2
Well Condition:
Total Casing Depth (ft): 20
Screened Interval (ft): 5-20
Depth to Groundwater (ft): 10.52
Depth to LNAPL (ft):
Water Column (ft):
Reference: BGS or TOC

Water Quality Meter(s)	**Model**	**Calibration Date/Time**
Temp/pH/SC/ORP/DO:	YSI 556 MPS	
Turbidity:	MicroTPI/TPW	
Other:		

QA/QC Samples		
Type	**Sample ID**	**Time**

Sample ID	**Sample Containers**				**Field Filtered**	**Turbidity/ Color**	**Analysis Requested**	**MS/MSD & Comments**
	No.	**Type**	**Pres.**	**Vol.**				
MW-19	2	A	HCl	40 ml	N		NWTPH-G/BETX	

1140 Time	1145	1150	1155	1200	1205	1210		
Parameter (every 5 min)	5 min	10 min	15 min	20 min	25 min	30 min	min	min
Flow Rate (LPM)	0.2							
Volume Purged (L)	1	2	3	4	5	6		
Water Depth (ft)	10.63	10.65	10.66	10.68	10.70	10.72		
Temperature (Celsius)	15.34	15.23	15.47	15.61	15.47	15.65		
pH	6.97	6.92	6.89	6.84	6.85	6.85		
Sp. Conductance (~~µ~~mS/cm)	0.233	0.235	0.238	0.241	0.246	0.248		
DO (mg/L)	0.61	0.65	0.31	0.25	0.23	0.22		
ORP (mV)	-68.4	-80.8	-86.9	-89.4	-92.8	-95.3		
Turbidity (NTU)	7.46	8.31	6.98	6.84	5.77	5.33		
Color	clear							
Odor/Evidence of LNAPL	petroleum odor, no sheen							

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 12/8/16
Project Name: Ecology Circle K 1461
Project Number: 1696010*00
Sampling Personnel: JES
Water Level Meter: Geotech IFP
Purging Equipment: Peristaltic
Sampling Equipment: Peristaltic
Sampling Time: 0950
Purge Depth (ft):
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Well Number: **MW-20**
Monument Type: Stickup: ____ (ft PVC) Flush: X
Well Diameter (in): 4
Well Condition:
Total Casing Depth (ft): 5
Screened Interval (ft): 5-20
Depth to Groundwater (ft): 10.59
Depth to LNAPL (ft): n/a
Water Column (ft):
Reference: BGS or TOC

Water Quality Meter(s)	Model	Calibration Date/Time
Temp/pH/SC/ORP/DO:	YSI 556 MPS	
Turbidity:	MicroTPI/TPW	
Other:		

QA/QC Samples		
Type	Sample ID	Time
☒	☒	☒
☒	☒	☒

Sample ID	Sample Containers				Field Filtered	Turbidity/ Color	Analysis Requested	MS/MSD & Comments
	No.	Type	Pres.	Vol.				
MW-20	2	A	HCl	40 ml	N		NWTPH-G/BETX	
	+ Fuel additives & total lead							

0923 Time	0928	0933	0938	0943	0948			
Parameter (every 5 min)	5 min	10 min	15 min	20 min	25 min	min	min	min
Flow Rate (LPM)	0.28	0.2						
Volume Purged (L)	1	2	3	4	5			
Water Depth (ft)	10.69	10.75	10.79	10.81	10.82			
Temperature (Celsius)	15.25	15.34	15.44	15.34	15.29			
pH	6.55	6.55	6.55	6.55	6.56			
Sp. Conductance (~~u~~mS/cm)	0.570	0.573	0.573	0.572	0.573			
DO (mg/L)	0.54	0.37	0.32	0.31	0.29			
ORP (mV)	-63.9	-70.2	-74.2	-75.8	-77.1			
Turbidity (NTU)	3.61	0.31	0.40	0.58	0.23			
Color	clear							
Odor/Evidence of LNAPL	sl. petroleum odor, NS							

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

Groundwater Purge and Sample Form (Minimal Drawdown) **Kennedy/Jenks Consultants**

Date: 12/8/16
Well Number: **MW-21**
Project Name: Ecology Circle K 1461
Monument Type: Stickup: ______ (ft PVC) Flush: X
Project Number: 1696010*00
Well Diameter (in): 4
Sampling Personnel:
Well Condition:
Water Level Meter: Geotech IFP
Total Casing Depth (ft): 20
Purging Equipment: Peristaltic
Screened Interval (ft): 5-20
Sampling Equipment: Peristaltic
Depth to Groundwater (ft): 10.38
Sampling Time: 1450
Depth to LNAPL (ft):
Purge Depth (ft): ~15
Water Column (ft):
Reference: BGS or TOC
Total Discharge (L):
Water Disposal: 55-gallon drum
Weather:

Water Quality Meter(s)	**Model**	**Calibration Date/Time**
Temp/pH/SC/ORP/DO:	YSI 556 MPS	
Turbidity:	MicroTPI/TPW	
Other:		

QA/QC Samples		
Type	**Sample ID**	**Time**
☒	☒	☒
☒	☒	☒

Sample ID	**Sample Containers**				**Field Filtered**	**Turbidity/ Color**	**Analysis Requested**	**MS/MSD & Comments**
	No.	**Type**	**Pres.**	**Vol.**				
MW-21	2	A	HCl	40 ml	N		NWTPH-G/BETX	

1412 Time	1417	1422	1427	1432	1437			
Parameter (every 5 min)	5 min	10 min	15 min	20 min	25 min	min	min	min
Flow Rate (LPM)	0.2							
Volume Purged (L)	1	2	3	4	5			
Water Depth (ft)	10.46	10.51	10.57	10.59	10.60			
Temperature (Celsius)	14.84	15.16	15.32	15.01	15.14			
pH	6.61	6.61	6.61	6.61	6.60			
Sp. Conductance (~~µ~~mS/cm)	0.979	1.008	1.008	1.009	1.010			
DO (mg/L)	0.75	0.48	0.31	0.31	0.30			
ORP (mV)	-78.9	-84.5	-89.0	-89.8	-91.5			
Turbidity (NTU)	2.46	2.28	1.91	2.01	1.08			
Color	clear							
Odor/Evidence of LNAPL	petroleum odor							

Notes: (i.e. actions taken if well dewaters orproblems during purging/sampling, etc.)

slight to moderate sheen in bucket

Appendix D

Analytical Laboratory Reports

Analytical Resources, Incorporated
Analytical Chemists and Consultants

11 May 2016

Julia Schwartz
Kennedy Jenks Consultants
32001 - 32nd Avenue South, Suite 100
Federal Way, WA 98001

RE: Circle K

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)	Associated SDG ID(s)
16D0063	N/A

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the reqirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, Inc.

Mark Harris, Project Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Cert# 100006

PJLA Testing
Accreditation # 66169

Chain of Custody Record & Laboratory Analysis Request

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)
www.arilabs.com

ARI Assigned Number: AZ04
Turn-around Requested: Standard
Page: 1 of 2
ARI Client Company: Kennedy/Jenks
Phone: 253-835-6424
Date:
Ice Present? Y
Client Contact: Julia Schwarz or Ty Schreiner
No. of Coolers: 1
Cooler Temps: 0.2
Client Project Name: Circle K
Client Project #: 1696010.00
Samplers: Julia Schwarz / Diane Rauch

					Analysis Requested								
Sample ID	Date	Time	Matrix	No Containers	NWTPH-G/ BTEX								Notes/Comments
MW-6-042016	4/20/16	1030	water	3	✓								
MW-10-042016		1035											
MW-9-042016		1235											
MW-8-042016		1245											
MW-4-042016		1420											
MW-7-042016		1435											
MW-15-042016		1600											
MW-14-042016		1605											
MW-11-042016		1636											
MW-13-042016		1705											

Comments/Special Instructions

	Relinquished by	Received by	Relinquished by	Received by
(Signature)				
Printed Name	Julia Schwarz	A. Volgardsen		
Company	Kennedy/Jenks	ARI		
Date & Time	4/21/16 0830	4/21/16 830		

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Chain of Custody Record & Laboratory Analysis Request

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)
www.arilabs.com

ARI Assigned Number: Element ~~A204~~	Turn-around Requested: Standard	Page: 2	of 2
ARI Client Company: Kennedy/Jenks Phone: 253-835-6424		Date:	Ice Present?
Client Contact: Julia Schwarz or Ty Schreiner		No. of Coolers: 1	Cooler Temps:
Client Project Name: Circle K			
Client Project #: 1696010.00	Samplers: Julia Schwarz / Diane Rauch		

Sample ID	Date	Time	Matrix	No Containers	Analysis Requested NWTPH-G/BTEX								Notes/Comments
DUP-1-042016	4/20/16		Water	3	✓								
Trip Blank													

Comments/Special Instructions	Relinquished by	Received by.	Relinquished by	Received by
	(Signature)	(Signature)	(Signature)	(Signature)
	Printed Name Julia Schwarz	Printed Name A. Volgardsen	Printed Name	Printed Name
	Company Kennedy/Jenks	Company ARI	Company	Company
	Date & Time 4/21/16 0830	Date & Time: 4/21/16 830	Date & Time	Date & Time

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Kennedy Jenks

Project Name: Circle K

COC No(s): [✓ NA]

Delivered by: Fed-Ex UPS Courier [✓ Hand Delivered] Other:

Assigned ARI Job No: A204 Element

Tracking No: [✓ NA]

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES [✓ NO]

Were custody papers included with the cooler? .... [✓ YES] NO

Were custody papers properly filled out (ink, signed, etc.) .... [✓ YES] NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) 0.2

Time:

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: D005376

Cooler Accepted by: A Date: 4/21/16 Time: 830

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? .... YES [✓ NO]

What kind of packing material was used? ... Bubble Wrap [✓ Wet Ice] Gel Packs Baggies Foam Block Paper Other:

Was sufficient ice used (if appropriate)? .... NA [✓ YES] NO

Were all bottles sealed in individual plastic bags? .... YES [✓ NO]

Did all bottles arrive in good condition (unbroken)? .... [✓ YES] NO

Were all bottle labels complete and legible? .... [✓ YES] NO

Did the number of containers listed on COC match with the number of containers received? .... [✓ YES] NO

Did all bottle labels and tags agree with custody papers? .... [✓ YES] NO

Were all bottles used correct for the requested analyses? .... [✓ YES] NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)... [✓ NA] YES NO

Were all VOC vials free of air bubbles? .... NA [✓ YES] NO

Was sufficient amount of sample sent in each bottle? .... [✓ YES] NO

Date VOC Trip Blank was made at ARI.. NA 4-14-16

Was Sample Split by ARI : [✓ NA] YES Date/Time: Equipment: Split by:

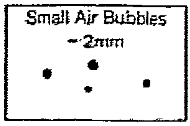
Samples Logged by: JM Date: 4-22-16 Time. 1216

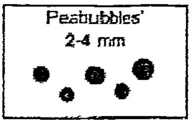
*** Notify Project Manager of discrepancies or concerns ***

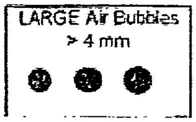
Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:







Small → "sm" (< 2 mm)
Peabubbles → "pb" (2 to < 4 mm)
Large → "lg" (4 to < 6 mm)
Headspace → "hs" (> 6 mm)

Analytical Report

Kennedy Jenks Consultants
32001 - 32nd Avenue South, Suite 100
Federal Way WA, 98001

Project: Circle K
Project Number: 1696010-00
Project Manager: Julia Schwartz

Reported:
11-May-2016 12:17

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-6-042016	16D0063-01	Water	20-Apr-2016 10:30	21-Apr-2016 08:30
MW-10-042016	16D0063-02	Water	20-Apr-2016 10:35	21-Apr-2016 08:30
MW-9-042016	16D0063-03	Water	20-Apr-2016 12:35	21-Apr-2016 08:30
MW-8-042016	16D0063-04	Water	20-Apr-2016 12:45	21-Apr-2016 08:30
MW-4-042016	16D0063-05	Water	20-Apr-2016 14:20	21-Apr-2016 08:30
MW-7-042016	16D0063-06	Water	20-Apr-2016 14:35	21-Apr-2016 08:30
MW-15-042016	16D0063-07	Water	20-Apr-2016 16:00	21-Apr-2016 08:30
MW-14-042016	16D0063-08	Water	20-Apr-2016 16:05	21-Apr-2016 08:30
MW-11-042016	16D0063-09	Water	20-Apr-2016 16:36	21-Apr-2016 08:30
MW-13-042016	16D0063-10	Water	20-Apr-2016 17:05	21-Apr-2016 08:30
DUP1-042016	16D0063-11	Water	20-Apr-2016 00:00	21-Apr-2016 08:30
Trip Blanks	16D0063-12	Water	14-Apr-2016 00:00	21-Apr-2016 08:30

The percent recoveries for the surrogate, d4-1,2-dichloroethane, were high following the analyses of samples MW-9-042016, MW-8-042016 and MW-4-042016. These samples were diluted and re-analyzed. The percent recoveries for all surrogates were within established QC limits for the dilutions. The results for both analyses have been submitted for these samples.

MW-6-042016

16D0063-01 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2
Analyzed: 26-Apr-2016 17:54

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BED0103
Prepared: 26-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.03	0.20	**4.29**	ug/L	
Toluene	108-88-3	1	0.04	0.20	**0.40**	ug/L	
Ethylbenzene	100-41-4	1	0.04	0.20	**0.34**	ug/L	
m,p-Xylene	179601-23-1	1	0.05	0.40	**0.29**	ug/L	J
o-Xylene	95-47-6	1	0.04	0.20	**0.14**	ug/L	J
Xylenes, total	1330-20-7	1	0.09	0.60	**0.43**	ug/L	J
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*98.1*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*98.0*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*99.8*	*%*	

Method: NWTPHg
Instrument: NT2
Analyzed: 26-Apr-2016 17:54

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BED0103
Prepared: 26-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	9.06	100	ND	ug/L	U
Surrogate: Toluene-d8				*80-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*98.0*	*%*	

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010-00	**Reported:**
Federal Way WA, 98001	Project Manager: Julia Schwartz	11-May-2016 12:17

MW-10-042016

16D0063-02 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2
Analyzed: 26-Apr-2016 18:15

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BED0103
Prepared: 26-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.03	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.04	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.04	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.05	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.04	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.09	0.60	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*101*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*98.2*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*96.4*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*97.1*	*%*	

Method: NWTPHg
Instrument: NT2
Analyzed: 26-Apr-2016 18:15

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BED0103
Prepared: 26-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	9.06	100	ND	ug/L	U
Surrogate: Toluene-d8				*80-120 %*	*98.2*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*96.4*	*%*	

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010-00	**Reported:**
Federal Way WA, 98001	Project Manager: Julia Schwartz	11-May-2016 12:17

MW-9-042016

16D0063-03 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2
Analyzed: 26-Apr-2016 18:36

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BED0103
Prepared: 26-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.03	0.20	**9.89**	ug/L	
Toluene	108-88-3	1	0.04	0.20	**37.1**	ug/L	
Ethylbenzene	100-41-4	1	0.04	0.20	**214**	ug/L	E
m,p-Xylene	179601-23-1	1	0.05	0.40	**226**	ug/L	E
o-Xylene	95-47-6	1	0.04	0.20	**55.6**	ug/L	
Xylenes, total	1330-20-7	1	0.09	0.60	**281**	ug/L	E
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*174*	*%*	*
Surrogate: Toluene-d8				*80-120 %*	*102*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*105*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*103*	*%*	

Method: NWTPHg
Instrument: NT2
Analyzed: 26-Apr-2016 18:36

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BED0103
Prepared: 26-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	9.06	100	**12400**	ug/L	E
Surrogate: Toluene-d8				*80-120 %*	*102*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*105*	*%*	

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010-00	**Reported:**
Federal Way WA, 98001	Project Manager: Julia Schwartz	11-May-2016 12:17

MW-9-042016

16D0063-03RE1 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2
Analyzed: 27-Apr-2016 13:15

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BED0107
Prepared: 27-Apr-2016
Sample Size: 1 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.27	2.00	**11.3**	ug/L	
Toluene	108-88-3	1	0.40	2.00	**44.5**	ug/L	
Ethylbenzene	100-41-4	1	0.37	2.00	**416**	ug/L	
m,p-Xylene	179601-23-1	1	0.52	4.00	**728**	ug/L	
o-Xylene	95-47-6	1	0.35	2.00	**61.2**	ug/L	
Xylenes, total	1330-20-7	1	0.87	6.00	**789**	ug/L	
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*110*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*96.7*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*98.5*	*%*	

Method: NWTPHg
Instrument: NT2
Analyzed: 27-Apr-2016 13:15

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BED0107
Prepared: 27-Apr-2016
Sample Size: 1 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	90.6	1000	**13800**	ug/L	
Surrogate: Toluene-d8				*80-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*96.7*	*%*	

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010-00	**Reported:**
Federal Way WA, 98001	Project Manager: Julia Schwartz	11-May-2016 12:17

MW-8-042016

16D0063-04 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2
Analyzed: 26-Apr-2016 18:57

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BED0103
Prepared: 26-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.03	0.20	**9.22**	ug/L	
Toluene	108-88-3	1	0.04	0.20	**218**	ug/L	E
Ethylbenzene	100-41-4	1	0.04	0.20	**321**	ug/L	E
m,p-Xylene	179601-23-1	1	0.05	0.40	**440**	ug/L	E
o-Xylene	95-47-6	1	0.04	0.20	**302**	ug/L	E
Xylenes, total	1330-20-7	1	0.09	0.60	**742**	ug/L	E
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*251*	*%*	*
Surrogate: Toluene-d8				*80-120 %*	*98.7*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*106*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*103*	*%*	

Method: NWTPHg
Instrument: NT2
Analyzed: 26-Apr-2016 18:57

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BED0103
Prepared: 26-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	9.06	100	**20900**	ug/L	E
Surrogate: Toluene-d8				*80-120 %*	*98.7*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*106*	*%*	

MW-8-042016

16D0063-04RE1 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2
Analyzed: 27-Apr-2016 13:39

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BED0107
Prepared: 27-Apr-2016
Sample Size: 0.4 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.68	5.00	**10.8**	ug/L	
Toluene	108-88-3	1	1.00	5.00	**1240**	ug/L	
Ethylbenzene	100-41-4	1	0.93	5.00	**1780**	ug/L	
m,p-Xylene	179601-23-1	1	1.30	10.0	**4240**	ug/L	E
o-Xylene	95-47-6	1	0.88	5.00	**1910**	ug/L	
Xylenes, total	1330-20-7	1	2.18	15.0	**6150**	ug/L	E
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*107*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*102*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*97.4*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*100*	*%*	

Method: NWTPHg
Instrument: NT2
Analyzed: 27-Apr-2016 13:39

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BED0107
Prepared: 27-Apr-2016
Sample Size: 0.4 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	227	2500	**52100**	ug/L	
Surrogate: Toluene-d8				*80-120 %*	*102*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*97.4*	*%*	

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010-00	**Reported:**
Federal Way WA, 98001	Project Manager: Julia Schwartz	11-May-2016 12:17

MW-8-042016

16D0063-04RE2 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2
Analyzed: 28-Apr-2016 15:18

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BED0114
Prepared: 28-Apr-2016
Sample Size: 0.2 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	1.35	10.0	**9.59**	ug/L	J
Toluene	108-88-3	1	2.00	10.0	**1130**	ug/L	
Ethylbenzene	100-41-4	1	1.85	10.0	**1650**	ug/L	
m,p-Xylene	179601-23-1	1	2.60	20.0	**4580**	ug/L	
o-Xylene	95-47-6	1	1.75	10.0	**1790**	ug/L	
Xylenes, total	1330-20-7	1	4.36	30.0	**6370**	ug/L	
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*109*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*99.6*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*94.6*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*101*	*%*	

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010-00	**Reported:**
Federal Way WA, 98001	Project Manager: Julia Schwartz	11-May-2016 12:17

MW-4-042016

16D0063-05 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2
Analyzed: 26-Apr-2016 19:18

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BED0103
Prepared: 26-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.03	0.20	**51.4**	ug/L	
Toluene	108-88-3	1	0.04	0.20	**47.5**	ug/L	
Ethylbenzene	100-41-4	1	0.04	0.20	**281**	ug/L	E
m,p-Xylene	179601-23-1	1	0.05	0.40	**407**	ug/L	E
o-Xylene	95-47-6	1	0.04	0.20	**234**	ug/L	E
Xylenes, total	1330-20-7	1	0.09	0.60	**641**	ug/L	E
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*175*	*%*	*
Surrogate: Toluene-d8				*80-120 %*	*104*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*107*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*100*	*%*	

Method: NWTPHg
Instrument: NT2
Analyzed: 26-Apr-2016 19:18

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BED0103
Prepared: 26-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	9.06	100	**17100**	ug/L	E
Surrogate: Toluene-d8				*80-120 %*	*104*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*107*	*%*	

MW-4-042016

16D0063-05RE1 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2
Analyzed: 27-Apr-2016 14:03

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BED0107
Prepared: 27-Apr-2016
Sample Size: 0.4 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.68	5.00	**64.4**	ug/L	
Toluene	108-88-3	1	1.00	5.00	**57.3**	ug/L	
Ethylbenzene	100-41-4	1	0.93	5.00	**1080**	ug/L	
m,p-Xylene	179601-23-1	1	1.30	10.0	**3750**	ug/L	
o-Xylene	95-47-6	1	0.88	5.00	**865**	ug/L	
Xylenes, total	1330-20-7	1	2.18	15.0	**4610**	ug/L	
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*108*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*100*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*99.8*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*99.6*	*%*	

Method: NWTPHg
Instrument: NT2
Analyzed: 27-Apr-2016 14:03

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BED0107
Prepared: 27-Apr-2016
Sample Size: 0.4 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	227	2500	**38200**	ug/L	
Surrogate: Toluene-d8				*80-120 %*	*100*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*99.8*	*%*	

MW-7-042016

16D0063-06 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2
Analyzed: 27-Apr-2016 12:51

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BED0107
Prepared: 27-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.03	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.04	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.04	0.20	**0.04**	ug/L	J
m,p-Xylene	179601-23-1	1	0.05	0.40	**0.15**	ug/L	J
o-Xylene	95-47-6	1	0.04	0.20	**0.04**	ug/L	J
Xylenes, total	1330-20-7	1	0.09	0.60	**0.19**	ug/L	J
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*102*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*96.5*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*96.2*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*99.9*	*%*	

Method: NWTPHg
Instrument: NT2
Analyzed: 27-Apr-2016 12:51

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BED0107
Prepared: 27-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	9.06	100	ND	ug/L	U
Surrogate: Toluene-d8				*80-120 %*	*96.5*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*96.2*	*%*	

MW-15-042016

16D0063-07 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2
Analyzed: 27-Apr-2016 16:33

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BED0107
Prepared: 27-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.03	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.04	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.04	0.20	**0.06**	ug/L	J
m,p-Xylene	179601-23-1	1	0.05	0.40	**0.25**	ug/L	J
o-Xylene	95-47-6	1	0.04	0.20	**0.04**	ug/L	J
Xylenes, total	1330-20-7	1	0.09	0.60	**0.29**	ug/L	J
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*105*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*99.5*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*96.0*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*101*	*%*	

Method: NWTPHg
Instrument: NT2
Analyzed: 27-Apr-2016 16:33

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BED0107
Prepared: 27-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	9.06	100	ND	ug/L	U
Surrogate: Toluene-d8				*80-120 %*	*99.5*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*96.0*	*%*	

MW-14-042016

16D0063-08 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2
Analyzed: 27-Apr-2016 16:54

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BED0107
Prepared: 27-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.03	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.04	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.04	0.20	**0.05**	ug/L	J
m,p-Xylene	179601-23-1	1	0.05	0.40	**0.24**	ug/L	J
o-Xylene	95-47-6	1	0.04	0.20	**0.09**	ug/L	J
Xylenes, total	1330-20-7	1	0.09	0.60	**0.33**	ug/L	J
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*105*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*100*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*95.5*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*99.3*	*%*	

Method: NWTPHg
Instrument: NT2
Analyzed: 27-Apr-2016 16:54

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BED0107
Prepared: 27-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	9.06	100	ND	ug/L	U
Surrogate: Toluene-d8				*80-120 %*	*100*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*95.5*	*%*	

MW-11-042016

16D0063-09 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2
Analyzed: 27-Apr-2016 17:15

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BED0107
Prepared: 27-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.03	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.04	0.20	**0.06**	ug/L	J
Ethylbenzene	100-41-4	1	0.04	0.20	**0.05**	ug/L	J
m,p-Xylene	179601-23-1	1	0.05	0.40	**0.18**	ug/L	J
o-Xylene	95-47-6	1	0.04	0.20	**0.04**	ug/L	J
Xylenes, total	1330-20-7	1	0.09	0.60	**0.22**	ug/L	J
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*106*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*98.6*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*92.3*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*102*	*%*	

Method: NWTPHg
Instrument: NT2
Analyzed: 27-Apr-2016 17:15

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BED0107
Prepared: 27-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	9.06	100	ND	ug/L	U
Surrogate: Toluene-d8				*80-120 %*	*98.6*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*92.3*	*%*	

Kennedy Jenks Consultants
32001 - 32nd Avenue South, Suite 100
Federal Way WA, 98001

Project: Circle K
Project Number: 1696010-00
Project Manager: Julia Schwartz

Reported:
11-May-2016 12:17

MW-13-042016

16D0063-10 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2
Analyzed: 28-Apr-2016 15:42

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BED0114
Prepared: 28-Apr-2016
Sample Size: 0.2 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	1.35	10.0	**1740**	ug/L	
Toluene	108-88-3	1	2.00	10.0	**3300**	ug/L	
Ethylbenzene	100-41-4	1	1.85	10.0	**1080**	ug/L	
m,p-Xylene	179601-23-1	1	2.60	20.0	**4730**	ug/L	
o-Xylene	95-47-6	1	1.75	10.0	**1910**	ug/L	
Xylenes, total	1330-20-7	1	4.36	30.0	**6630**	ug/L	
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*105*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*100*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*94.9*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*100*	*%*	

Method: NWTPHg
Instrument: NT2
Analyzed: 28-Apr-2016 15:42

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BED0114
Prepared: 28-Apr-2016
Sample Size: 0.2 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	453	5000	**57700**	ug/L	
HC ID: GAS							
Surrogate: Toluene-d8				*80-120 %*	*100*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*94.9*	*%*	

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010-00	**Reported:**
Federal Way WA, 98001	Project Manager: Julia Schwartz	11-May-2016 12:17

DUP1-042016

16D0063-11 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2
Analyzed: 28-Apr-2016 09:12

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BED0114
Prepared: 28-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.03	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.04	0.20	**0.06**	ug/L	J
Ethylbenzene	100-41-4	1	0.04	0.20	**0.04**	ug/L	J
m,p-Xylene	179601-23-1	1	0.05	0.40	**0.19**	ug/L	J
o-Xylene	95-47-6	1	0.04	0.20	**0.05**	ug/L	J
Xylenes, total	1330-20-7	1	0.09	0.60	**0.24**	ug/L	J
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*102*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*100*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*98.9*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*101*	*%*	

Method: NWTPHg
Instrument: NT2
Analyzed: 28-Apr-2016 09:12

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BED0114
Prepared: 28-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	9.06	100	ND	ug/L	U
Surrogate: Toluene-d8				*80-120 %*	*100*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*98.9*	*%*	

Trip Blanks

16D0063-12 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2
Analyzed: 27-Apr-2016 12:29

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BED0107
Prepared: 27-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.03	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.04	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.04	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.05	0.40	**0.13**	ug/L	J
o-Xylene	95-47-6	1	0.04	0.20	ND	ug/L	U
Xylenes, total	1330-20-7	1	0.09	0.60	**0.16**	ug/L	J
Surrogate: 1,2-Dichloroethane-d4				*80-129 %*	*101*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*98.7*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*95.0*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*97.9*	*%*	

Method: NWTPHg
Instrument: NT2
Analyzed: 27-Apr-2016 12:29

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BED0107
Prepared: 27-Apr-2016
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	9.06	100	ND	ug/L	U
Surrogate: Toluene-d8				*80-120 %*	*98.7*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*95.0*	*%*	

Volatile Organic Compounds - Quality Control

Batch BED0103 - No Prep - Volatiles

Instrument: NT2

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Water Blank (BED0103-BLK1)					Prepared: 26-Apr-2016 Analyzed: 26-Apr-2016 11:58						
Gasoline Range Organics (Tol-Nap)	ND		100	ug/L							U
Benzene	ND	0.03	0.20	ug/L							U
Toluene	0.05	0.04	0.20	ug/L							J
Ethylbenzene	ND	0.04	0.20	ug/L							U
m,p-Xylene	ND	0.05	0.40	ug/L							U
o-Xylene	ND	0.04	0.20	ug/L							U
Xylenes, total	ND	0.09	0.60	ug/L							U
Surrogate: Toluene-d8	*4.89*			ug/L	*5.00*		*97.8*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*4.75*			ug/L	*5.00*		*94.9*	*80-120*			
Surrogate: 1,2-Dichloroethane-d4	*4.94*			ug/L	*5.00*		*98.8*	*80-129*			
Surrogate: Toluene-d8	*4.89*			ug/L	*5.00*		*97.8*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*4.75*			ug/L	*5.00*		*94.9*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	*4.95*			ug/L	*5.00*		*99.0*	*80-120*			

Volatile Organic Compounds - Quality Control

Batch BED0103 - No Prep - Volatiles

Instrument: NT2

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
8260 WATER (BED0103-BS1)					Prepared: 26-Apr-2016		Analyzed: 26-Apr-2016 10:32				
Benzene	10.1			ug/L	10.0		101	80-120			
Toluene	9.94			ug/L	10.0		99.4	80-120			
Ethylbenzene	10.2			ug/L	10.0		102	78-122			
m,p-Xylene	21.4			ug/L	20.0		107	78-126			
o-Xylene	10.4			ug/L	10.0		104	76-127			
Xylenes, total	31.8			ug/L	30.0		106	76-127			
Surrogate: 1,2-Dichloroethane-d4	*4.95*			ug/L	*5.00*		*99.1*	*80-129*			
Surrogate: Toluene-d8	*5.01*			ug/L	*5.00*		*100*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*5.06*			ug/L	*5.00*		*101*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	*5.01*			ug/L	*5.00*		*100*	*80-120*			

Volatile Organic Compounds - Quality Control

Batch BED0103 - No Prep - Volatiles

Instrument: NT2

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
GAS WATER (BED0103-BS2)					Prepared: 26-Apr-2016		Analyzed: 26-Apr-2016 11:15				
Gasoline Range Organics (Tol-Nap)	914			ug/L	1000		91.4	80-120			
Benzene	6.76			ug/L	7.33		92.3	80-120			
Toluene	46.9			ug/L	53.1		88.4	80-120			
Ethylbenzene	12.9			ug/L	13.6		94.7	78-122			
m,p-Xylene	42.3			ug/L	43.4		97.5	78-126			
o-Xylene	16.8			ug/L	16.9		99.7	76-127			
Surrogate: Toluene-d8	*4.86*			ug/L	*5.00*		*97.3*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*4.99*			ug/L	*5.00*		*99.7*	*80-120*			
Surrogate: 1,2-Dichloroethane-d4	*5.37*			ug/L	*5.00*		*107*	*80-129*			
Surrogate: Toluene-d8	*4.86*			ug/L	*5.00*		*97.3*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*4.99*			ug/L	*5.00*		*99.7*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	*5.01*			ug/L	*5.00*		*100*	*80-120*			

Volatile Organic Compounds - Quality Control

Batch BED0103 - No Prep - Volatiles

Instrument: NT2

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
8260 WATER (BED0103-BSD1)					Prepared: 26-Apr-2016 Analyzed: 26-Apr-2016 10:53						
Benzene	10.2			ug/L	10.0		102	80-120	1.16	30	
Toluene	9.97			ug/L	10.0		99.7	80-120	0.33	30	
Ethylbenzene	9.91			ug/L	10.0		99.1	78-122	2.87	30	
m,p-Xylene	20.8			ug/L	20.0		104	78-126	3.09	30	
o-Xylene	10.2			ug/L	10.0		102	76-127	1.50	30	
Xylenes, total	31.0			ug/L	30.0		103	76-127	2.57	30	
Surrogate: 1,2-Dichloroethane-d4	*5.05*			ug/L	*5.00*		*101*	*80-129*			
Surrogate: Toluene-d8	*5.08*			ug/L	*5.00*		*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*5.04*			ug/L	*5.00*		*101*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	*5.11*			ug/L	*5.00*		*102*	*80-120*			

Volatile Organic Compounds - Quality Control

Batch BED0103 - No Prep - Volatiles

Instrument: NT2

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
GAS WATER (BED0103-BSD2)					Prepared: 26-Apr-2016 Analyzed: 26-Apr-2016 11:36						
Gasoline Range Organics (Tol-Nap)	955			ug/L	1000		95.5	80-120	4.35	30	
Benzene	7.59			ug/L	7.33		104	80-120	11.50	30	
Toluene	52.1			ug/L	53.1		98.1	80-120	10.50	30	
Ethylbenzene	13.9			ug/L	13.6		102	78-122	7.70	30	
m,p-Xylene	45.2			ug/L	43.4		104	78-126	6.56	30	
o-Xylene	18.0			ug/L	16.9		107	76-127	6.68	30	
Surrogate: Toluene-d8	*5.03*			ug/L	*5.00*		*101*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*4.95*			ug/L	*5.00*		*98.9*	*80-120*			
Surrogate: 1,2-Dichloroethane-d4	*5.22*			ug/L	*5.00*		*104*	*80-129*			
Surrogate: Toluene-d8	*5.03*			ug/L	*5.00*		*101*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*4.95*			ug/L	*5.00*		*98.9*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	*5.08*			ug/L	*5.00*		*102*	*80-120*			

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010-00	**Reported:**
Federal Way WA, 98001	Project Manager: Julia Schwartz	11-May-2016 12:17

Batch BED0107 - No Prep - Volatiles

Instrument: NT2

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BED0107-BLK1)					Prepared: 27-Apr-2016 Analyzed: 27-Apr-2016 12:08						
Gasoline Range Organics (Tol-Nap)	ND		100	ug/L							U
Benzene	ND	0.03	0.20	ug/L							U
Toluene	ND	0.04	0.20	ug/L							U
Ethylbenzene	0.04	0.04	0.20	ug/L							J
m,p-Xylene	0.15	0.05	0.40	ug/L							J
o-Xylene	ND	0.04	0.20	ug/L							U
Xylenes, total	0.18	0.09	0.60	ug/L							J
Surrogate: Toluene-d8	*4.90*			ug/L	*5.00*		*98.0*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*4.84*			ug/L	*5.00*		*96.8*	*80-120*			
Surrogate: 1,2-Dichloroethane-d4	*4.98*			ug/L	*5.00*		*99.5*	*81-118*			
Surrogate: Toluene-d8	*4.90*			ug/L	*5.00*		*98.0*	*89-112*			
Surrogate: 4-Bromofluorobenzene	*4.84*			ug/L	*5.00*		*96.8*	*85-114*			
Surrogate: 1,2-Dichlorobenzene-d4	*5.03*			ug/L	*5.00*		*101*	*80-120*			

Volatile Organic Compounds - Quality Control

Batch BED0107 - No Prep - Volatiles

Instrument: NT2

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BED0107-BS1)					Prepared: 27-Apr-2016 Analyzed: 27-Apr-2016 10:43						
Gasoline Range Organics (Tol-Nap)	1030			ug/L	1000		103	80-120			
Benzene	8.26			ug/L	7.33		113	80-120			
Toluene	56.2			ug/L	53.1		106	80-120			
Ethylbenzene	15.1			ug/L	13.6		111	79-121			
m,p-Xylene	48.6			ug/L	43.4		112	80-120			
o-Xylene	19.5			ug/L	16.9		115	80-120			
Surrogate: Toluene-d8	*5.05*			ug/L	*5.00*		*101*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*4.90*			ug/L	*5.00*		*98.1*	*80-120*			
Surrogate: 1,2-Dichloroethane-d4	*5.26*			ug/L	*5.00*		*105*	*81-118*			
Surrogate: Toluene-d8	*5.05*			ug/L	*5.00*		*101*	*89-112*			
Surrogate: 4-Bromofluorobenzene	*4.90*			ug/L	*5.00*		*98.1*	*85-114*			
Surrogate: 1,2-Dichlorobenzene-d4	*4.91*			ug/L	*5.00*		*98.2*	*80-120*			

Volatile Organic Compounds - Quality Control

Batch BED0107 - No Prep - Volatiles

Instrument: NT2

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BED0107-BSD1)					Prepared: 27-Apr-2016	Analyzed: 27-Apr-2016 11:04					
Gasoline Range Organics (Tol-Nap)	990			ug/L	1000		99.0	80-120	4.35	30	
Benzene	8.21			ug/L	7.33		112	80-120	0.66	20	
Toluene	55.9			ug/L	53.1		105	80-120	0.58	20	
Ethylbenzene	14.9			ug/L	13.6		109	79-121	1.47	20	
m,p-Xylene	48.4			ug/L	43.4		112	80-120	0.40	20	
o-Xylene	19.4			ug/L	16.9		115	80-120	0.40	20	
Surrogate: Toluene-d8	*5.12*			ug/L	*5.00*		*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*4.87*			ug/L	*5.00*		*97.4*	*80-120*			
Surrogate: 1,2-Dichloroethane-d4	*5.21*			ug/L	*5.00*		*104*	*81-118*			
Surrogate: Toluene-d8	*5.12*			ug/L	*5.00*		*102*	*89-112*			
Surrogate: 4-Bromofluorobenzene	*4.87*			ug/L	*5.00*		*97.4*	*85-114*			
Surrogate: 1,2-Dichlorobenzene-d4	*5.02*			ug/L	*5.00*		*100*	*80-120*			

Batch BED0114 - No Prep - Volatiles

Instrument: NT2

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BED0114-BLK1)					Prepared: 28-Apr-2016 Analyzed: 28-Apr-2016 08:29						
Gasoline Range Organics (Tol-Nap)	ND		100	ug/L							U
Benzene	ND	0.03	0.20	ug/L							U
Toluene	0.10	0.04	0.20	ug/L							J
Ethylbenzene	0.04	0.04	0.20	ug/L							J
m,p-Xylene	0.18	0.05	0.40	ug/L							J
o-Xylene	0.05	0.04	0.20	ug/L							J
Xylenes, total	0.24	0.09	0.60	ug/L							J
Surrogate: Toluene-d8	*5.00*			ug/L	*5.00*		*99.9*	*50-150*			
Surrogate: 4-Bromofluorobenzene	*4.79*			ug/L	*5.00*		*95.8*	*50-150*			
Surrogate: 1,2-Dichloroethane-d4	*5.05*			ug/L	*5.00*		*101*	*81-118*			
Surrogate: Toluene-d8	*5.00*			ug/L	*5.00*		*99.9*	*89-112*			
Surrogate: 4-Bromofluorobenzene	*4.79*			ug/L	*5.00*		*95.8*	*85-114*			
Surrogate: 1,2-Dichlorobenzene-d4	*5.05*			ug/L	*5.00*		*101*	*80-120*			

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010-00	**Reported:**
Federal Way WA, 98001	Project Manager: Julia Schwartz	11-May-2016 12:17

Volatile Organic Compounds - Quality Control

Batch BED0114 - No Prep - Volatiles

Instrument: NT2

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BED0114-BS1)					Prepared: 28-Apr-2016	Analyzed: 28-Apr-2016 07:46					
Gasoline Range Organics (Tol-Nap)	960			ug/L	1000		96.0	80-120			
Benzene	8.02			ug/L	7.33		110	79-120			
Toluene	55.3			ug/L	53.1		104	80-121			
Ethylbenzene	14.6			ug/L	13.6		107	79-121			
m,p-Xylene	47.6			ug/L	43.4		110	80-120			
o-Xylene	18.9			ug/L	16.9		112	80-120			
Surrogate: Toluene-d8	*5.09*			ug/L	*5.00*		*102*	*50-150*			
Surrogate: 4-Bromofluorobenzene	*4.94*			ug/L	*5.00*		*98.9*	*50-150*			
Surrogate: 1,2-Dichloroethane-d4	*5.42*			ug/L	*5.00*		*108*	*81-118*			
Surrogate: Toluene-d8	*5.09*			ug/L	*5.00*		*102*	*89-112*			
Surrogate: 4-Bromofluorobenzene	*4.94*			ug/L	*5.00*		*98.9*	*85-114*			
Surrogate: 1,2-Dichlorobenzene-d4	*4.97*			ug/L	*5.00*		*99.5*	*80-120*			

Volatile Organic Compounds - Quality Control

Batch BED0114 - No Prep - Volatiles

Instrument: NT2

Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BED0114-BSD1)					Prepared: 28-Apr-2016 Analyzed: 28-Apr-2016 08:07						
Gasoline Range Organics (Tol-Nap)	981			ug/L	1000		98.1	80-120	2.25	30	
Benzene	8.16			ug/L	7.33		111	79-120	1.64	20	
Toluene	56.3			ug/L	53.1		106	80-121	1.69	20	
Ethylbenzene	14.8			ug/L	13.6		109	79-121	1.60	20	
m,p-Xylene	48.2			ug/L	43.4		111	80-120	1.17	20	
o-Xylene	19.3			ug/L	16.9		114	80-120	1.90	20	
Surrogate: Toluene-d8	*5.08*			ug/L	*5.00*		*102*	*50-150*			
Surrogate: 4-Bromofluorobenzene	*4.89*			ug/L	*5.00*		*97.7*	*50-150*			
Surrogate: 1,2-Dichloroethane-d4	*5.49*			ug/L	*5.00*		*110*	*81-118*			
Surrogate: Toluene-d8	*5.08*			ug/L	*5.00*		*102*	*89-112*			
Surrogate: 4-Bromofluorobenzene	*4.89*			ug/L	*5.00*		*97.7*	*85-114*			
Surrogate: 1,2-Dichlorobenzene-d4	*5.10*			ug/L	*5.00*		*102*	*80-120*			

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010-00	**Reported:**
Federal Way WA, 98001	Project Manager: Julia Schwartz	11-May-2016 12:17

Certified Analyses included in this Report

Analyte	Certifications
EPA 8260C in Water	
Chloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Vinyl Chloride	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromomethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Chloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Trichlorofluoromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Acrolein	DoD-ELAP,NELAP,CALAP,WADOE
1,1,2-Trichloro-1,2,2-Trifluoroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Acetone	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1-Dichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromoethane	DoD-ELAP,NELAP,CALAP,WADOE
Iodomethane	DoD-ELAP,NELAP,CALAP,WADOE
Methylene Chloride	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Acrylonitrile	DoD-ELAP,NELAP,CALAP,WADOE
Carbon Disulfide	DoD-ELAP,NELAP,CALAP,WADOE
trans-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Vinyl Acetate	DoD-ELAP,NELAP,CALAP,WADOE
1,1-Dichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
2-Butanone	DoD-ELAP,NELAP,CALAP,WADOE
2,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
cis-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Chloroform	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromochloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1,1-Trichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1-Dichloropropene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Carbon tetrachloride	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Benzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Trichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromodichloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Dibromomethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
2-Chloroethyl vinyl ether	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
4-Methyl-2-Pentanone	DoD-ELAP,NELAP,CALAP,WADOE
cis-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Toluene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE

trans-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
2-Hexanone	DoD-ELAP,NELAP,CALAP,WADOE
1,1,2-Trichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,3-Dichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Tetrachloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Dibromochloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dibromoethane	DoD-ELAP,NELAP,CALAP,WADOE
Chlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Ethylbenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1,1,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
m,p-Xylene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
o-Xylene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Styrene	DoD-ELAP,NELAP,CALAP,WADOE
Bromoform	DoD-ELAP,NELAP,CALAP,WADOE
1,1,2,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2,3-Trichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
trans-1,4-Dichloro 2-Butene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
n-Propylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
Bromobenzene	DoD-ELAP,NELAP,CALAP,WADOE
Isopropyl Benzene	DoD-ELAP,NELAP,CALAP,WADOE
2-Chlorotoluene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
4-Chlorotoluene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
t-Butylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
1,3,5-Trimethylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
1,2,4-Trimethylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
s-Butylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
4-Isopropyl Toluene	DoD-ELAP,NELAP,CALAP,WADOE
1,3-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,4-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
n-Butylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
1,2-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dibromo-3-chloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2,4-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Hexachloro-1,3-Butadiene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Naphthalene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2,3-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Dichlorodifluoromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Methyl tert-butyl Ether	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
n-Hexane	WADOE

2-Pentanone	WADOE

NWTPHg in Water

Gasoline Range Organics (Tol-Nap)	WADOE,DoD-ELAP
Gasoline Range Organics (2MP-TMB)	WADOE,DoD-ELAP
Gasoline Range Organics (Tol-C12)	WADOE,DoD-ELAP
Gasoline Range Organics (C6-C10)	WADOE,ADEC,DoD-ELAP
Gasoline Range Organics (C5-C12)	WADOE,DoD-ELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	UST-033	05/06/2016
CALAP	California Department of Public Health CAELAP	2748	02/28/2016
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	03/30/2017
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006	05/11/2017
WADOE	WA Dept of Ecology	C558	06/30/2016
WA-DW	Ecology - Drinking Water	C558	06/30/2016

Notes and Definitions

U	This analyte is not detected above the applicable reporting or detection limit.
J	The compound was detected below the reporting limit but above the detection limit.
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL)
*	Flagged value is not within established control limits.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

14 October 2016

Julia Schwarz
Kennedy Jenks Consultants
32001 - 32nd Avenue South, Suite 100
Federal Way, WA 98001

RE: Circle K

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)	Associated SDG ID(s)
16I0389	N/A

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the reqirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, Inc.

Matthew D Bates

Matthew Bates For Mark Harris, Project Manager

Accredited in accordance with nelac
Cert# 100006

PJLA Testing
Accreditation # 66169

Chain of Custody Record & Laboratory Analysis Request

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)
www.arilabs.com

ARI Assigned Number: 16I0389
Turn-around Requested: Standard
Page: 1 of 1
ARI Client Company: Kennedy/Jenks Consultants
Phone: 253-835-6424
Date: 9/23/16
Ice Present? Yes
Client Contact: Julia Schwarz or Ty Schreiner
No. of Coolers: 1
Cooler Temps: 4.0
Client Project Name: Circle K
Client Project #: 1696010.00
Samplers: Julia Schwarz

Sample ID	Date	Time	Matrix	No. Containers	NWTPH-Gx	BTEX							Notes/Comments
MW-19-10	9/23/16	0917	Soil	6	X	X							
MW-19-19		0947											
MW-20-10		1350											
MW-20-20		1410											
MW-21-10		1630											
MW-21-19.5		1700											
TB													

Comments/Special Instructions

Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
Printed Name: Julia Schwarz	Printed Name: Kelly Botten	Printed Name:	Printed Name:
Company: Kennedy/Jenks	Company: ARI	Company:	Company:
Date & Time: 9/26/16 1635	Date & Time: 9/26/16 16:35	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Kennedy Jenks

COC No(s): ____________ NA

Assigned ARI Job No: 16I0389

Project Name: Circle K

Delivered by: Fed-Ex UPS Courier [✓ Hand Delivered] Other: ______

Tracking No: ____________ NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES [✓ NO]

Were custody papers included with the cooler? .... [✓ YES] NO

Were custody papers properly filled out (ink, signed, etc.) .... [✓ YES] NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) 4.0 ____ ____ ____ ____

Time: 6:35

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: D005276

Cooler Accepted by: Kelly Botten Date: 9/26/16 Time: 6:35

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? .... YES [✓ NO]

What kind of packing material was used? ... Bubble Wrap [✓ Wet Ice] Gel Packs Baggies Foam Block Paper Other: ______

Was sufficient ice used (if appropriate)? .... NA [✓ YES] NO

Were all bottles sealed in individual plastic bags? .... [✓ YES] ~~NO~~ JM

Did all bottles arrive in good condition (unbroken)? .... [✓ YES] NO

Were all bottle labels complete and legible? .... [✓ YES] NO

Did the number of containers listed on COC match with the number of containers received? .... [✓ YES] NO

Did all bottle labels and tags agree with custody papers? .... [✓ YES] NO

Were all bottles used correct for the requested analyses? .... [✓ YES] NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)... [✓ NA] YES NO

Were all VOC vials free of air bubbles? .... NA [✓ YES] NO

Was sufficient amount of sample sent in each bottle? .... [✓ YES] NO

Date VOC Trip Blank was made at ARI.......... NA 9-19-16

Was Sample Split by ARI : [✓ NA] YES Date/Time: ______ Equipment: ______ Split by: ______

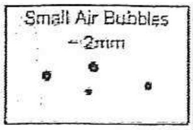
Samples Logged by: JM Date: 9-26-16 Time: 1028

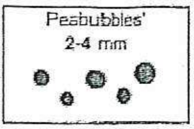
*** Notify Project Manager of discrepancies or concerns ***

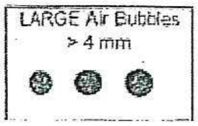
Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:







Small → "sm" (< 2 mm)

Peabubbles → "pb" (2 to < 4 mm)

Large → "lg" (4 to < 6 mm)

Headspace → "hs" (> 6 mm)

Analytical Report

Kennedy Jenks Consultants
32001 - 32nd Avenue South, Suite 100
Federal Way, WA 98001

Project: Circle K
Project Number: 1696010.00
Project Manager: Julia Schwarz

Reported:
14-Oct-2016 16:21

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-19-10	16I0389-01	Solid	23-Sep-2016 09:17	26-Sep-2016 06:35
MW-19-19	16I0389-02	Solid	23-Sep-2016 09:47	26-Sep-2016 06:35
MW-20-10	16I0389-03	Solid	23-Sep-2016 13:50	26-Sep-2016 06:35
MW-20-20	16I0389-04	Solid	23-Sep-2016 14:10	26-Sep-2016 06:35
MW-21-10	16I0389-05	Solid	23-Sep-2016 16:30	26-Sep-2016 06:35
MW-21-19.5	16I0389-06	Solid	23-Sep-2016 17:00	26-Sep-2016 06:35
Trip Blank	16I0389-07	Water	23-Sep-2016 00:00	26-Sep-2016 06:35

Case Narrative

CASE NARRATIVE

Client: Kennedy Jenks Consultants
Project: Circle K
Workorder: 16I0389

Sample receipt

7 samples were received 26-Sep-2016 06:35 under ARI workorder 16I0389. For details regarding sample receipt, please refer to the Cooler Receipt Form.

Gasoline by NWTPH-G (GC/MS)

These samples were prepared and analyzed within the recommended holding time.

All initial and continuing calibrations were within method requirements.

The percent recoveries for all surrogates were within acceptable QC limits.

No target compounds were detected in the method blank above the LOQs.

The percent recoveries and RPD were within acceptable QC limits for hte LCS/LCSD.

Volatiles - EPA Method SW8260C

These samples were prepared and analyzed within the recommended holding time.

All initial and continuing calibrations were within method requirements.

The areas for all internal standard were withi acceptable QC limits.

The percent recoveries for all surrogates were within acceptable QC limits.

No target compounds were detected in the method blank above the LOQs.

The percent recoveries and RPD were within acceptable QC limits for hte LCS/LCSD.

Analytical Report

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010.00	**Reported:**
Federal Way, WA 98001	Project Manager: Julia Schwarz	14-Oct-2016 16:21

MW-19-10

16I0389-01 (Solid)

Volatile Organic Compounds

Method: EPA 8260C (Medium Level)

Instrument: NT15 Analyzed: 04-Oct-2016 17:37

Sample Preparation: Preparation Method: EPA 5035 (Methanol Extraction)

Preparation Batch: BEJ0307 Sample Size: 5.212 g (wet) Dry Weight:4.46 g

Prepared: 04-Oct-2016 Final Volume: 5 mL % Solids: 85.49

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	2500	530	3230	**30800**	ug/kg	
Toluene	108-88-3	2500	556	3230	**230000**	ug/kg	
Ethylbenzene	100-41-4	2500	878	3230	**81000**	ug/kg	
m,p-Xylene	179601-23-1	2500	1800	3230	**353000**	ug/kg	
o-Xylene	95-47-6	2500	736	3230	**140000**	ug/kg	
Surrogate: 1,2-Dichloroethane-d4				*80-124 %*	*112*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*108*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*103*	*%*	

Analytical Report

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010.00	**Reported:**
Federal Way, WA 98001	Project Manager: Julia Schwarz	14-Oct-2016 16:21

MW-19-10

16I0389-01 (Solid)

Volatile Organic Compounds

Method: NWTPHg

Instrument: NT2

Analyzed: 04-Oct-2016 13:47

Sample Preparation:
Preparation Method: EPA 5035 (Methanol Extraction)
Preparation Batch: BEJ0088 Sample Size: 5.351 g (wet) Dry Weight:4.57 g
Prepared: 04-Oct-2016 Final Volume: 5 mL % Solids: 85.39

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		5000	633000	**12600000**	ug/kg	
HC ID: GAS						
Surrogate: Toluene-d8			*80-120 %*	*103*	*%*	
Surrogate: 4-Bromofluorobenzene			*78-123 %*	*100*	*%*	

Kennedy Jenks Consultants
32001 - 32nd Avenue South, Suite 100
Federal Way, WA 98001

Project: Circle K
Project Number: 1696010.00
Project Manager: Julia Schwarz

Reported:
14-Oct-2016 16:21

MW-19-19

16I0389-02 (Solid)

Volatile Organic Compounds

Method: EPA 8260C

Instrument: NT15

Analyzed: 04-Oct-2016 18:02

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BEJ0080
Prepared: 04-Oct-2016
Sample Size: 6.48 g (wet)
Final Volume: 5 g
Dry Weight:5.71 g
% Solids: 88.16

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.88	**7.21**	ug/kg	
Toluene	108-88-3	1	0.88	**17.1**	ug/kg	
Ethylbenzene	100-41-4	1	0.88	**2.82**	ug/kg	
m,p-Xylene	179601-23-1	1	0.88	**11.4**	ug/kg	
o-Xylene	95-47-6	1	0.88	**5.26**	ug/kg	
Surrogate: 1,2-Dichloroethane-d4			*80-149 %*	*119*	*%*	
Surrogate: Toluene-d8			*77-120 %*	*99.7*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*105*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*105*	*%*	

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010.00	**Reported:**
Federal Way, WA 98001	Project Manager: Julia Schwarz	14-Oct-2016 16:21

MW-19-19

16I0389-02 (Solid)

Volatile Organic Compounds

Method: NWTPHg

Instrument: NT2

Analyzed: 04-Oct-2016 14:07

Sample Preparation:
Preparation Method: EPA 5035 (Methanol Extraction)
Preparation Batch: BEJ0088
Sample Size: 6.303 g (wet)
Dry Weight:5.52 g
Prepared: 04-Oct-2016
Final Volume: 5 mL
% Solids: 87.51

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		50	5250	ND	ug/kg	U
Surrogate: Toluene-d8			*80-120 %*	*103*	*%*	
Surrogate: 4-Bromofluorobenzene			*78-123 %*	*106*	*%*	

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010.00	**Reported:**
Federal Way, WA 98001	Project Manager: Julia Schwarz	14-Oct-2016 16:21

MW-20-10

16I0389-03 (Solid)

Volatile Organic Compounds

Method: EPA 8260C (Medium Level)

Instrument: NT2

Analyzed: 04-Oct-2016 14:28

Sample Preparation:
Preparation Method: EPA 5035 (Methanol Extraction)
Preparation Batch: BEJ0329 Sample Size: 5.592 g (wet) Dry Weight:4.89 g
Prepared: 04-Oct-2016 Final Volume: 5 mL % Solids: 87.37

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	500	95.8	584	**117**	ug/kg	J
Toluene	108-88-3	500	100	584	ND	ug/kg	U
Ethylbenzene	100-41-4	500	159	584	**2380**	ug/kg	
m,p-Xylene	179601-23-1	500	326	584	**8800**	ug/kg	
o-Xylene	95-47-6	500	133	584	**2670**	ug/kg	
Surrogate: Dibromofluoromethane				*30-160 %*	*92.5*	*%*	
Surrogate: 1,2-Dichloroethane-d4				*80-124 %*	*108*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*104*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*101*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*100*	*%*	

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010.00	**Reported:**
Federal Way, WA 98001	Project Manager: Julia Schwarz	14-Oct-2016 16:21

MW-20-10

16I0389-03 (Solid)

Volatile Organic Compounds

Method: NWTPHg

Instrument: NT2

Analyzed: 04-Oct-2016 14:28

Sample Preparation: Preparation Method: EPA 5035 (Methanol Extraction)

Preparation Batch: BEJ0088 | Sample Size: 5.592 g (wet) | Dry Weight:4.89 g

Prepared: 04-Oct-2016 | Final Volume: 5 mL | % Solids: 87.37

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		500	58400	**630000**	ug/kg	
HC ID: GAS						
Surrogate: Toluene-d8			*80-120 %*	*104*	*%*	
Surrogate: 4-Bromofluorobenzene			*78-123 %*	*101*	*%*	

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010.00	**Reported:**
Federal Way, WA 98001	Project Manager: Julia Schwarz	14-Oct-2016 16:21

MW-20-20

16I0389-04 (Solid)

Volatile Organic Compounds

Method: EPA 8260C

Instrument: NT15

Analyzed: 04-Oct-2016 18:50

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BEJ0080
Prepared: 04-Oct-2016
Sample Size: 4.43 g (wet)
Final Volume: 5 g
Dry Weight:3.89 g
% Solids: 87.77

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	1.29	**31.1**	ug/kg	
Toluene	108-88-3	1	1.29	**45.1**	ug/kg	
Ethylbenzene	100-41-4	1	1.29	**21.1**	ug/kg	
m,p-Xylene	179601-23-1	1	1.29	**81.4**	ug/kg	
o-Xylene	95-47-6	1	1.29	**28.8**	ug/kg	
Surrogate: 1,2-Dichloroethane-d4			*80-149 %*	*122*	*%*	
Surrogate: Toluene-d8			*77-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*102*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*105*	*%*	

Kennedy Jenks Consultants
32001 - 32nd Avenue South, Suite 100
Federal Way, WA 98001

Project: Circle K
Project Number: 1696010.00
Project Manager: Julia Schwarz

Reported:
14-Oct-2016 16:21

MW-20-20

16I0389-04 (Solid)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2
Analyzed: 04-Oct-2016 14:48

Sample Preparation:
Preparation Method: EPA 5035 (Methanol Extraction)
Preparation Batch: BEJ0088
Sample Size: 5.341 g (wet)
Dry Weight:4.80 g
Prepared: 04-Oct-2016
Final Volume: 5 mL
% Solids: 89.78

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		50	5780	ND	ug/kg	U
Surrogate: Toluene-d8			*80-120 %*	*103*	*%*	
Surrogate: 4-Bromofluorobenzene			*78-123 %*	*106*	*%*	

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010.00	**Reported:**
Federal Way, WA 98001	Project Manager: Julia Schwarz	14-Oct-2016 16:21

MW-21-10

16I0389-05 (Solid)

Volatile Organic Compounds

Method: EPA 8260C (Medium Level)

Instrument: NT15

Analyzed: 04-Oct-2016 19:15

Sample Preparation:
Preparation Method: EPA 5035 (Methanol Extraction)
Preparation Batch: BEJ0307
Sample Size: 5.797 g (wet)
Dry Weight:5.15 g
Prepared: 04-Oct-2016
Final Volume: 5 mL
% Solids: 88.83

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	50	8.99	54.8	**1060**	ug/kg	
Toluene	108-88-3	50	9.43	54.8	**2770**	ug/kg	
Ethylbenzene	100-41-4	50	14.9	54.8	**1380**	ug/kg	
m,p-Xylene	179601-23-1	50	30.6	54.8	**6670**	ug/kg	
o-Xylene	95-47-6	50	12.5	54.8	**2850**	ug/kg	
Surrogate: 1,2-Dichloroethane-d4				*80-124 %*	*109*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*110*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*101*	*%*	

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Analytical Report

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010.00	**Reported:**
Federal Way, WA 98001	Project Manager: Julia Schwarz	14-Oct-2016 16:21

MW-21-10

16I0389-05 (Solid)

Volatile Organic Compounds

Method: NWTPHg

Instrument: NT2

Analyzed: 04-Oct-2016 15:09

Sample Preparation:

Preparation Method: EPA 5035 (Methanol Extraction)

Preparation Batch: BEJ0088 Sample Size: 4.576 g (wet) Dry Weight:4.06 g

Prepared: 04-Oct-2016 Final Volume: 5 mL % Solids: 88.78

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		500	67900	**198000**	ug/kg	
HC ID: GAS						
Surrogate: Toluene-d8			*80-120 %*	*102*	*%*	
Surrogate: 4-Bromofluorobenzene			*78-123 %*	*99.7*	*%*	

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MW-21-19.5

16I0389-06 (Solid)

Volatile Organic Compounds

Method: EPA 8260C

Instrument: NT15 — Analyzed: 04-Oct-2016 19:39

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BEJ0080 — Sample Size: 5.96 g (wet) — Dry Weight:5.17 g
Prepared: 04-Oct-2016 — Final Volume: 5 g — % Solids: 86.79

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.97	**209**	ug/kg	E
Toluene	108-88-3	1	0.97	**62.4**	ug/kg	
Ethylbenzene	100-41-4	1	0.97	**11.5**	ug/kg	
m,p-Xylene	179601-23-1	1	0.97	**44.3**	ug/kg	
o-Xylene	95-47-6	1	0.97	**21.1**	ug/kg	
Surrogate: 1,2-Dichloroethane-d4			*80-149 %*	*118*	*%*	
Surrogate: Toluene-d8			*77-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*106*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*104*	*%*	

Instrument: NT2 — Analyzed: 04-Oct-2016 15:30

Sample Preparation: Preparation Method: EPA 5035 (Methanol Extraction)
Preparation Batch: BEJ0329 — Sample Size: 6.372 g (wet) — Dry Weight:5.53 g
Prepared: 04-Oct-2016 — Final Volume: 5 mL — % Solids: 86.79

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	50	8.66	52.8	**710**	ug/kg	
Toluene	108-88-3	50	9.08	52.8	**263**	ug/kg	
Ethylbenzene	100-41-4	50	14.4	52.8	**62.5**	ug/kg	
m,p-Xylene	179601-23-1	50	29.5	52.8	**274**	ug/kg	
o-Xylene	95-47-6	50	12.0	52.8	**101**	ug/kg	
Surrogate: Dibromofluoromethane				*30-160 %*	*84.4*	*%*	
Surrogate: 1,2-Dichloroethane-d4				*80-124 %*	*103*	*%*	
Surrogate: Toluene-d8				*80-120 %*	*104*	*%*	
Surrogate: 4-Bromofluorobenzene				*80-120 %*	*106*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4				*80-120 %*	*99.1*	*%*	

MW-21-19.5

16I0389-06 (Solid)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2
Analyzed: 04-Oct-2016 15:30

Sample Preparation:
Preparation Method: EPA 5035 (Methanol Extraction)
Preparation Batch: BEJ0088
Sample Size: 6.372 g (wet)
Dry Weight:5.64 g
Prepared: 04-Oct-2016
Final Volume: 5 mL
% Solids: 88.47

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		50	5090	**6410**	ug/kg	
HC ID: GAS						
Surrogate: Toluene-d8			*80-120 %*	*104*	*%*	
Surrogate: 4-Bromofluorobenzene			*78-123 %*	*106*	*%*	

Analytical Report

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010.00	**Reported:**
Federal Way, WA 98001	Project Manager: Julia Schwarz	14-Oct-2016 16:21

Trip Blank

16I0389-07 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Instrument: NT2

Analyzed: 04-Oct-2016 13:26

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEJ0079 Sample Size: 10 mL
Prepared: 04-Oct-2016 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.20	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*105*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*104*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*98.7*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*101*	*%*	

Analytical Report

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010.00	**Reported:**
Federal Way, WA 98001	Project Manager: Julia Schwarz	14-Oct-2016 16:21

Trip Blank

16I0389-07 (Water)

Volatile Organic Compounds

Method: NWTPHg

Instrument: NT2

Analyzed: 04-Oct-2016 13:26

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEJ0079 Sample Size: 10 mL
Prepared: 04-Oct-2016 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	100	ND	ug/L	U
Surrogate: Toluene-d8			*80-120 %*	*104*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*98.7*	*%*	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Volatile Organic Compounds - Quality Control

Batch BEJ0079 - EPA 5030 (Purge and Trap)

Instrument: NT2

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BEJ0079-BLK1)				Prepared: 04-Oct-2016	Analyzed: 04-Oct-2016 11:02					
Gasoline Range Organics (Tol-Nap)	ND	100	ug/L							U
Surrogate: Toluene-d8	5.10		ug/L	*5.00*		*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.77		ug/L	*5.00*		*95.5*	*80-120*			
Blank (BEJ0079-BLK2)				Prepared: 04-Oct-2016	Analyzed: 04-Oct-2016 11:02					
Benzene	ND	0.20	ug/L							U
Toluene	ND	0.20	ug/L							U
Ethylbenzene	ND	0.20	ug/L							U
m,p-Xylene	ND	0.40	ug/L							U
o-Xylene	ND	0.20	ug/L							U
Surrogate: 1,2-Dichloroethane-d4	5.33		ug/L	*5.00*		*107*	*80-129*			
Surrogate: Toluene-d8	5.10		ug/L	*5.00*		*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.77		ug/L	*5.00*		*95.5*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	5.09		ug/L	*5.00*		*102*	*80-120*			
LCS (BEJ0079-BS1)				Prepared: 04-Oct-2016	Analyzed: 04-Oct-2016 09:40					
Gasoline Range Organics (Tol-Nap)	1070	100	ug/L	1000		107	80-120			
Surrogate: Toluene-d8	5.11		ug/L	*5.00*		*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.90		ug/L	*5.00*		*98.0*	*80-120*			
LCS (BEJ0079-BS2)				Prepared: 04-Oct-2016	Analyzed: 04-Oct-2016 10:21					
Benzene	9.97	0.20	ug/L	10.0		99.7	80-120			
Toluene	9.60	0.20	ug/L	10.0		96.0	80-120			
Ethylbenzene	9.71	0.20	ug/L	10.0		97.1	80-120			
m,p-Xylene	19.9	0.40	ug/L	20.0		99.5	80-121			
o-Xylene	10.0	0.20	ug/L	10.0		100	80-121			
Surrogate: 1,2-Dichloroethane-d4	5.20		ug/L	*5.00*		*104*	*80-129*			
Surrogate: Toluene-d8	5.13		ug/L	*5.00*		*103*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.99		ug/L	*5.00*		*99.9*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	5.04		ug/L	*5.00*		*101*	*80-120*			
LCS Dup (BEJ0079-BSD1)				Prepared: 04-Oct-2016	Analyzed: 04-Oct-2016 10:00					
Gasoline Range Organics (Tol-Nap)	1090	100	ug/L	1000		109	80-120	1.74	30	

Volatile Organic Compounds - Quality Control

Batch BEJ0079 - EPA 5030 (Purge and Trap)

Instrument: NT2

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BEJ0079-BSD1)				Prepared: 04-Oct-2016		Analyzed: 04-Oct-2016 10:00				
Surrogate: Toluene-d8	5.20		ug/L	*5.00*		*104*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.95		ug/L	*5.00*		*99.0*	*80-120*			
LCS Dup (BEJ0079-BSD2)				Prepared: 04-Oct-2016		Analyzed: 04-Oct-2016 10:41				
Benzene	10.2	0.20	ug/L	10.0		102	80-120	2.20	30	
Toluene	9.79	0.20	ug/L	10.0		97.9	80-120	2.00	30	
Ethylbenzene	9.75	0.20	ug/L	10.0		97.5	80-120	0.42	30	
m,p-Xylene	20.2	0.40	ug/L	20.0		101	80-121	1.25	30	
o-Xylene	10.1	0.20	ug/L	10.0		101	80-121	1.00	30	
Surrogate: 1,2-Dichloroethane-d4	5.09		ug/L	*5.00*		*102*	*80-129*			
Surrogate: Toluene-d8	5.10		ug/L	*5.00*		*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.96		ug/L	*5.00*		*99.3*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	4.93		ug/L	*5.00*		*98.6*	*80-120*			

Volatile Organic Compounds - Quality Control

Batch BEJ0080 - No Prep - Volatiles

Instrument: NT15

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BEJ0080-BLK1)				Prepared: 04-Oct-2016 Analyzed: 04-Oct-2016 11:56						
Benzene	ND	1.00	ug/kg							U
Toluene	ND	1.00	ug/kg							U
Ethylbenzene	ND	1.00	ug/kg							U
m,p-Xylene	ND	1.00	ug/kg							U
o-Xylene	ND	1.00	ug/kg							U
Surrogate: 1,2-Dichloroethane-d4	50.4		ug/kg	*50.0*		*101*	*80-149*			
Surrogate: Toluene-d8	49.1		ug/kg	*50.0*		*98.2*	*77-120*			
Surrogate: 4-Bromofluorobenzene	50.6		ug/kg	*50.0*		*101*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	50.4		ug/kg	*50.0*		*101*	*80-120*			
LCS (BEJ0080-BS1)				Prepared: 04-Oct-2016 Analyzed: 04-Oct-2016 10:36						
Benzene	50.0		ug/kg	50.0		99.9	80-120			
Toluene	49.8		ug/kg	50.0		99.6	75-120			
Ethylbenzene	52.8		ug/kg	50.0		106	80-125			
m,p-Xylene	107		ug/kg	100		107	76-121			
o-Xylene	56.1		ug/kg	50.0		112	67-132			
Surrogate: 1,2-Dichloroethane-d4	48.6		ug/kg	*50.0*		*97.1*	*80-149*			
Surrogate: Toluene-d8	49.3		ug/kg	*50.0*		*98.6*	*77-120*			
Surrogate: 4-Bromofluorobenzene	50.9		ug/kg	*50.0*		*102*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	50.1		ug/kg	*50.0*		*100*	*80-120*			
LCS Dup (BEJ0080-BSD1)				Prepared: 04-Oct-2016 Analyzed: 04-Oct-2016 11:32						
Benzene	52.1		ug/kg	50.0		104	80-120	4.10	30	
Toluene	52.2		ug/kg	50.0		104	75-120	4.67	30	
Ethylbenzene	53.9		ug/kg	50.0		108	80-125	2.12	30	
m,p-Xylene	111		ug/kg	100		111	76-121	3.70	30	
o-Xylene	57.9		ug/kg	50.0		116	67-132	3.17	30	
Surrogate: 1,2-Dichloroethane-d4	48.9		ug/kg	*50.0*		*97.8*	*80-149*			
Surrogate: Toluene-d8	50.0		ug/kg	*50.0*		*100*	*77-120*			
Surrogate: 4-Bromofluorobenzene	49.9		ug/kg	*50.0*		*99.8*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	49.8		ug/kg	*50.0*		*99.6*	*80-120*			

Volatile Organic Compounds - Quality Control

Batch BEJ0088 - EPA 5035 (Methanol Extraction)

Instrument: NT2

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BEJ0088-BLK1)				Prepared: 04-Oct-2016 Analyzed: 04-Oct-2016 11:02						
Gasoline Range Organics (Tol-Nap)	ND	5000	ug/kg							U
Surrogate: Toluene-d8	5.10		ug/kg	*5.00*		*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.77		ug/kg	*5.00*		*95.5*	*78-123*			
LCS (BEJ0088-BS1)				Prepared: 04-Oct-2016 Analyzed: 04-Oct-2016 09:40						
Gasoline Range Organics (Tol-Nap)	53700		ug/kg	50000		107	70-121			
Surrogate: Toluene-d8	5.11		ug/kg	*5.00*		*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.90		ug/kg	*5.00*		*98.0*	*78-123*			
LCS Dup (BEJ0088-BSD1)				Prepared: 04-Oct-2016 Analyzed: 04-Oct-2016 10:00						
Gasoline Range Organics (Tol-Nap)	54600		ug/kg	50000		109	70-121	1.74	30	
Surrogate: Toluene-d8	5.20		ug/kg	*5.00*		*104*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.95		ug/kg	*5.00*		*99.0*	*78-123*			

Volatile Organic Compounds - Quality Control

Batch BEJ0307 - EPA 5035 (Methanol Extraction)

Instrument: NT15

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BEJ0307-BLK1)				Prepared: 04-Oct-2016 Analyzed: 04-Oct-2016 11:56							
Benzene	ND	8.20	50.0	ug/kg							U
Toluene	ND	8.60	50.0	ug/kg							U
Ethylbenzene	ND	13.6	50.0	ug/kg							U
m,p-Xylene	ND	27.9	50.0	ug/kg							U
o-Xylene	ND	11.4	50.0	ug/kg							U
Surrogate: Dibromofluoromethane		50.9		ug/kg	*50.0*		*102*	*30-160*			
Surrogate: 1,2-Dichloroethane-d4		50.4		ug/kg	*50.0*		*101*	*80-124*			
Surrogate: Toluene-d8		49.1		ug/kg	*50.0*		*98.2*	*80-120*			
Surrogate: 4-Bromofluorobenzene		50.6		ug/kg	*50.0*		*101*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4		50.4		ug/kg	*50.0*		*101*	*80-120*			
LCS (BEJ0307-BS1)				Prepared: 04-Oct-2016 Analyzed: 04-Oct-2016 10:36							
Benzene	2500			ug/kg	2500		99.9	80-120			
Toluene	2490			ug/kg	2500		99.6	77-120			
Ethylbenzene	2640			ug/kg	2500		106	79-122			
m,p-Xylene	5340			ug/kg	5000		107	81-122			
o-Xylene	2810			ug/kg	2500		112	79-120			
Surrogate: Dibromofluoromethane		49.7		ug/kg	*50.0*		*99.4*	*30-160*			
Surrogate: 1,2-Dichloroethane-d4		48.6		ug/kg	*50.0*		*97.1*	*80-124*			
Surrogate: Toluene-d8		49.3		ug/kg	*50.0*		*98.6*	*80-120*			
Surrogate: 4-Bromofluorobenzene		50.9		ug/kg	*50.0*		*102*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4		50.1		ug/kg	*50.0*		*100*	*80-120*			
LCS Dup (BEJ0307-BSD1)				Prepared: 04-Oct-2016 Analyzed: 04-Oct-2016 11:32							
Benzene	2600			ug/kg	2500		104	80-120	4.10	30	
Toluene	2610			ug/kg	2500		104	77-120	4.67	30	
Ethylbenzene	2700			ug/kg	2500		108	79-122	2.12	30	
m,p-Xylene	5540			ug/kg	5000		111	81-122	3.70	30	
o-Xylene	2900			ug/kg	2500		116	79-120	3.17	30	
Surrogate: Dibromofluoromethane		49.9		ug/kg	*50.0*		*99.8*	*30-160*			
Surrogate: 1,2-Dichloroethane-d4		48.9		ug/kg	*50.0*		*97.8*	*80-124*			
Surrogate: Toluene-d8		50.0		ug/kg	*50.0*		*100*	*80-120*			
Surrogate: 4-Bromofluorobenzene		49.9		ug/kg	*50.0*		*99.8*	*80-120*			

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Project Number: 1696010.00
Project Manager: Julia Schwarz

Reported:
14-Oct-2016 16:21

Volatile Organic Compounds - Quality Control

Batch BEJ0307 - EPA 5035 (Methanol Extraction)

Instrument: NT15

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BEJ0307-BSD1)					Prepared: 04-Oct-2016	Analyzed: 04-Oct-2016 11:32					
Surrogate: 1,2-Dichlorobenzene-d4		49.8		ug/kg	*50.0*		*99.6*	*80-120*			

Volatile Organic Compounds - Quality Control

Batch BEJ0329 - EPA 5035 (Methanol Extraction)

Instrument: NT2

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BEJ0329-BLK1)					Prepared: 04-Oct-2016		Analyzed: 04-Oct-2016 11:02				
Benzene	ND	8.20	50.0	ug/kg							U
Toluene	ND	8.60	50.0	ug/kg							U
Ethylbenzene	ND	13.6	50.0	ug/kg							U
m,p-Xylene	ND	27.9	50.0	ug/kg							U
o-Xylene	ND	11.4	50.0	ug/kg							U
Surrogate: Dibromofluoromethane		4.77		ug/kg	*5.00*		*95.4*	*30-160*			
Surrogate: 1,2-Dichloroethane-d4		5.33		ug/kg	*5.00*		*107*	*80-124*			
Surrogate: Toluene-d8		5.10		ug/kg	*5.00*		*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene		4.77		ug/kg	*5.00*		*95.5*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4		5.09		ug/kg	*5.00*		*102*	*80-120*			
LCS (BEJ0329-BS1)					Prepared: 04-Oct-2016		Analyzed: 04-Oct-2016 10:21				
Benzene	499			ug/kg	500		99.7	80-120			
Toluene	480			ug/kg	500		96.0	77-120			
Ethylbenzene	485			ug/kg	500		97.1	79-122			
m,p-Xylene	995			ug/kg	1000		99.5	81-122			
o-Xylene	502			ug/kg	500		100	79-120			
Surrogate: Dibromofluoromethane		5.09		ug/kg	*5.00*		*102*	*30-160*			
Surrogate: 1,2-Dichloroethane-d4		5.20		ug/kg	*5.00*		*104*	*80-124*			
Surrogate: Toluene-d8		5.13		ug/kg	*5.00*		*103*	*80-120*			
Surrogate: 4-Bromofluorobenzene		4.99		ug/kg	*5.00*		*99.9*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4		5.04		ug/kg	*5.00*		*101*	*80-120*			
LCS Dup (BEJ0329-BSD1)					Prepared: 04-Oct-2016		Analyzed: 04-Oct-2016 10:41				
Benzene	510			ug/kg	500		102	80-120	2.20	30	
Toluene	490			ug/kg	500		97.9	77-120	2.00	30	
Dibromochloromethane	508			ug/kg	500		102	79-120	5.97	30	
Ethylbenzene	487			ug/kg	500		97.5	79-122	0.42	30	
m,p-Xylene	1010			ug/kg	1000		101	81-122	1.25	30	
o-Xylene	507			ug/kg	500		101	79-120	1.00	30	
Surrogate: Dibromofluoromethane		4.98		ug/kg	*5.00*		*99.6*	*30-160*			
Surrogate: 1,2-Dichloroethane-d4		5.09		ug/kg	*5.00*		*102*	*80-124*			
Surrogate: Toluene-d8		5.10		ug/kg	*5.00*		*102*	*80-120*			

Volatile Organic Compounds - Quality Control

Batch BEJ0329 - EPA 5035 (Methanol Extraction)

Instrument: NT2

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BEJ0329-BSD1)					Prepared: 04-Oct-2016	Analyzed: 04-Oct-2016 10:41					
Surrogate: 4-Bromofluorobenzene		4.96		ug/kg	*5.00*		*99.3*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4		4.93		ug/kg	*5.00*		*98.6*	*80-120*			

Certified Analyses included in this Report

Analyte	Certifications
EPA 8260C in Solid	
Chloromethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Vinyl Chloride	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Bromomethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Chloroethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Trichlorofluoromethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Acrolein	WADOE,DoD-ELAP,NELAP,CALAP
1,1,2-Trichloro-1,2,2-Trifluoroethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Acetone	WADOE,DoD-ELAP,NELAP,CALAP
1,1-Dichloroethene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Bromoethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Iodomethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Methylene Chloride	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Acrylonitrile	WADOE,DoD-ELAP,NELAP,CALAP
Carbon Disulfide	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
trans-1,2-Dichloroethene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Vinyl Acetate	WADOE,DoD-ELAP,NELAP,CALAP
1,1-Dichloroethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
2-Butanone	WADOE,DoD-ELAP,NELAP,CALAP
2,2-Dichloropropane	WADOE,DoD-ELAP,NELAP,CALAP
cis-1,2-Dichloroethene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Chloroform	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Bromochloromethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,1,1-Trichloroethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,1-Dichloropropene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Carbon tetrachloride	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,2-Dichloroethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Benzene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Trichloroethene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,2-Dichloropropane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Bromodichloromethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Dibromomethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
4-Methyl-2-Pentanone	WADOE,DoD-ELAP,NELAP,CALAP
cis-1,3-Dichloropropene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Toluene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
trans-1,3-Dichloropropene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC

2-Hexanone	WADOE,DoD-ELAP,NELAP,CALAP
1,1,2-Trichloroethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,3-Dichloropropane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Tetrachloroethene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Dibromochloromethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,2-Dibromoethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Chlorobenzene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Ethylbenzene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,1,1,2-Tetrachloroethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
m,p-Xylene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
o-Xylene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Styrene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Bromoform	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,1,2,2-Tetrachloroethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,2,3-Trichloropropane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
trans-1,4-Dichloro 2-Butene	WADOE
n-Propylbenzene	WADOE,DoD-ELAP,NELAP,CALAP
Bromobenzene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Isopropyl Benzene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
2-Chlorotoluene	WADOE,DoD-ELAP,NELAP,CALAP
4-Chlorotoluene	WADOE,DoD-ELAP,NELAP,CALAP
t-Butylbenzene	WADOE,DoD-ELAP,NELAP,CALAP
1,3,5-Trimethylbenzene	WADOE,DoD-ELAP,NELAP,CALAP
1,2,4-Trimethylbenzene	WADOE,DoD-ELAP,NELAP,CALAP
s-Butylbenzene	WADOE,DoD-ELAP,NELAP,CALAP
4-Isopropyl Toluene	WADOE,DoD-ELAP,NELAP,CALAP
1,3-Dichlorobenzene	WADOE,DoD-ELAP,NELAP,CALAP
1,4-Dichlorobenzene	WADOE,DoD-ELAP,NELAP,CALAP
n-Butylbenzene	WADOE,DoD-ELAP,NELAP,CALAP
1,2-Dichlorobenzene	WADOE,DoD-ELAP,NELAP,CALAP
1,2-Dibromo-3-chloropropane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,2,4-Trichlorobenzene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Hexachloro-1,3-Butadiene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Naphthalene	WADOE,DoD-ELAP,NELAP,CALAP
1,2,3-Trichlorobenzene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Dichlorodifluoromethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Methyl tert-butyl Ether	WADOE,DoD-ELAP,NELAP,CALAP
n-Hexane	WADOE
2-Pentanone	WADOE

Chloromethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Vinyl Chloride	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Bromomethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Chloroethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Trichlorofluoromethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Acrolein	WADOE,DoD-ELAP,NELAP,CALAP
1,1,2-Trichloro-1,2,2-Trifluoroethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Acetone	WADOE,DoD-ELAP,NELAP,CALAP
1,1-Dichloroethene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Bromoethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Iodomethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Methylene Chloride	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Acrylonitrile	WADOE,DoD-ELAP,NELAP,CALAP
Carbon Disulfide	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
trans-1,2-Dichloroethene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Vinyl Acetate	WADOE,DoD-ELAP,NELAP,CALAP
1,1-Dichloroethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
2-Butanone	WADOE,DoD-ELAP,NELAP,CALAP
2,2-Dichloropropane	WADOE,DoD-ELAP,NELAP,CALAP
cis-1,2-Dichloroethene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Chloroform	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Bromochloromethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,1,1-Trichloroethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,1-Dichloropropene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Carbon tetrachloride	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,2-Dichloroethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Benzene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Trichloroethene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,2-Dichloropropane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Bromodichloromethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Dibromomethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
4-Methyl-2-Pentanone	WADOE,DoD-ELAP,NELAP,CALAP
cis-1,3-Dichloropropene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Toluene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
trans-1,3-Dichloropropene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
2-Hexanone	WADOE,DoD-ELAP,NELAP,CALAP
1,1,2-Trichloroethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,3-Dichloropropane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Tetrachloroethene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC

Dibromochloromethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,2-Dibromoethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Chlorobenzene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Ethylbenzene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,1,1,2-Tetrachloroethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
m,p-Xylene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
o-Xylene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Styrene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Bromoform	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,1,2,2-Tetrachloroethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,2,3-Trichloropropane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
trans-1,4-Dichloro 2-Butene	WADOE
n-Propylbenzene	WADOE,DoD-ELAP,NELAP,CALAP
Bromobenzene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Isopropyl Benzene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
2-Chlorotoluene	WADOE,DoD-ELAP,NELAP,CALAP
4-Chlorotoluene	WADOE,DoD-ELAP,NELAP,CALAP
t-Butylbenzene	WADOE,DoD-ELAP,NELAP,CALAP
1,3,5-Trimethylbenzene	WADOE,DoD-ELAP,NELAP,CALAP
1,2,4-Trimethylbenzene	WADOE,DoD-ELAP,NELAP,CALAP
s-Butylbenzene	WADOE,DoD-ELAP,NELAP,CALAP
4-Isopropyl Toluene	WADOE,DoD-ELAP,NELAP,CALAP
1,3-Dichlorobenzene	WADOE,DoD-ELAP,NELAP,CALAP
1,4-Dichlorobenzene	WADOE,DoD-ELAP,NELAP,CALAP
n-Butylbenzene	WADOE,DoD-ELAP,NELAP,CALAP
1,2-Dichlorobenzene	WADOE,DoD-ELAP,NELAP,CALAP
1,2-Dibromo-3-Chloropropane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
1,2,4-Trichlorobenzene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Hexachloro-1,3-Butadiene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Naphthalene	WADOE,DoD-ELAP,NELAP,CALAP
1,2,3-Trichlorobenzene	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Dichlorodifluoromethane	WADOE,DoD-ELAP,NELAP,CALAP,ADEC
Methyl tert-butyl Ether	WADOE,DoD-ELAP,NELAP,CALAP
n-Hexane	WADOE

EPA 8260C in Water

Chloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Vinyl Chloride	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromomethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Chloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE

Trichlorofluoromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Acrolein	DoD-ELAP,NELAP,CALAP,WADOE
1,1,2-Trichloro-1,2,2-Trifluoroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Acetone	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1-Dichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromoethane	DoD-ELAP,NELAP,CALAP,WADOE
Iodomethane	DoD-ELAP,NELAP,CALAP,WADOE
Methylene Chloride	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Acrylonitrile	DoD-ELAP,NELAP,CALAP,WADOE
Carbon Disulfide	DoD-ELAP,NELAP,CALAP,WADOE
trans-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Vinyl Acetate	DoD-ELAP,NELAP,CALAP,WADOE
1,1-Dichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
2-Butanone	DoD-ELAP,NELAP,CALAP,WADOE
2,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
cis-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Chloroform	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromochloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1,1-Trichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1-Dichloropropene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Carbon tetrachloride	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Benzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Trichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromodichloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Dibromomethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
2-Chloroethyl vinyl ether	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
4-Methyl-2-Pentanone	DoD-ELAP,NELAP,CALAP,WADOE
cis-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Toluene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
trans-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
2-Hexanone	DoD-ELAP,NELAP,CALAP,WADOE
1,1,2-Trichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,3-Dichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Tetrachloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Dibromochloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dibromoethane	DoD-ELAP,NELAP,CALAP,WADOE
Chlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE

Ethylbenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1,1,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
m,p-Xylene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
o-Xylene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Styrene	DoD-ELAP,NELAP,CALAP,WADOE
Bromoform	DoD-ELAP,NELAP,CALAP,WADOE
1,1,2,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2,3-Trichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
trans-1,4-Dichloro 2-Butene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
n-Propylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
Bromobenzene	DoD-ELAP,NELAP,CALAP,WADOE
Isopropyl Benzene	DoD-ELAP,NELAP,CALAP,WADOE
2-Chlorotoluene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
4-Chlorotoluene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
t-Butylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
1,3,5-Trimethylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
1,2,4-Trimethylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
s-Butylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
4-Isopropyl Toluene	DoD-ELAP,NELAP,CALAP,WADOE
1,3-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,4-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
n-Butylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
1,2-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dibromo-3-chloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2,4-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Hexachloro-1,3-Butadiene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Naphthalene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2,3-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Dichlorodifluoromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Methyl tert-butyl Ether	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
n-Hexane	WADOE
2-Pentanone	WADOE

NWTPHg in Water

Gasoline Range Organics (Tol-Nap)	WADOE,DoD-ELAP
Gasoline Range Organics (2MP-TMB)	WADOE,DoD-ELAP
Gasoline Range Organics (Tol-C12)	WADOE,DoD-ELAP
Gasoline Range Organics (C6-C10)	WADOE,ADEC,DoD-ELAP
Gasoline Range Organics (C5-C12)	WADOE,DoD-ELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	UST-033	05/06/2017
CALAP	California Department of Public Health CAELAP	2748	02/28/2018
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	03/30/2017
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006	05/11/2017
WADOE	WA Dept of Ecology	C558	06/30/2017
WA-DW	Ecology - Drinking Water	C558	06/30/2017

Notes and Definitions

U	This analyte is not detected above the applicable reporting or detection limit.
M	Estimated value for a GC/MS analyte detected and confirmed by an analyst but with low spectral match parameters.
J	Estimated concentration value detected below the reporting limit.
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL)
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

28 December 2016

Julia Schwarz
Kennedy Jenks Consultants
32001 - 32nd Avenue South, Suite 100
Federal Way, WA 98001

RE: Circle K

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)	Associated SDG ID(s)
16L0126	N/A

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the reqirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Amanda Volgardsen For Mark Harris, Project Manager

ACCREDITED IN ACCORDANCE WITH nelac
Cert# 100006

PJLA Testing
Accreditation # 66169

Chain of Custody Record & Laboratory Analysis Request

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)
www.arilabs.com

ARI Assigned Number: 16L0126
Turn-around Requested: Standard
ARI Client Company: Kennedy / Jenks
Phone: 253-835-6424
Client Contact: Julia Schwarz
Client Project Name: Former Circle K
Client Project #: 1696010.00
Samplers: J. Schwarz, D. Rauch, T. Hackins

Page: 1 of 2
Date: 12/8/16
Ice Present? Yes
No. of Coolers: 2
Cooler Temps: 0.0, 0.8

					Analysis Requested								Notes/Comments
Sample ID	Date	Time	Matrix	No. Containers	NWTPH-Gx/ BTEX	MTBE, EDB, EDC, Total Lead	Nitrate, sulfate, sulfide, Diss. Mn & Fe	Alkalinity	Methane				
MW-2-161207	12/7/16	1430	water	3	X								
MW-4-161208	12/8/16												
MW-6-161207	12/7/16	1145											
MW-7-161208	12/8/16	0845											
MW-8-161207	12/7/16	0955											
MW-9-161207		1035											
MW-10-161207		1145											
MW-11-161207		1455											
MW-13-161208	12/8/16	1355											
MW-14-161207	12/7/16	1635		10			X	X	X				

Comments/Special Instructions: MW-4, MW-8, MW-9, & MW-13 expected to have high concentrations of gasoline & BTEX

Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
Printed Name: Julia Schwarz	Printed Name: Tyler Renkn	Printed Name:	Printed Name:
Company: Kennedy/Jenks	Company: ARI	Company:	Company:
Date & Time: 12/8/16 1725	Date & Time: 12-8-16 @ 1725	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Chain of Custody Record & Laboratory Analysis Request

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)
www.arilabs.com

ARI Assigned Number: 16L0126
Turn-around Requested: Standard
Page: 2 of 2
ARI Client Company: Kennedy / Jenks
Phone: 253-835-6424
Date: 12/8/16
Ice Present? Yes
Client Contact: Julia Schwarz
No. of Coolers: 2
Cooler Temps: 0.0, 0.8
Client Project Name: Former Circle K
Client Project #: 1696010.00
Samplers: J. Schwarz, Diane Rauch

Sample ID	Date	Time	Matrix	No. Containers	NWTPH-Gx & BTEX	MTBE, EDB, EDC, Total Lead	Nitrate, Sulfate Sulfide	Dissolved Fe&Mn	Alkalinity	Methane			Notes/Comments
MW-15-161207	12/7/16	1540	Water	3	X								
MW-16-161207-PRE		0950											
MW-16-161207-POST		1038											
MW-17-161207		1610		10			X	X	X	X			
MW-18-161207		1515		3									
MW-19-161208	12/8/16	1215		10			X	X	X	X			
MW-20-161208		0950		7		X							
MW-21-161208		1450		14		X	X	X	X	X			
DUP-1-161208		—		3									

Comments/Special Instructions
MW-19, MW-20, MW-21 & DUP-1 expected to have high concentrations of gasoline & BTEX, (also possibly MW-15 & MW-16)

Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
Printed Name: Julia Schwarz	Printed Name: Tyler Renken	Printed Name:	Printed Name:
Company: Kennedy/Jenks	Company: ARI	Company:	Company:
Date & Time: 12/8/16 1725	Date & Time: 12-8-16 @ 1725	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

WORK ORDER

16L0126

Client: **Kennedy Jenks Consultants**

Project Manager: **Mark Harris**

Project: **Circle K**

Project Number: **1696010.00**

Preservation Confirmation

Container ID	Container Type	pH
16L0126-01 A	VOA Vial, Clear, 40 mL, HCL	
16L0126-01 B	VOA Vial, Clear, 40 mL, HCL	
16L0126-01 C	VOA Vial, Clear, 40 mL, HCL	
16L0126-02 A	VOA Vial, Clear, 40 mL, HCL	
16L0126-02 B	VOA Vial, Clear, 40 mL, HCL	
16L0126-02 C	VOA Vial, Clear, 40 mL, HCL	
16L0126-03 A	VOA Vial, Clear, 40 mL, HCL	
16L0126-03 B	VOA Vial, Clear, 40 mL, HCL	
16L0126-03 C	VOA Vial, Clear, 40 mL, HCL	
16L0126-04 A	VOA Vial, Clear, 40 mL, HCL	
16L0126-04 B	VOA Vial, Clear, 40 mL, HCL	
16L0126-04 C	VOA Vial, Clear, 40 mL, HCL	
16L0126-05 A	VOA Vial, Clear, 40 mL, HCL	
16L0126-05 B	VOA Vial, Clear, 40 mL, HCL	
16L0126-05 C	VOA Vial, Clear, 40 mL, HCL	
16L0126-06 A	VOA Vial, Clear, 40 mL, HCL	
16L0126-06 B	VOA Vial, Clear, 40 mL, HCL	
16L0126-06 C	VOA Vial, Clear, 40 mL, HCL	
16L0126-07 A	VOA Vial, Clear, 40 mL, HCL	
16L0126-07 B	VOA Vial, Clear, 40 mL, HCL	
16L0126-07 C	VOA Vial, Clear, 40 mL, HCL	
16L0126-08 A	VOA Vial, Clear, 40 mL, HCL	
16L0126-08 B	VOA Vial, Clear, 40 mL, HCL	
16L0126-08 C	VOA Vial, Clear, 40 mL, HCL	
16L0126-09 A	VOA Vial, Clear, 40 mL, HCL	
16L0126-09 B	VOA Vial, Clear, 40 mL, HCL	
16L0126-09 C	VOA Vial, Clear, 40 mL, HCL	
16L0126-09 D	VOA Vial, Clear, 40 mL, HCL	
16L0126-09 E	VOA Vial, Clear, 40 mL, HCL	
16L0126-09 F	VOA Vial, Clear, 40 mL, HCL	
16L0126-09 G	HDPE NM, 500 mL, 1:1 HNO3	<2 pass

Reviewed By

Date

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Printed: 12/9/2016 11:43:55AM

WORK ORDER

16L0126

Client: Kennedy Jenks Consultants | **Project Manager: Mark Harris**

Project: Circle K | **Project Number: 1696010.00**

16L0126-10 A	VOA Vial, Clear, 40 mL, HCL	
16L0126-10 B	VOA Vial, Clear, 40 mL, HCL	
16L0126-10 C	VOA Vial, Clear, 40 mL, HCL	
16L0126-10 D	VOA Vial, Clear, 40 mL	
16L0126-10 E	VOA Vial, Clear, 40 mL	
16L0126-10 F	VOA Vial, Clear, 40 mL	
16L0126-10 G	Small OJ, 500 mL	
16L0126-10 H	Small OJ, 500 mL	
16L0126-10 I	Small OJ, 500 mL, ZnOAC	TL 12-9-16 → < 9 Fail
16L0126-10 J	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2 pass
16L0126-11 A	VOA Vial, Clear, 40 mL, HCL	
16L0126-11 B	VOA Vial, Clear, 40 mL, HCL	
16L0126-11 C	VOA Vial, Clear, 40 mL, HCL	
16L0126-12 A	VOA Vial, Clear, 40 mL, HCL	
16L0126-12 B	VOA Vial, Clear, 40 mL, HCL	
16L0126-12 C	VOA Vial, Clear, 40 mL, HCL	
16L0126-13 A	VOA Vial, Clear, 40 mL, HCL	
16L0126-13 B	VOA Vial, Clear, 40 mL, HCL	
16L0126-13 C	VOA Vial, Clear, 40 mL, HCL	
16L0126-14 A	VOA Vial, Clear, 40 mL, HCL	
16L0126-14 B	VOA Vial, Clear, 40 mL, HCL	
16L0126-14 C	VOA Vial, Clear, 40 mL, HCL	
16L0126-14 D	VOA Vial, Clear, 40 mL	
16L0126-14 E	VOA Vial, Clear, 40 mL	
16L0126-14 F	VOA Vial, Amber, 40 mL	
16L0126-14 G	Small OJ, 500 mL	
16L0126-14 H	Small OJ, 500 mL	
16L0126-14 I	Small OJ, 500 mL, ZnOAC	< 9 Fail
16L0126-14 J	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2 Pass
16L0126-15 A	VOA Vial, Clear, 40 mL, HCL	
16L0126-15 B	VOA Vial, Clear, 40 mL, HCL	
16L0126-15 C	VOA Vial, Clear, 40 mL, HCL	
16L0126-16 A	VOA Vial, Clear, 40 mL, HCL	
16L0126-16 B	VOA Vial, Clear, 40 mL, HCL	

Reviewed By ____________________ Date ____________

WORK ORDER

16L0126

Client: Kennedy Jenks Consultants **Project Manager: Mark Harris**
Project: Circle K **Project Number: 1696010.00**

16L0126-16 C	VOA Vial, Clear, 40 mL, HCL		
16L0126-16 D	VOA Vial, Clear, 40 mL		
16L0126-16 E	VOA Vial, Clear, 40 mL		
16L0126-16 F	VOA Vial, Clear, 40 mL		
16L0126-16 G	Small OJ, 500 mL		
16L0126-16 H	Small OJ, 500 mL		
16L0126-16 I	Small OJ, 500 mL, ZnOAC	<9	Fail
16L0126-16 J	HDPE NM, 500 mL, 1:1 HNO3 (FF)	<2	pass
16L0126-17 A	VOA Vial, Clear, 40 mL, HCL		
16L0126-17 B	VOA Vial, Clear, 40 mL, HCL		
16L0126-17 C	VOA Vial, Clear, 40 mL, HCL		
16L0126-17 D	VOA Vial, Clear, 40 mL, HCL		
16L0126-17 E	VOA Vial, Clear, 40 mL, HCL		
16L0126-17 F	VOA Vial, Clear, 40 mL, HCL		
16L0126-17 G	HDPE NM, 500 mL, 1:1 HNO3	<2	pass
16L0126-18 A	VOA Vial, Clear, 40 mL, HCL		
16L0126-18 B	VOA Vial, Clear, 40 mL, HCL		
16L0126-18 C	VOA Vial, Clear, 40 mL, HCL		
16L0126-18 D	VOA Vial, Clear, 40 mL, HCL		
16L0126-18 E	VOA Vial, Clear, 40 mL, HCL		
16L0126-18 F	VOA Vial, Clear, 40 mL, HCL		
16L0126-18 G	VOA Vial, Clear, 40 mL		
16L0126-18 H	VOA Vial, Clear, 40 mL		
16L0126-18 I	VOA Vial, Clear, 40 mL		
16L0126-18 J	Small OJ, 500 mL		
16L0126-18 K	Small OJ, 500 mL		
16L0126-18 L	Small OJ, 500 mL, ZnOAC	<9	Fail
16L0126-18 M	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
16L0126-19 A	VOA Vial, Clear, 40 mL, HCL		
16L0126-19 B	VOA Vial, Clear, 40 mL, HCL		
16L0126-19 C	VOA Vial, Clear, 40 mL, HCL		
16L0126-20 A	VOA Vial, Clear, 40 mL, HCL		
16L0126-20 B	VOA Vial, Clear, 40 mL, HCL		
16L0126-20 C	VOA Vial, Clear, 40 mL, HCL		

Reviewed By

Date

WORK ORDER

16L0126

Client: Kennedy Jenks Consultants | **Project Manager: Mark Harris**

Project: Circle K | **Project Number: 1696010.00**

16L0126-20 D	VOA Vial, Clear, 40 mL, HCL		
16L0126-21 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	<2	Pass

TR
Preservation Confirmed By

12-9-16
Date

Reviewed By

Date

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Kennedy Jenks

COC No(s): ______ NA

Assigned ARI Job No: 16L0126

Project Name: Circle K

Delivered by: Fed-Ex UPS Courier [✓ Hand Delivered] Other: ______

Tracking No: ______ [✓ NA]

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler?	YES	[✓ NO]
Were custody papers included with the cooler?	[✓ YES]	NO
Were custody papers properly filled out (ink, signed, etc.)	[✓ YES]	NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) 0.0 0.8

Time: ______

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: D005276

Cooler Accepted by: TR Date: 12-8-16 Time: 1725

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? YES [✓ NO]

What kind of packing material was used? ... Bubble Wrap [✓ Wet Ice] Gel Packs Baggies Foam Block Paper Other: ______

Was sufficient ice used (if appropriate)?	NA	[✓ YES]	NO
Were all bottles sealed in individual plastic bags?		YES	[✓ NO]
Did all bottles arrive in good condition (unbroken)?		[✓ YES]	NO
Were all bottle labels complete and legible?		[✓ YES]	NO
Did the number of containers listed on COC match with the number of containers received?		YES	[✓ NO]
Did all bottle labels and tags agree with custody papers?		[✓ YES]	NO
Were all bottles used correct for the requested analyses?		[✓ YES]	NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)...	NA	[✓ YES]	NO
Were all VOC vials free of air bubbles?	NA	YES	[✓ NO]
Was sufficient amount of sample sent in each bottle?		[✓ YES]	NO
Date VOC Trip Blank was made at ARI	NA	12-5-16	

Was Sample Split by ARI : [✓ NA] YES Date/Time: ______ Equipment: ______ Split by: ______

Samples Logged by: TR Date: 12-9-16 Time: 0953

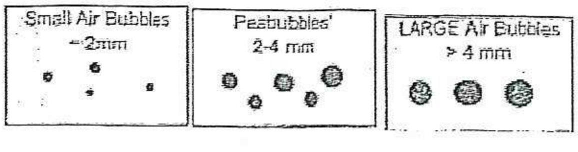
*** Notify Project Manager of discrepancies or concerns ***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

1 of 3 VOA vials for MW-16-161207-POST have pb bubbles
COC says there are 3 containers for MW-13-161208 but 7 containers were received (6x 40mL HCl VOA vials, and 1x 500mL HDPE). Logged for TPHG/BETX and Pb.

By: ______ Date: ______



Small → "sm" (< 2 mm)
Peabubbles → "pb" (2 to < 4 mm)
Large → "lg" (4 to < 6 mm)
Headspace → "hs" (> 6 mm)

4x Trip Blanks arrived not listed on COC.

No time written on COC for sample "MW-4-161208", looked at label and sample taken @ 1600.

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010.00	**Reported:**
Federal Way, WA 98001	Project Manager: Julia Schwarz	28-Dec-2016 09:58

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-2-161207	16L0126-01	Water	07-Dec-2016 14:30	08-Dec-2016 17:25
MW-4-161208	16L0126-02	Water	08-Dec-2016 16:00	08-Dec-2016 17:25
MW-6-161207	16L0126-03	Water	07-Dec-2016 11:45	08-Dec-2016 17:25
MW-7-161208	16L0126-04	Water	08-Dec-2016 08:45	08-Dec-2016 17:25
MW-8-161207	16L0126-05	Water	07-Dec-2016 09:55	08-Dec-2016 17:25
MW-9-161207	16L0126-06	Water	07-Dec-2016 10:35	08-Dec-2016 17:25
MW-10-161207	16L0126-07	Water	07-Dec-2016 11:45	08-Dec-2016 17:25
MW-11-161207	16L0126-08	Water	07-Dec-2016 14:55	08-Dec-2016 17:25
MW-13-161208	16L0126-09	Water	08-Dec-2016 13:55	08-Dec-2016 17:25
MW-14-161207	16L0126-10	Water	07-Dec-2016 16:35	08-Dec-2016 17:25
MW-15-161207	16L0126-11	Water	07-Dec-2016 15:40	08-Dec-2016 17:25
MW-16-161207-PRE	16L0126-12	Water	07-Dec-2016 09:50	08-Dec-2016 17:25
MW-16-161207-POST	16L0126-13	Water	07-Dec-2016 10:38	08-Dec-2016 17:25
MW-17-161207	16L0126-14	Water	07-Dec-2016 16:10	08-Dec-2016 17:25
MW-18-161207	16L0126-15	Water	07-Dec-2016 15:15	08-Dec-2016 17:25
MW-19-161208	16L0126-16	Water	08-Dec-2016 12:15	08-Dec-2016 17:25
MW-20-161208	16L0126-17	Water	08-Dec-2016 09:50	08-Dec-2016 17:25
MW-21-161208	16L0126-18	Water	08-Dec-2016 14:50	08-Dec-2016 17:25
Dup-1-161208	16L0126-19	Water	08-Dec-2016 00:00	08-Dec-2016 17:25
Trip Blanks	16L0126-20	Water	07-Dec-2016 00:00	08-Dec-2016 17:25
MW-21-161208	16L0126-21	Water	08-Dec-2016 14:50	08-Dec-2016 17:25

Case Narrative

CASE NARRATIVE

Client: Kennedy Jenks Consultants
Project: Circle K
Workorder: 16L0126

Sample receipt

Twenty samples and trip blanks were received December 8, 2016 under ARI workorder 16L0126. For details regarding sample receipt, please refer to the Cooler Receipt Form.

Gasoline by NWTPH-g (GC/MS)

The sample(s) were run within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The sample surrogate percent recovery for MW-19-161208 and MW-20-161208 was out of control high for Toluene-d8.

The method blank(s) were clean at the reporting limits.

The LCS/LCSD percent recoveries were within control limits.

Volatiles - EPA Method SW8260C

The sample(s) were run within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The sample surrogate percent recovery for MW-19-161208 and MW-20-161208 was out of control high for 1,2-Dichloroethane-d4, and out of control low for Toluene-d8. The samples were re-analyzed, no further actions were taken.

The method blank BEL0337 has Toluene contamination. All associated samples that contain this analye have been flagged with a "B" qualifier.

The LCS/LCSD percent recoveries and RPD were within control limits.

Methane - MEE by RSK175

The sample(s) were run within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The LCS/LCSD percent recoveries and RPD were within control limits.

Total and Dissolved Metals - EPA Method 6010C

The sample(s) were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank BEL0303 has Iron contamination below ARI's reporting limits. The Iron has been flagged with a "J" qualifier on the blank.

The LCS percent recoveries were within control limits.

Wet Chemistry

The Sulfide samples were received outside of the seven day recommended holding time. The Sulfide analysis has been flagged with an "H" qualifier.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The LCS percent recoveries were within control limits.

The matrix spike/matrix spike duplicate percent recoveries and RPD were within control limits.

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MW-2-161207

16L0126-01 (Water)

Volatile Organic Compounds

Method: EPA 8260C — Sampled: 12/07/2016 14:30

Instrument: NT2 — Analyzed: 12/09/2016 16:22

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0253 — Sample Size: 10 mL
Prepared: 12/09/2016 11:07 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.20	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*106*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*98.6*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*97.2*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*99.6*	*%*	

MW-2-161207

16L0126-01 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/07/2016 14:30
Analyzed: 12/09/2016 16:22

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0253
Sample Size: 10 mL
Prepared: 12/09/2016 11:07
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	100	ND	ug/L	U
Surrogate: Toluene-d8			*80-120 %*	*98.6*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*97.2*	*%*	

MW-4-161208

16L0126-02 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2

Sampled: 12/08/2016 16:00
Analyzed: 12/09/2016 16:45

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0253
Prepared: 12/09/2016 11:07
Sample Size: 0.4 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	5.00	**17.6**	ug/L	
Toluene	108-88-3	1	5.00	**30.0**	ug/L	
Ethylbenzene	100-41-4	1	5.00	**606**	ug/L	
m,p-Xylene	179601-23-1	1	10.0	**2770**	ug/L	
o-Xylene	95-47-6	1	5.00	**664**	ug/L	
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*111*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*100*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*96.3*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*102*	*%*	

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MW-4-161208

16L0126-02 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/08/2016 16:00
Analyzed: 12/09/2016 16:45

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0253 Sample Size: 0.4 mL
Prepared: 12/09/2016 11:07 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	2500	**28000**	ug/L	
HC ID: GAS						
Surrogate: Toluene-d8			*80-120 %*	*100*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*96.3*	*%*	

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MW-6-161207

16L0126-03 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2

Sampled: 12/07/2016 11:45
Analyzed: 12/09/2016 17:06

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0253 Sample Size: 10 mL
Prepared: 12/09/2016 11:07 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.20	**16.5**	ug/L	
Toluene	108-88-3	1	0.20	**1.56**	ug/L	
Ethylbenzene	100-41-4	1	0.20	**1.64**	ug/L	
m,p-Xylene	179601-23-1	1	0.40	**1.88**	ug/L	
o-Xylene	95-47-6	1	0.20	**0.70**	ug/L	
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*106*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*99.1*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*94.5*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*101*	*%*	

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Project Manager: Julia Schwarz

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MW-6-161207

16L0126-03 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/07/2016 11:45
Analyzed: 12/09/2016 17:06

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0253
Prepared: 12/09/2016 11:07
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	100	**101**	ug/L	
HC ID: GAS						
Surrogate: Toluene-d8			*80-120 %*	*99.1*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*94.5*	*%*	

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MW-7-161208

16L0126-04 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2

Sampled: 12/08/2016 08:45
Analyzed: 12/09/2016 17:26

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0253
Prepared: 12/09/2016 11:07
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.20	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*107*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*98.6*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*96.0*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*99.7*	*%*	

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MW-7-161208

16L0126-04 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/08/2016 08:45
Analyzed: 12/09/2016 17:26

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0253
Sample Size: 10 mL
Prepared: 12/09/2016 11:07
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	100	ND	ug/L	U
Surrogate: Toluene-d8			*80-120 %*	*98.6*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*96.0*	*%*	

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MW-8-161207

16L0126-05 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2

Sampled: 12/07/2016 09:55
Analyzed: 12/09/2016 17:50

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0253
Sample Size: 0.2 mL
Prepared: 12/09/2016 11:07
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	10.0	**11.3**	ug/L	
Toluene	108-88-3	1	10.0	**1390**	ug/L	
Ethylbenzene	100-41-4	1	10.0	**1800**	ug/L	
m,p-Xylene	179601-23-1	1	20.0	**5590**	ug/L	
o-Xylene	95-47-6	1	10.0	**2360**	ug/L	
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*117*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*96.4*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*100*	*%*	

MW-8-161207

16L0126-05 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/07/2016 09:55
Analyzed: 12/09/2016 17:50

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0253 Sample Size: 0.2 mL
Prepared: 12/09/2016 11:07 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	5000	**65700**	ug/L	
HC ID: GAS						
Surrogate: Toluene-d8			*80-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*96.4*	*%*	

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MW-9-161207

16L0126-06 (Water)

Volatile Organic Compounds

Method: EPA 8260C — Sampled: 12/07/2016 10:35
Instrument: NT2 — Analyzed: 12/09/2016 18:13

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0253 — Sample Size: 1 mL
Prepared: 12/09/2016 11:07 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	2.00	**2.05**	ug/L	
Toluene	108-88-3	1	2.00	**10.6**	ug/L	
Ethylbenzene	100-41-4	1	2.00	**125**	ug/L	
m,p-Xylene	179601-23-1	1	4.00	**203**	ug/L	
o-Xylene	95-47-6	1	2.00	**21.3**	ug/L	
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*116*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*95.4*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*101*	*%*	

MW-9-161207

16L0126-06 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/07/2016 10:35
Analyzed: 12/09/2016 18:13

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0253
Sample Size: 1 mL
Prepared: 12/09/2016 11:07
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	1000	**7910**	ug/L	
HC ID: GRO						
Surrogate: Toluene-d8			*80-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*95.4*	*%*	

Kennedy Jenks Consultants	Project: Circle K	
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MW-10-161207

16L0126-07 (Water)

Volatile Organic Compounds

Method: EPA 8260C — Sampled: 12/07/2016 11:45

Instrument: NT2 — Analyzed: 12/12/2016 11:02

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281 — Sample Size: 10 mL
Prepared: 12/12/2016 11:02 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.20	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*105*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*97.8*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*94.8*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*101*	*%*	

MW-10-161207

16L0126-07 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/07/2016 11:45
Analyzed: 12/12/2016 11:02

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281
Prepared: 12/12/2016 11:02
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	100	ND	ug/L	U
Surrogate: Toluene-d8			*80-120 %*	*97.8*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*94.8*	*%*	

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Kennedy Jenks Consultants	Project: Circle K	
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MW-11-161207

16L0126-08 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2

Sampled: 12/07/2016 14:55
Analyzed: 12/12/2016 11:22

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281 Sample Size: 10 mL
Prepared: 12/12/2016 11:22 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.20	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*102*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*98.3*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*97.6*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*97.7*	*%*	

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MW-11-161207
16L0126-08 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/07/2016 14:55
Analyzed: 12/12/2016 11:22

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281
Sample Size: 10 mL
Prepared: 12/12/2016 11:22
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	100	ND	ug/L	U
Surrogate: Toluene-d8			*80-120 %*	*98.3*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*97.6*	*%*	

Kennedy Jenks Consultants	Project: Circle K	
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MW-13-161208

16L0126-09 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2

Sampled: 12/08/2016 13:55
Analyzed: 12/12/2016 11:45

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281 Sample Size: 0.2 mL
Prepared: 12/12/2016 11:45 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	10.0	**1120**	ug/L	
Toluene	108-88-3	1	10.0	**949**	ug/L	
Ethylbenzene	100-41-4	1	10.0	**808**	ug/L	
m,p-Xylene	179601-23-1	1	20.0	**3290**	ug/L	
o-Xylene	95-47-6	1	10.0	**1060**	ug/L	
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*109*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*98.4*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*101*	*%*	

Analytical Report

Kennedy Jenks Consultants
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Federal Way, WA 98001

Project: Circle K
Project Number: 1696010.00
Project Manager: Julia Schwarz

Reported:
28-Dec-2016 09:58

MW-13-161208
16L0126-09 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/08/2016 13:55
Analyzed: 12/12/2016 11:45

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281
Prepared: 12/12/2016 11:45
Sample Size: 0.2 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	5000	**40000**	ug/L	
HC ID: GAS						
Surrogate: Toluene-d8			*80-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*98.4*	*%*	

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Kennedy Jenks Consultants	Project: Circle K	
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MW-13-161208

16L0126-09 (Water)

Metals and Metallic Compounds

Method: EPA 6010C — Sampled: 12/08/2016 13:55

Instrument: ICP2 — Analyzed: 12/13/2016 17:59

Sample Preparation:

Preparation Method: TWC EPA 3010A
Preparation Batch: BEL0301 — Sample Size: 25 mL
Prepared: 12/12/2016 16:10 — Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Lead	7439-92-1	1	0.0200	ND	mg/L	U

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Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010.00	**Reported:**
Federal Way, WA 98001	Project Manager: Julia Schwarz	28-Dec-2016 09:58

MW-14-161207

16L0126-10 (Water)

Wet Chemistry

Method: SM 2320 B-97
Sampled: 12/07/2016 16:35
Instrument: Accumet AR60
Analyzed: 12/09/2016 14:45

Sample Preparation:
Preparation Method: No Prep Wet Chem
Preparation Batch: BEL0264
Sample Size: 100 mL
Prepared: 12/09/2016 14:15
Final Volume: 100 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	**173**	mg/L CaCO3	

MW-14-161207

16L0126-10 (Water)

Wet Chemistry

Method: SM 4500-NO3¯ I-00
Instrument: [CALC]

Sampled: 12/07/2016 16:35
Analyzed: 12/09/2016 13:58

Sample Preparation:
Preparation Method: [CALC]
Preparation Batch: [CALC]
Prepared: 12/09/2016 10:50
Final Volume: 1

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrate-N	14797-55-8	1	0.020	ND	mg/L	

Instrument: LACHAT2

Analyzed: 12/09/2016 13:58

Sample Preparation:
Preparation Method: No Prep Wet Chem
Preparation Batch: BEL0250
Sample Size: 10 mL
Prepared: 12/09/2016 10:50
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrite-N	14797-65-0	1	0.010	**2.53**	mg/L	

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16L0126-10 (Water)

Wet Chemistry

Method: SM 4500-S2 D-00 Sampled: 12/07/2016 16:35
Instrument: DX500 Analyzed: 12/15/2016 16:54

Sample Preparation:
Preparation Method: No Prep Wet Chem
Preparation Batch: BEL0430 Sample Size: 5 mL
Prepared: 12/15/2016 16:14 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfide	18496-25-8	1	0.050	**0.511**	mg/L	H

MW-14-161207

16L0126-10 (Water)

Wet Chemistry

Method: SM 4500-SO4 G-97
Instrument: LACHAT1

Sampled: 12/07/2016 16:35
Analyzed: 12/13/2016 10:50

Sample Preparation:
Preparation Method: No Prep Wet Chem
Preparation Batch: BEL0315
Prepared: 12/13/2016 07:23
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	1	2.00	**14.8**	mg/L	

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16L0126-10 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2

Sampled: 12/07/2016 16:35
Analyzed: 12/12/2016 12:46

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281 Sample Size: 10 mL
Prepared: 12/12/2016 12:46 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.20	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*106*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*97.9*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*98.7*	*%*	

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16L0126-10 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/07/2016 16:35
Analyzed: 12/12/2016 12:46

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281
Prepared: 12/12/2016 12:46
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	100	ND	ug/L	U
Surrogate: Toluene-d8			*80-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*97.9*	*%*	

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16L0126-10 (Water)

Dissolved Gases

Method: EPA RSK-175 — Sampled: 12/07/2016 16:35
Instrument: FID6 — Analyzed: 12/12/2016 10:44

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BEL0278 — Sample Size: 10 mL
Prepared: 12/12/2016 08:26 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Methane	74-82-8	1	0.65	**725**	ug/L	
Surrogate: Propane			*72-122 %*	*83.6*	*%*	

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16L0126-10 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6010C
Sampled: 12/07/2016 16:35
Instrument: ICP2
Analyzed: 12/13/2016 18:40

Sample Preparation:
Preparation Method: WMN (No Prep)
Preparation Batch: BEL0303
Sample Size: 50 mL
Prepared: 12/12/2016 17:20
Final Volume: 50 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	**0.421**	mg/L	
Manganese, Dissolved	7439-96-5	1		0.0010	**0.0706**	mg/L	

MW-14-161207

16L0126-10RE1 (Water)

Wet Chemistry

Method: SM 4500-NO3⁻ I-00
Instrument: LACHAT2

Sampled: 12/07/2016 16:35
Analyzed: 12/09/2016 14:23

Sample Preparation:
Preparation Method: No Prep Wet Chem
Preparation Batch: BEL0250
Prepared: 12/09/2016 10:50
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		5	0.050	**2.57**	mg/L	D

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MW-15-161207

16L0126-11 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Sampled: 12/07/2016 15:40
Instrument: NT2
Analyzed: 12/12/2016 13:07

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281
Sample Size: 10 mL
Prepared: 12/12/2016 13:07
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.20	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*104*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*97.6*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*94.4*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*102*	*%*	

MW-15-161207

16L0126-11 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/07/2016 15:40
Analyzed: 12/12/2016 13:07

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281
Prepared: 12/12/2016 13:07
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	100	ND	ug/L	U
Surrogate: Toluene-d8			*80-120 %*	*97.6*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*94.4*	*%*	

MW-16-161207-PRE

16L0126-12 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2

Sampled: 12/07/2016 09:50
Analyzed: 12/12/2016 13:27

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281
Sample Size: 10 mL
Prepared: 12/12/2016 13:27
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.20	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*105*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*97.9*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*93.7*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*100*	*%*	

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MW-16-161207-PRE

16L0126-12 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/07/2016 09:50
Analyzed: 12/12/2016 13:27

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281
Sample Size: 10 mL
Prepared: 12/12/2016 13:27
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	100	ND	ug/L	U
Surrogate: Toluene-d8			*80-120 %*	*97.9*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*93.7*	*%*	

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MW-16-161207-POST

16L0126-13 (Water)

Volatile Organic Compounds

Method: EPA 8260C — Sampled: 12/07/2016 10:38
Instrument: NT2 — Analyzed: 12/12/2016 13:48

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281 — Sample Size: 10 mL
Prepared: 12/12/2016 13:48 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.20	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*106*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*96.1*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*94.3*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*99.4*	*%*	

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16L0126-13 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/07/2016 10:38
Analyzed: 12/12/2016 13:48

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281
Sample Size: 10 mL
Prepared: 12/12/2016 13:48
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	100	ND	ug/L	U
Surrogate: Toluene-d8			*80-120 %*	*96.1*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*94.3*	*%*	

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MW-17-161207

16L0126-14 (Water)

Wet Chemistry

Method: SM 2320 B-97 Sampled: 12/07/2016 16:10
Instrument: Accumet AR60 Analyzed: 12/09/2016 14:15

Sample Preparation: Preparation Method: No Prep Wet Chem
Preparation Batch: BEL0264 Sample Size: 100 mL
Prepared: 12/09/2016 14:15 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	**37.7**	mg/L CaCO3	

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16L0126-14 (Water)

Wet Chemistry

Method: SM 4500-NO3$^-$ I-00 Sampled: 12/07/2016 16:10
Instrument: [CALC] Analyzed: 12/09/2016 14:00

Sample Preparation: Preparation Method: [CALC]
Preparation Batch: [CALC]
Prepared: 12/09/2016 10:50 Final Volume: 1

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrate-N	14797-55-8	1	0.020	ND	mg/L	

Instrument: LACHAT2 Analyzed: 12/09/2016 14:00

Sample Preparation: Preparation Method: No Prep Wet Chem
Preparation Batch: BEL0250 Sample Size: 10 mL
Prepared: 12/09/2016 10:50 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		1	0.010	**0.469**	mg/L	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrite-N	14797-65-0	1	0.010	**0.469**	mg/L	

MW-17-161207

16L0126-14 (Water)

Wet Chemistry

Method: SM 4500-S2 D-00
Instrument: DX500

Sampled: 12/07/2016 16:10
Analyzed: 12/15/2016 16:56

Sample Preparation:
Preparation Method: No Prep Wet Chem
Preparation Batch: BEL0430
Prepared: 12/15/2016 16:14
Sample Size: 5 mL
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfide	18496-25-8	1	0.050	ND	mg/L	H, U

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16L0126-14 (Water)

Wet Chemistry

Method: SM 4500-SO4 G-97 — Sampled: 12/07/2016 16:10

Instrument: LACHAT1 — Analyzed: 12/13/2016 10:54

Sample Preparation:
Preparation Method: No Prep Wet Chem
Preparation Batch: BEL0315 — Sample Size: 10 mL
Prepared: 12/13/2016 07:23 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	1	2.00	**4.86**	mg/L	

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16L0126-14 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Sampled: 12/07/2016 16:10
Instrument: NT2
Analyzed: 12/12/2016 14:08

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281
Sample Size: 10 mL
Prepared: 12/12/2016 14:08
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.20	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*104*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*96.3*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*96.9*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*102*	*%*	

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16L0126-14 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/07/2016 16:10
Analyzed: 12/12/2016 14:08

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281 Sample Size: 10 mL
Prepared: 12/12/2016 14:08 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	100	**1060**	ug/L	
HC ID: GRO						
Surrogate: Toluene-d8			*80-120 %*	*96.3*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*96.9*	*%*	

MW-17-161207

16L0126-14 (Water)

Dissolved Gases

Method: EPA RSK-175
Instrument: FID6

Sampled: 12/07/2016 16:10
Analyzed: 12/12/2016 10:58

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BEL0278
Prepared: 12/12/2016 08:26
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Methane	74-82-8	1	0.65	ND	ug/L	U
Surrogate: Propane			*72-122 %*	*84.4*	*%*	

MW-17-161207

16L0126-14 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6010C
Instrument: ICP2

Sampled: 12/07/2016 16:10
Analyzed: 12/13/2016 18:44

Sample Preparation:
Preparation Method: WMN (No Prep)
Preparation Batch: BEL0303
Prepared: 12/12/2016 17:20
Sample Size: 50 mL
Final Volume: 50 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	**0.0306**	mg/L	J
Manganese, Dissolved	7439-96-5	1		0.0010	**0.0376**	mg/L	

MW-18-161207

16L0126-15 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2

Sampled: 12/07/2016 15:15
Analyzed: 12/12/2016 14:28

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281 Sample Size: 10 mL
Prepared: 12/12/2016 14:28 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.20	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*107*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*97.5*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*96.2*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*102*	*%*	

MW-18-161207

16L0126-15 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/07/2016 15:15
Analyzed: 12/12/2016 14:28

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281
Sample Size: 10 mL
Prepared: 12/12/2016 14:28
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	100	ND	ug/L	U
Surrogate: Toluene-d8			*80-120 %*	*97.5*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*96.2*	*%*	

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MW-19-161208

16L0126-16 (Water)

Wet Chemistry

Method: SM 2320 B-97 — Sampled: 12/08/2016 12:15

Instrument: Accumet AR60 — Analyzed: 12/09/2016 14:15

Sample Preparation:
Preparation Method: No Prep Wet Chem
Preparation Batch: BEL0264 — Sample Size: 100 mL
Prepared: 12/09/2016 14:15 — Final Volume: 100 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	**106**	mg/L CaCO3	

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MW-19-161208

16L0126-16 (Water)

Wet Chemistry

Method: SM 4500-NO3⁻ I-00 — Sampled: 12/08/2016 12:15

Instrument: [CALC] — Analyzed: 12/09/2016 14:01

Sample Preparation: Preparation Method: [CALC]
Preparation Batch: [CALC]
Prepared: 12/09/2016 10:50 Final Volume: 1

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrate-N	14797-55-8	1	0.020	ND	mg/L	

Instrument: LACHAT2 — Analyzed: 12/09/2016 14:01

Sample Preparation: Preparation Method: No Prep Wet Chem
Preparation Batch: BEL0250 Sample Size: 10 mL
Prepared: 12/09/2016 10:50 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		1	0.010	ND	mg/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrite-N	14797-65-0	1	0.010	ND	mg/L	U

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Project: Circle K
Project Number: 1696010.00
Project Manager: Julia Schwarz

Reported:
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MW-19-161208

16L0126-16 (Water)

Wet Chemistry

Method: SM 4500-S2 D-00
Instrument: DX500

Sampled: 12/08/2016 12:15
Analyzed: 12/15/2016 16:56

Sample Preparation:
Preparation Method: No Prep Wet Chem
Preparation Batch: BEL0430
Prepared: 12/15/2016 16:14
Sample Size: 5 mL
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfide	18496-25-8	1	0.050	**0.068**	mg/L	

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16L0126-16 (Water)

Wet Chemistry

Method: SM 4500-SO4 G-97 — Sampled: 12/08/2016 12:15

Instrument: LACHAT1 — Analyzed: 12/13/2016 10:55

Sample Preparation:
Preparation Method: No Prep Wet Chem
Preparation Batch: BEL0315 — Sample Size: 10 mL
Prepared: 12/13/2016 07:23 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	1	2.00	**6.15**	mg/L	

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Project Number: 1696010.00
Project Manager: Julia Schwarz

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MW-19-161208

16L0126-16 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2

Sampled: 12/08/2016 12:15
Analyzed: 12/12/2016 14:49

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281
Prepared: 12/12/2016 14:49
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.20	**265**	ug/L	E
Toluene	108-88-3	1	0.20	**515**	ug/L	E
Ethylbenzene	100-41-4	1	0.20	**350**	ug/L	E
m,p-Xylene	179601-23-1	1	0.40	**519**	ug/L	E
o-Xylene	95-47-6	1	0.20	**341**	ug/L	E
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*271*	*%*	*
Surrogate: Toluene-d8			*80-120 %*	*69.3*	*%*	*
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*98.7*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*101*	*%*	

MW-19-161208

16L0126-16 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/08/2016 12:15
Analyzed: 12/12/2016 14:49

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281
Sample Size: 10 mL
Prepared: 12/12/2016 14:49
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	100	**15900**	ug/L	E
HC ID: GAS						
Surrogate: Toluene-d8			*80-120 %*	*69.3*	*%*	*
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*98.7*	*%*	

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MW-19-161208

16L0126-16 (Water)

Dissolved Gases

Method: EPA RSK-175
Instrument: FID6

Sampled: 12/08/2016 12:15
Analyzed: 12/12/2016 11:12

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BEL0278
Prepared: 12/12/2016 08:26
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Methane	74-82-8	1	0.65	**29.6**	ug/L	
Surrogate: Propane			*72-122 %*	*89.2*	*%*	

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16L0126-16 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6010C — Sampled: 12/08/2016 12:15
Instrument: ICP2 — Analyzed: 12/13/2016 18:48

Sample Preparation:
Preparation Method: WMN (No Prep)
Preparation Batch: BEL0303 — Sample Size: 50 mL
Prepared: 12/12/2016 17:20 — Final Volume: 50 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	**1.93**	mg/L	
Manganese, Dissolved	7439-96-5	1		0.0010	**0.926**	mg/L	

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16L0126-16RE1 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2

Sampled: 12/08/2016 12:15
Analyzed: 12/13/2016 16:39

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0337
Prepared: 12/13/2016 12:44
Sample Size: 0.05 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	40.0	**1930**	ug/L	
Toluene	108-88-3	1	40.0	**6350**	ug/L	B
Ethylbenzene	100-41-4	1	40.0	**1180**	ug/L	
m,p-Xylene	179601-23-1	1	80.0	**4210**	ug/L	
o-Xylene	95-47-6	1	40.0	**1510**	ug/L	
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*109*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*94.7*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*102*	*%*	

Analytical Report

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16L0126-16RE1 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/08/2016 12:15
Analyzed: 12/13/2016 16:39

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0337
Sample Size: 0.05 mL
Prepared: 12/13/2016 16:39
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	20000	**68200**	ug/L	
HC ID: GAS						
Surrogate: Toluene-d8			*80-120 %*	*101*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*94.7*	*%*	

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MW-20-161208

16L0126-17 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2

Sampled: 12/08/2016 09:50
Analyzed: 12/12/2016 15:09

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281 Sample Size: 10 mL
Prepared: 12/12/2016 15:09 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
1,2-Dichloroethane	107-06-2	1	0.20	**2.33**	ug/L	
Benzene	71-43-2	1	0.20	**433**	ug/L	E
Toluene	108-88-3	1	0.20	**616**	ug/L	E
1,2-Dibromoethane	106-93-4	1	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.20	**393**	ug/L	E
m,p-Xylene	179601-23-1	1	0.40	**617**	ug/L	E
o-Xylene	95-47-6	1	0.20	**423**	ug/L	E
Methyl tert-butyl Ether	1634-04-4	1	0.50	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*244*	*%*	*
Surrogate: Toluene-d8			*80-120 %*	*57.9*	*%*	*
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*102*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*99.4*	*%*	

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16L0126-17 (Water)

Volatile Organic Compounds

Method: NWTPHg — Sampled: 12/08/2016 09:50
Instrument: NT2 — Analyzed: 12/12/2016 15:09

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281 — Sample Size: 10 mL
Prepared: 12/12/2016 15:09 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	100	**15300**	ug/L	E
HC ID: GAS						
Surrogate: Toluene-d8			*80-120 %*	*57.9*	*%*	*
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*102*	*%*	

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MW-20-161208

16L0126-17 (Water)

Metals and Metallic Compounds

Method: EPA 6010C
Instrument: ICP2

Sampled: 12/08/2016 09:50
Analyzed: 12/13/2016 19:55

Sample Preparation:
Preparation Method: TWC EPA 3010A
Preparation Batch: BEL0301
Prepared: 12/12/2016 16:10
Sample Size: 25 mL
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Lead	7439-92-1	1	0.0200	ND	mg/L	U

MW-20-161208

16L0126-17RE1 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2

Sampled: 12/08/2016 09:50
Analyzed: 12/13/2016 16:59

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0337 Sample Size: 0.05 mL
Prepared: 12/13/2016 12:44 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
1,2-Dichloroethane	107-06-2	1	40.0	ND	ug/L	U
Benzene	71-43-2	1	40.0	**7010**	ug/L	
Toluene	108-88-3	1	40.0	**9220**	ug/L	B
1,2-Dibromoethane	106-93-4	1	40.0	ND	ug/L	U
Ethylbenzene	100-41-4	1	40.0	**1520**	ug/L	
m,p-Xylene	179601-23-1	1	80.0	**5730**	ug/L	
o-Xylene	95-47-6	1	40.0	**2450**	ug/L	
Methyl tert-butyl Ether	1634-04-4	1	100	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*111*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*100*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*93.2*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*103*	*%*	

MW-20-161208

16L0126-17RE1 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/08/2016 09:50
Analyzed: 12/13/2016 16:59

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0337
Prepared: 12/13/2016 16:59
Sample Size: 0.05 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	20000	**85900**	ug/L	
HC ID: GAS						
Surrogate: Toluene-d8			*80-120 %*	*100*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*93.2*	*%*	

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Project: Circle K
Project Number: 1696010.00
Project Manager: Julia Schwarz

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MW-21-161208

16L0126-18 (Water)

Wet Chemistry

Method: SM 2320 B-97
Instrument: Accumet AR60

Sampled: 12/08/2016 14:50
Analyzed: 12/09/2016 14:45

Sample Preparation: Preparation Method: No Prep Wet Chem
Preparation Batch: BEL0264
Prepared: 12/09/2016 14:15
Sample Size: 100 mL
Final Volume: 100 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	**465**	mg/L CaCO3	

MW-21-161208

16L0126-18 (Water)

Wet Chemistry

Method: SM 4500-NO3⁻ I-00 Sampled: 12/08/2016 14:50
Instrument: [CALC] Analyzed: 12/09/2016 14:02

Sample Preparation: Preparation Method: [CALC]
Preparation Batch: [CALC]
Prepared: 12/09/2016 10:50 Final Volume: 1

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrate-N	14797-55-8	1	0.020	ND	mg/L	

Instrument: LACHAT2 Analyzed: 12/09/2016 14:02

Sample Preparation: Preparation Method: No Prep Wet Chem
Preparation Batch: BEL0250 Sample Size: 10 mL
Prepared: 12/09/2016 10:50 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		1	0.010	ND	mg/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrite-N	14797-65-0	1	0.010	**0.014**	mg/L	

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16L0126-18 (Water)

Wet Chemistry

Method: SM 4500-S2 D-00
Instrument: DX500

Sampled: 12/08/2016 14:50
Analyzed: 12/15/2016 16:57

Sample Preparation:
Preparation Method: No Prep Wet Chem
Preparation Batch: BEL0430
Prepared: 12/15/2016 16:14
Sample Size: 5 mL
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfide	18496-25-8	1	0.050	ND	mg/L	U

MW-21-161208

16L0126-18 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2

Sampled: 12/08/2016 14:50
Analyzed: 12/13/2016 17:20

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0337
Sample Size: 0.02 mL
Prepared: 12/13/2016 13:08
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
1,2-Dichloroethane	107-06-2	1	100	ND	ug/L	U
Benzene	71-43-2	1	100	**21400**	ug/L	
Toluene	108-88-3	1	100	**21400**	ug/L	B
1,2-Dibromoethane	106-93-4	1	100	ND	ug/L	U
Ethylbenzene	100-41-4	1	100	**2280**	ug/L	
m,p-Xylene	179601-23-1	1	200	**9230**	ug/L	
o-Xylene	95-47-6	1	100	**4010**	ug/L	
Methyl tert-butyl Ether	1634-04-4	1	250	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*114*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*100*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*94.7*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*100*	*%*	

MW-21-161208
16L0126-18 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/08/2016 14:50
Analyzed: 12/13/2016 17:20

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0337 Sample Size: 0.02 mL
Prepared: 12/13/2016 17:20 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	50000	**163000**	ug/L	
HC ID: GAS						
Surrogate: Toluene-d8			*80-120 %*	*100*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*94.7*	*%*	

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16L0126-18 (Water)

Dissolved Gases

Method: EPA RSK-175 — Sampled: 12/08/2016 14:50
Instrument: FID6 — Analyzed: 12/12/2016 11:25

Sample Preparation:
Preparation Method: No Prep - Volatiles
Preparation Batch: BEL0278 — Sample Size: 10 mL
Prepared: 12/12/2016 08:26 — Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Methane	74-82-8	1	0.65	**726**	ug/L	
Surrogate: Propane			*72-122 %*	*79.8*	*%*	

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MW-21-161208

16L0126-18 (Water)

Metals and Metallic Compounds

Method: EPA 6010C
Instrument: ICP2

Sampled: 12/08/2016 14:50
Analyzed: 12/13/2016 19:59

Sample Preparation:
Preparation Method: TWC EPA 3010A
Preparation Batch: BEL0301
Prepared: 12/12/2016 16:10
Sample Size: 25 mL
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Lead	7439-92-1	1	0.0200	ND	mg/L	U

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MW-21-161208

16L0126-18RE1 (Water)

Wet Chemistry

Method: SM 4500-SO4 G-97
Instrument: LACHAT1

Sampled: 12/08/2016 14:50
Analyzed: 12/13/2016 11:09

Sample Preparation:
Preparation Method: No Prep Wet Chem
Preparation Batch: BEL0315
Prepared: 12/13/2016 07:23
Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	2	4.00	**4.19**	mg/L	D

Dup-1-161208

16L0126-19 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2

Sampled: 12/08/2016 00:00
Analyzed: 12/13/2016 17:40

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0337
Sample Size: 0.2 mL
Prepared: 12/13/2016 12:44
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	10.0	**1140**	ug/L	
Toluene	108-88-3	1	10.0	**1080**	ug/L	B
Ethylbenzene	100-41-4	1	10.0	**714**	ug/L	
m,p-Xylene	179601-23-1	1	20.0	**2970**	ug/L	
o-Xylene	95-47-6	1	10.0	**1020**	ug/L	
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*107*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*102*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*95.7*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*102*	*%*	

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Dup-1-161208

16L0126-19 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/08/2016 00:00
Analyzed: 12/13/2016 17:40

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0337
Sample Size: 0.2 mL
Prepared: 12/13/2016 17:40
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	5000	**38600**	ug/L	
HC ID: GAS						
Surrogate: Toluene-d8			*80-120 %*	*102*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*95.7*	*%*	

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Trip Blanks

16L0126-20 (Water)

Volatile Organic Compounds

Method: EPA 8260C
Instrument: NT2

Sampled: 12/07/2016 00:00
Analyzed: 12/12/2016 10:42

Sample Preparation:
Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281
Sample Size: 10 mL
Prepared: 12/12/2016 10:42
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.20	ND	ug/L	U
Toluene	108-88-3	1	0.20	ND	ug/L	U
Ethylbenzene	100-41-4	1	0.20	ND	ug/L	U
m,p-Xylene	179601-23-1	1	0.40	ND	ug/L	U
o-Xylene	95-47-6	1	0.20	ND	ug/L	U
Surrogate: 1,2-Dichloroethane-d4			*80-129 %*	*109*	*%*	
Surrogate: Toluene-d8			*80-120 %*	*98.3*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*96.9*	*%*	
Surrogate: 1,2-Dichlorobenzene-d4			*80-120 %*	*99.2*	*%*	

Trip Blanks

16L0126-20 (Water)

Volatile Organic Compounds

Method: NWTPHg
Instrument: NT2

Sampled: 12/07/2016 00:00
Analyzed: 12/12/2016 10:42

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BEL0281 Sample Size: 10 mL
Prepared: 12/12/2016 10:42 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)		1	100	ND	ug/L	U
Surrogate: Toluene-d8			*80-120 %*	*98.3*	*%*	
Surrogate: 4-Bromofluorobenzene			*80-120 %*	*96.9*	*%*	

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16L0126-21 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6010C
Instrument: ICP2
Sampled: 12/08/2016 14:50
Analyzed: 12/13/2016 18:52

Sample Preparation:
Preparation Method: WMN (No Prep)
Preparation Batch: BEL0303
Prepared: 12/12/2016 17:20
Sample Size: 50 mL
Final Volume: 50 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	**10.9**	mg/L	
Manganese, Dissolved	7439-96-5	1		0.0010	**5.06**	mg/L	

Wet Chemistry - Quality Control

Batch BEL0250 - No Prep Wet Chem

Instrument: LACHAT2

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BEL0250-BLK1)				Prepared: 09-Dec-2016		Analyzed: 09-Dec-2016 13:38				
Nitrate + Nitrite as N	ND	0.010	mg/L							U
Nitrite-N	ND	0.010	mg/L							U
LCS (BEL0250-BS1)				Prepared: 09-Dec-2016		Analyzed: 09-Dec-2016 13:40				
Nitrate + Nitrite as N	0.497	0.010	mg/L	0.500		99.4	90-110			
LCS (BEL0250-BS2)				Prepared: 09-Dec-2016		Analyzed: 09-Dec-2016 13:41				
Nitrite-N	0.494	0.010	mg/L	0.500		98.8	75-125			

Wet Chemistry - Quality Control

Batch BEL0264 - No Prep Wet Chem

Instrument: Accumet AR60

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BEL0264-BLK1)			Prepared: 09-Dec-2016 Analyzed: 09-Dec-2016 14:15							
Alkalinity, Total	ND	1.00	mg/L CaCO3							U
Duplicate (BEL0264-DUP1)	**Source: 16L0126-10**		Prepared: 09-Dec-2016 Analyzed: 09-Dec-2016 14:45							
Alkalinity, Total	173	1.00	mg/L CaCO3		173			0.29	20	
Reference (BEL0264-SRM1)	**SRM: E002024**		Prepared: 09-Dec-2016 Analyzed: 09-Dec-2016 14:45							
Alkalinity, Total	43.9	1.00	mg/L CaCO3	44.1		99.5	90-110			

Wet Chemistry - Quality Control

Batch BEL0315 - No Prep Wet Chem

Instrument: LACHAT1

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BEL0315-BLK1)				Prepared: 13-Dec-2016	Analyzed: 13-Dec-2016 10:47					
Sulfate	ND	2.00	mg/L							U
LCS (BEL0315-BS1)				Prepared: 13-Dec-2016	Analyzed: 13-Dec-2016 10:49					
Sulfate	14.8	2.00	mg/L	15.0		98.7	90-110			
Duplicate (BEL0315-DUP1)	**Source: 16L0126-10**			Prepared: 13-Dec-2016	Analyzed: 13-Dec-2016 10:51					
Sulfate	15.1	2.00	mg/L		14.8			1.73	20	
Matrix Spike (BEL0315-MS1)	**Source: 16L0126-10**			Prepared: 13-Dec-2016	Analyzed: 13-Dec-2016 10:53					
Sulfate	94.3	10.0	mg/L	75.0	14.8	106	75-125			D

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Wet Chemistry - Quality Control

Batch BEL0430 - No Prep Wet Chem

Instrument: DX500

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BEL0430-BLK1)				Prepared: 15-Dec-2016 Analyzed: 15-Dec-2016 16:28						
Sulfide	ND	0.050	mg/L							U
LCS (BEL0430-BS1)				Prepared: 15-Dec-2016 Analyzed: 15-Dec-2016 16:28						
Sulfide	0.477	0.050	mg/L	0.497		95.9	75-125			
Duplicate (BEL0430-DUP1)	**Source: 16L0126-10**			Prepared: 15-Dec-2016 Analyzed: 15-Dec-2016 16:54						
Sulfide	0.481	0.050	mg/L		0.511			6.05	20	
Matrix Spike (BEL0430-MS1)	**Source: 16L0126-10**			Prepared: 15-Dec-2016 Analyzed: 15-Dec-2016 16:55						
Sulfide	0.986	0.050	mg/L	0.497	0.511	95.5	75-125			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Volatile Organic Compounds - Quality Control

Batch BEL0253 - EPA 5030 (Purge and Trap)

Instrument: NT2

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BEL0253-BLK1)				Prepared: 09-Dec-2016 Analyzed: 09-Dec-2016 11:13						
Gasoline Range Organics (Tol-Nap)	ND	100	ug/L							U
Surrogate: Toluene-d8	4.86		ug/L	*5.00*		*97.1*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.72		ug/L	*5.00*		*94.3*	*80-120*			
Blank (BEL0253-BLK2)				Prepared: 09-Dec-2016 Analyzed: 09-Dec-2016 11:13						
1,2-Dichloroethane	ND	0.20	ug/L							U
Benzene	ND	0.20	ug/L							U
Toluene	ND	0.20	ug/L							U
1,2-Dibromoethane	ND	0.20	ug/L							U
Ethylbenzene	ND	0.20	ug/L							U
m,p-Xylene	ND	0.40	ug/L							U
o-Xylene	ND	0.20	ug/L							U
Methyl tert-butyl Ether	ND	0.50	ug/L							U
Surrogate: 1,2-Dichloroethane-d4	5.35		ug/L	*5.00*		*107*	*80-129*			
Surrogate: Toluene-d8	4.86		ug/L	*5.00*		*97.1*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.72		ug/L	*5.00*		*94.3*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	4.93		ug/L	*5.00*		*98.7*	*80-120*			
LCS (BEL0253-BS1)				Prepared: 09-Dec-2016 Analyzed: 09-Dec-2016 09:29						
Gasoline Range Organics (Tol-Nap)	1000	100	ug/L	1000		100	80-120			
Surrogate: Toluene-d8	5.01		ug/L	*5.00*		*100*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.76		ug/L	*5.00*		*95.2*	*80-120*			
LCS (BEL0253-BS2)				Prepared: 09-Dec-2016 Analyzed: 09-Dec-2016 10:10						
1,2-Dichloroethane	10.5	0.20	ug/L	10.0		105	75-123			
Benzene	10.4	0.20	ug/L	10.0		104	80-120			
Toluene	10.3	0.20	ug/L	10.0		103	80-120			
1,2-Dibromoethane	11.2	0.20	ug/L	10.0		112	80-121			
Ethylbenzene	10.1	0.20	ug/L	10.0		101	80-120			
m,p-Xylene	20.7	0.40	ug/L	20.0		103	80-121			
o-Xylene	10.2	0.20	ug/L	10.0		102	80-121			
Methyl tert-butyl Ether	10.4	0.50	ug/L	10.0		104	71-132			
Surrogate: 1,2-Dichloroethane-d4	5.30		ug/L	*5.00*		*106*	*80-129*			
Surrogate: Toluene-d8	5.07		ug/L	*5.00*		*101*	*80-120*			

Volatile Organic Compounds - Quality Control

Batch BEL0253 - EPA 5030 (Purge and Trap)

Instrument: NT2

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BEL0253-BS2)				Prepared: 09-Dec-2016 Analyzed: 09-Dec-2016 10:10						
Surrogate: 4-Bromofluorobenzene	4.90		ug/L	*5.00*		*97.9*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	5.04		ug/L	*5.00*		*101*	*80-120*			
LCS Dup (BEL0253-BSD1)				Prepared: 09-Dec-2016 Analyzed: 09-Dec-2016 09:49						
Gasoline Range Organics (Tol-Nap)	1020	100	ug/L	1000		102	80-120	1.71	30	
Surrogate: Toluene-d8	5.06		ug/L	*5.00*		*101*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.81		ug/L	*5.00*		*96.1*	*80-120*			
LCS Dup (BEL0253-BSD2)				Prepared: 09-Dec-2016 Analyzed: 09-Dec-2016 10:30						
1,2-Dichloroethane	10.4	0.20	ug/L	10.0		104	75-123	1.61	30	
Benzene	10.2	0.20	ug/L	10.0		102	80-120	1.30	30	
Toluene	10.1	0.20	ug/L	10.0		101	80-120	2.25	30	
1,2-Dibromoethane	10.9	0.20	ug/L	10.0		109	80-121	3.32	30	
Ethylbenzene	9.87	0.20	ug/L	10.0		98.7	80-120	2.36	30	
m,p-Xylene	20.2	0.40	ug/L	20.0		101	80-121	2.26	30	
o-Xylene	9.99	0.20	ug/L	10.0		99.9	80-121	1.71	30	
Methyl tert-butyl Ether	10.3	0.50	ug/L	10.0		103	71-132	0.37	30	
Surrogate: 1,2-Dichloroethane-d4	4.94		ug/L	*5.00*		*98.8*	*80-129*			
Surrogate: Toluene-d8	5.04		ug/L	*5.00*		*101*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.83		ug/L	*5.00*		*96.7*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	5.07		ug/L	*5.00*		*101*	*80-120*			

Volatile Organic Compounds - Quality Control

Batch BEL0281 - EPA 5030 (Purge and Trap)

Instrument: NT2

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BEL0281-BLK1)				Prepared: 12-Dec-2016	Analyzed: 12-Dec-2016 10:21					
Gasoline Range Organics (Tol-Nap)	ND	100	ug/L							U
Surrogate: Toluene-d8	4.94		ug/L	*5.00*		*98.7*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.82		ug/L	*5.00*		*96.4*	*80-120*			
Blank (BEL0281-BLK2)				Prepared: 12-Dec-2016	Analyzed: 12-Dec-2016 10:21					
1,2-Dichloroethane	ND	0.20	ug/L							U
Benzene	ND	0.20	ug/L							U
Toluene	ND	0.20	ug/L							U
1,2-Dibromoethane	ND	0.20	ug/L							U
Ethylbenzene	ND	0.20	ug/L							U
m,p-Xylene	ND	0.40	ug/L							U
o-Xylene	ND	0.20	ug/L							U
Methyl tert-butyl Ether	ND	0.50	ug/L							U
Surrogate: 1,2-Dichloroethane-d4	5.35		ug/L	*5.00*		*107*	*80-129*			
Surrogate: Toluene-d8	4.94		ug/L	*5.00*		*98.7*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.82		ug/L	*5.00*		*96.4*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	4.99		ug/L	*5.00*		*99.7*	*80-120*			
LCS (BEL0281-BS1)				Prepared: 12-Dec-2016	Analyzed: 12-Dec-2016 07:54					
Gasoline Range Organics (Tol-Nap)	993	100	ug/L	1000		99.3	80-120			
Surrogate: Toluene-d8	4.95		ug/L	*5.00*		*99.0*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.81		ug/L	*5.00*		*96.2*	*80-120*			
LCS (BEL0281-BS2)				Prepared: 12-Dec-2016	Analyzed: 12-Dec-2016 08:55					
1,2-Dichloroethane	9.66	0.20	ug/L	10.0		96.6	75-123			
Benzene	9.76	0.20	ug/L	10.0		97.6	80-120			
Toluene	9.69	0.20	ug/L	10.0		96.9	80-120			
1,2-Dibromoethane	10.5	0.20	ug/L	10.0		105	80-121			
Ethylbenzene	9.53	0.20	ug/L	10.0		95.3	80-120			
m,p-Xylene	19.9	0.40	ug/L	20.0		99.5	80-121			
o-Xylene	9.78	0.20	ug/L	10.0		97.8	80-121			
Methyl tert-butyl Ether	10.6	0.50	ug/L	10.0		106	71-132			
Surrogate: 1,2-Dichloroethane-d4	5.46		ug/L	*5.00*		*109*	*80-129*			
Surrogate: Toluene-d8	4.98		ug/L	*5.00*		*99.6*	*80-120*			

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Project: Circle K
Project Number: 1696010.00
Project Manager: Julia Schwarz

Reported:
28-Dec-2016 09:58

Volatile Organic Compounds - Quality Control

Batch BEL0281 - EPA 5030 (Purge and Trap)

Instrument: NT2

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BEL0281-BS2)			Prepared: 12-Dec-2016 Analyzed: 12-Dec-2016 08:55							
Surrogate: 4-Bromofluorobenzene	4.86		ug/L	*5.00*		*97.2*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	5.13		ug/L	*5.00*		*103*	*80-120*			
LCS Dup (BEL0281-BSD1)			Prepared: 12-Dec-2016 Analyzed: 12-Dec-2016 08:35							
Gasoline Range Organics (Tol-Nap)	955	100	ug/L	1000		95.5	80-120	3.94	30	
Surrogate: Toluene-d8	5.01		ug/L	*5.00*		*100*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.93		ug/L	*5.00*		*98.6*	*80-120*			
LCS Dup (BEL0281-BSD2)			Prepared: 12-Dec-2016 Analyzed: 12-Dec-2016 09:40							
1,2-Dichloroethane	9.69	0.20	ug/L	10.0		96.9	75-123	0.29	30	
Benzene	10.0	0.20	ug/L	10.0		100	80-120	2.68	30	
Toluene	9.95	0.20	ug/L	10.0		99.5	80-120	2.61	30	
1,2-Dibromoethane	10.0	0.20	ug/L	10.0		100	80-121	4.08	30	
Ethylbenzene	9.88	0.20	ug/L	10.0		98.8	80-120	3.61	30	
m,p-Xylene	20.7	0.40	ug/L	20.0		104	80-121	4.14	30	
o-Xylene	10.2	0.20	ug/L	10.0		102	80-121	3.80	30	
Methyl tert-butyl Ether	10.3	0.50	ug/L	10.0		103	71-132	3.57	30	
Surrogate: 1,2-Dichloroethane-d4	5.18		ug/L	*5.00*		*104*	*80-129*			
Surrogate: Toluene-d8	5.03		ug/L	*5.00*		*101*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.89		ug/L	*5.00*		*97.7*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	5.01		ug/L	*5.00*		*100*	*80-120*			

Volatile Organic Compounds - Quality Control

Batch BEL0337 - EPA 5030 (Purge and Trap)

Instrument: NT2

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BEL0337-BLK1)				Prepared: 13-Dec-2016	Analyzed: 13-Dec-2016 14:56					
Gasoline Range Organics (Tol-Nap)	ND	100	ug/L							U
Surrogate: Toluene-d8	4.93		ug/L	*5.00*		*98.6*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.83		ug/L	*5.00*		*96.6*	*80-120*			
Blank (BEL0337-BLK2)				Prepared: 13-Dec-2016	Analyzed: 13-Dec-2016 14:56					
1,2-Dichloroethane	ND	0.20	ug/L							U
Benzene	ND	0.20	ug/L							U
Toluene	ND	0.20	ug/L							U
1,2-Dibromoethane	ND	0.20	ug/L							U
Ethylbenzene	ND	0.20	ug/L							U
m,p-Xylene	ND	0.40	ug/L							U
o-Xylene	ND	0.20	ug/L							U
Methyl tert-butyl Ether	ND	0.50	ug/L							U
Surrogate: 1,2-Dichloroethane-d4	5.40		ug/L	*5.00*		*108*	*80-129*			
Surrogate: Toluene-d8	4.93		ug/L	*5.00*		*98.6*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.83		ug/L	*5.00*		*96.6*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	4.94		ug/L	*5.00*		*98.8*	*80-120*			
Blank (BEL0337-BLK3)				Prepared: 13-Dec-2016	Analyzed: 13-Dec-2016 15:58					
1,2-Dichloroethane	ND	0.20	ug/L							U
Benzene	ND	0.20	ug/L							U
Toluene	0.20	0.20	ug/L							*
1,2-Dibromoethane	ND	0.20	ug/L							U
Ethylbenzene	ND	0.20	ug/L							U
m,p-Xylene	ND	0.40	ug/L							U
o-Xylene	ND	0.20	ug/L							U
Methyl tert-butyl Ether	ND	0.50	ug/L							U
Surrogate: 1,2-Dichloroethane-d4	5.11		ug/L	*5.00*		*102*	*80-129*			
Surrogate: Toluene-d8	4.97		ug/L	*5.00*		*99.3*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.78		ug/L	*5.00*		*95.6*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	4.95		ug/L	*5.00*		*99.1*	*80-120*			
LCS (BEL0337-BS1)				Prepared: 13-Dec-2016	Analyzed: 13-Dec-2016 13:34					
Gasoline Range Organics (Tol-Nap)	1060	100	ug/L	1000		106	80-120			

Volatile Organic Compounds - Quality Control

Batch BEL0337 - EPA 5030 (Purge and Trap)

Instrument: NT2

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS (BEL0337-BS1)			Prepared: 13-Dec-2016 Analyzed: 13-Dec-2016 13:34							
Surrogate: Toluene-d8	5.08		ug/L	*5.00*		*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.72		ug/L	*5.00*		*94.5*	*80-120*			
LCS (BEL0337-BS2)			Prepared: 13-Dec-2016 Analyzed: 13-Dec-2016 14:15							
1,2-Dichloroethane	10.9	0.20	ug/L	10.0		109	75-123			
Benzene	10.7	0.20	ug/L	10.0		107	80-120			
Toluene	10.8	0.20	ug/L	10.0		108	80-120			B
1,2-Dibromoethane	11.5	0.20	ug/L	10.0		115	80-121			
Ethylbenzene	10.5	0.20	ug/L	10.0		105	80-120			
m,p-Xylene	21.6	0.40	ug/L	20.0		108	80-121			
o-Xylene	10.8	0.20	ug/L	10.0		108	80-121			
Methyl tert-butyl Ether	11.2	0.50	ug/L	10.0		112	71-132			
Surrogate: 1,2-Dichloroethane-d4	5.36		ug/L	*5.00*		*107*	*80-129*			
Surrogate: Toluene-d8	5.02		ug/L	*5.00*		*100*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.81		ug/L	*5.00*		*96.3*	*80-120*			
Surrogate: 1,2-Dichlorobenzene-d4	5.10		ug/L	*5.00*		*102*	*80-120*			
LCS Dup (BEL0337-BSD1)			Prepared: 13-Dec-2016 Analyzed: 13-Dec-2016 13:55							
Gasoline Range Organics (Tol-Nap)	1080	100	ug/L	1000		108	80-120	1.90	30	
Surrogate: Toluene-d8	5.00		ug/L	*5.00*		*100*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.80		ug/L	*5.00*		*96.0*	*80-120*			
LCS Dup (BEL0337-BSD2)			Prepared: 13-Dec-2016 Analyzed: 13-Dec-2016 14:35							
1,2-Dichloroethane	11.0	0.20	ug/L	10.0		110	75-123	0.72	30	
Benzene	10.7	0.20	ug/L	10.0		107	80-120	0.67	30	
Toluene	10.6	0.20	ug/L	10.0		106	80-120	1.93	30	B
1,2-Dibromoethane	11.3	0.20	ug/L	10.0		113	80-121	1.52	30	
Ethylbenzene	10.6	0.20	ug/L	10.0		106	80-120	0.58	30	
m,p-Xylene	22.0	0.40	ug/L	20.0		110	80-121	1.96	30	
o-Xylene	10.9	0.20	ug/L	10.0		109	80-121	0.58	30	
Methyl tert-butyl Ether	11.7	0.50	ug/L	10.0		117	71-132	4.13	30	
Surrogate: 1,2-Dichloroethane-d4	5.60		ug/L	*5.00*		*112*	*80-129*			
Surrogate: Toluene-d8	5.06		ug/L	*5.00*		*101*	*80-120*			
Surrogate: 4-Bromofluorobenzene	4.99		ug/L	*5.00*		*99.7*	*80-120*			

Volatile Organic Compounds - Quality Control

Batch BEL0337 - EPA 5030 (Purge and Trap)

Instrument: NT2

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BEL0337-BSD2)				Prepared: 13-Dec-2016	Analyzed: 13-Dec-2016 14:35					
Surrogate: 1,2-Dichlorobenzene-d4	5.17		ug/L	*5.00*		*103*	*80-120*			

Dissolved Gases - Quality Control

Batch BEL0278 - No Prep - Volatiles

Instrument: FID6

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BEL0278-BLK1)				Prepared: 12-Dec-2016 Analyzed: 12-Dec-2016 09:28						
Methane	ND	0.65	ug/L							U
Surrogate: Propane	1630		ug/L	*1800*		*90.6*	*72-122*			
LCS (BEL0278-BS1)				Prepared: 12-Dec-2016 Analyzed: 12-Dec-2016 09:00						
Methane	668		ug/L	656		102	80-120			
Surrogate: Propane	1590		ug/L	*1800*		*88.1*	*62-122*			
LCS Dup (BEL0278-BSD1)				Prepared: 12-Dec-2016 Analyzed: 12-Dec-2016 09:14						
Methane	687		ug/L	656		105	80-120	2.77	30	
Surrogate: Propane	1600		ug/L	*1800*		*89.1*	*62-122*			

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010.00	**Reported:**
Federal Way, WA 98001	Project Manager: Julia Schwarz	28-Dec-2016 09:58

Metals and Metallic Compounds - Quality Control

Batch BEL0301 - TWC EPA 3010A

Instrument: ICP2

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BEL0301-BLK1)				Prepared: 12-Dec-2016		Analyzed: 13-Dec-2016 17:08				
Lead	ND	0.0200	mg/L							U
LCS (BEL0301-BS1)				Prepared: 12-Dec-2016		Analyzed: 13-Dec-2016 17:12				
Lead	1.89	0.0200	mg/L	2.00		94.7	80-120			

Metals and Metallic Compounds (dissolved) - Quality Control

Batch BEL0303 - WMN (No Prep)

Instrument: ICP2

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BEL0303-BLK1)					Prepared: 12-Dec-2016 Analyzed: 13-Dec-2016 15:20						
Iron	0.0080	0.0013	0.0500	mg/L							J
Manganese	ND		0.0010	mg/L							U
LCS (BEL0303-BS1)					Prepared: 12-Dec-2016 Analyzed: 13-Dec-2016 15:38						
Iron	1.95			mg/L	2.00		97.4	80-120			
Manganese	0.475			mg/L	0.500		94.9	80-120			

Kennedy Jenks Consultants	Project: Circle K	
32001 - 32nd Avenue South, Suite 100	Project Number: 1696010.00	**Reported:**
Federal Way, WA 98001	Project Manager: Julia Schwarz	28-Dec-2016 09:58

Certified Analyses included in this Report

Analyte	Certifications
EPA 6010C in Water	
Lead	WADOE,NELAP,DoD-ELAP,ADEC
Iron	WADOE,NELAP
Manganese	WADOE,NELAP
EPA 8260C in Water	
Chloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Vinyl Chloride	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromomethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Chloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Trichlorofluoromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Acrolein	DoD-ELAP,NELAP,CALAP,WADOE
1,1,2-Trichloro-1,2,2-Trifluoroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Acetone	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1-Dichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromoethane	DoD-ELAP,NELAP,CALAP,WADOE
Iodomethane	DoD-ELAP,NELAP,CALAP,WADOE
Methylene Chloride	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Acrylonitrile	DoD-ELAP,NELAP,CALAP,WADOE
Carbon Disulfide	DoD-ELAP,NELAP,CALAP,WADOE
trans-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Vinyl Acetate	DoD-ELAP,NELAP,CALAP,WADOE
1,1-Dichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
2-Butanone	DoD-ELAP,NELAP,CALAP,WADOE
2,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
cis-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Chloroform	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromochloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1,1-Trichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1-Dichloropropene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Carbon tetrachloride	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Benzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Trichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromodichloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE

Dibromomethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
2-Chloroethyl vinyl ether	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
4-Methyl-2-Pentanone	DoD-ELAP,NELAP,CALAP,WADOE
cis-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Toluene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
trans-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
2-Hexanone	DoD-ELAP,NELAP,CALAP,WADOE
1,1,2-Trichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,3-Dichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Tetrachloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Dibromochloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dibromoethane	DoD-ELAP,NELAP,CALAP,WADOE
Chlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Ethylbenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1,1,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
m,p-Xylene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
o-Xylene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Styrene	DoD-ELAP,NELAP,CALAP,WADOE
Bromoform	DoD-ELAP,NELAP,CALAP,WADOE
1,1,2,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2,3-Trichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
trans-1,4-Dichloro 2-Butene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
n-Propylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
Bromobenzene	DoD-ELAP,NELAP,CALAP,WADOE
Isopropyl Benzene	DoD-ELAP,NELAP,CALAP,WADOE
2-Chlorotoluene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
4-Chlorotoluene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
t-Butylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
1,3,5-Trimethylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
1,2,4-Trimethylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
s-Butylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
4-Isopropyl Toluene	DoD-ELAP,NELAP,CALAP,WADOE
1,3-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,4-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
n-Butylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
1,2-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dibromo-3-chloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2,4-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE

Hexachloro-1,3-Butadiene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Naphthalene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2,3-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Dichlorodifluoromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Methyl tert-butyl Ether	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
n-Hexane	WADOE
2-Pentanone	WADOE

EPA RSK-175 in Water

Methane	DoD-ELAP,NELAP
Ethane	DoD-ELAP,NELAP
Ethene	DoD-ELAP,NELAP
Acetylene	DoD-ELAP,NELAP

NWTPHg in Water

Gasoline Range Organics (Tol-Nap)	WADOE,DoD-ELAP
Gasoline Range Organics (2MP-TMB)	WADOE,DoD-ELAP
Gasoline Range Organics (Tol-C12)	WADOE,DoD-ELAP
Gasoline Range Organics (C6-C10)	WADOE,ADEC,DoD-ELAP
Gasoline Range Organics (C5-C12)	WADOE,DoD-ELAP

SM 2320 B-97 in Water

Alkalinity, Total	DoD-ELAP,WADOE,WA-DW,NELAP

SM 4500-NO3¯ I-00 in Water

Nitrate + Nitrite as N	DoD-ELAP,NELAP,WADOE
Nitrite-N	WADOE,NELAP,DoD-ELAP

SM 4500-S2 D-00 in Water

Sulfide	DoD-ELAP,WADOE,NELAP

SM 4500-SO4 G-97 in Water

Sulfate	DoD-ELAP,NELAP,WADOE

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	UST-033	05/06/2017
CALAP	California Department of Public Health CAELAP	2748	02/28/2018
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	03/30/2017
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006	05/11/2017
WADOE	WA Dept of Ecology	C558	06/30/2017
WA-DW	Ecology - Drinking Water	C558	06/30/2017

Notes and Definitions

U	This analyte is not detected above the applicable reporting or detection limit.
J	Estimated concentration value detected below the reporting limit.
H	Hold time violation - Hold time was exceeded.
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL)
D	The reported value is from a dilution
B	This analyte was detected in the method blank.
*	Flagged value is not within established control limits.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

12 August 2016

Julia Schwarz
Kennedy Jenks Consulting
32001 32nd Avenue S. Suite 100
Federal Way, WA 98001

Client Project: Circle K, 1696010.00
ARI Job No.: BEE6

Dear Julia:

Please find enclosed the original Chain-of-Custody (COC) records and the final results for the samples from the project referenced above.

Analytical Resources, Inc. (ARI) received fifteen soil samples and one water sample were received on August 2, 2016. Three soil samples were placed on hold as specified. The remaining samples were analyzed for BETX and NWTPH-G as requested.

These analyses proceeded without incident of note.

An electronic copy of these reports and all raw data will be kept on file with ARI. Should you have any questions regarding these results, please feel free to call me at any time.

Sincerely,

ANALYTICAL RESOURCES, INC.

Mark D. Harris
Project Manager
206/695-6210
markh@arilabs.com
www.arilabs.com

eFile: BEE6

Enclosures

Chain of Custody Record & Laboratory Analysis Request

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)
www.arilabs.com

ARI Assigned Number: BEE6
Turn-around Requested: Standard
Page: 1 of 2
ARI Client Company: Kennedy/Jenks
Phone: 253-835-6424
Date: 8/1/16
Ice Present? yes
Client Contact: Julia Schwarz or Ty Schreiner
No. of Coolers: 1
Cooler Temps: 4.1
Client Project Name: Circle K
Client Project #: 1696010.00
Samplers: Julia Schwarz

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: NWTPH-G/ BTEX								Notes/Comments
KJB-14-7	8/1/2016	0950	Soil	5	X								
KJB-14-13		1005			X								
KJB-14-18		1020			X								
KJB-15-7.5		1115											HOLD for potential to run later
KJB-15-11		1125			X								
KJB-15-19		1140			X								
KJB-16-7.5		1210			X								
KJB-16-16		1230			X								
MW-17-8		1410			X								
MW-17-11		1420											HOLD for potential later analysis

Comments/Special Instructions:

Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
Printed Name: Julia Schwarz	Printed Name: Tyler Renken	Printed Name:	Printed Name:
Company: Kennedy/Jenks	Company: ARI	Company:	Company:
Date & Time: 8/2/16 0833	Date & Time: 8-2-16 @ 0833	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Chain of Custody Record & Laboratory Analysis Request

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)
www.arilabs.com

ARI Assigned Number: BEE6
Turn-around Requested: Standard
ARI Client Company: Kennedy/Jenks
Phone: 253-835-6424
Client Contact: Julia Schwarz or Ty Schreiher
Client Project Name: Circle K
Client Project #: 1696010.00
Samplers: Julia Schwarz

Page: 2 of 2
Date: 8/1/16
Ice Present? Yes
No. of Coolers: 1
Cooler Temps: 4.1

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: NWTPH-G/ BTEX								Notes/Comments
MW-17-19	8/1/2016	1425	Soil	5	X								
MW-18-7		1500											HOLD for potential later analysis
MW-18-12.5		1510			X								
MW-18-17		1515			X								
KJB-Dup		—			X								
KJB-15		1150	water	3	X								

Comments/Special Instructions

	Relinquished by:	Received by:	Relinquished by:	Received by:
(Signature)				
Printed Name:	Julia Schwarz	Tyler Renken		
Company:	Kennedy/Jenks	ARI		
Date & Time:	8/2/16 0833	8-2-16 0833		

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Kennedy Jenks
COC No(s): ______ NA
Assigned ARI Job No: BEE6

Project Name: Circle K
Delivered by: Fed-Ex UPS Courier [✓ Hand Delivered] Other: ______
Tracking No: ______ [✓ NA]

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES [✓ NO]
Were custody papers included with the cooler? [✓ YES] NO
Were custody papers properly filled out (ink, signed, etc.) [✓ YES] NO
Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) 4.1
Time: ______
If cooler temperature is out of compliance fill out form 00070F
Temp Gun ID#: D005276
Cooler Accepted by: TR Date: 8-2-16 Time: 0833

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? YES [✓ NO]
What kind of packing material was used? ... Bubble Wrap [✓ Wet Ice] Gel Packs Baggies Foam Block Paper Other: ______
Was sufficient ice used (if appropriate)? NA [✓ YES] NO
Were all bottles sealed in individual plastic bags? [✓ YES] NO
Did all bottles arrive in good condition (unbroken)? [✓ YES] NO
Were all bottle labels complete and legible? [✓ YES] NO
Did the number of containers listed on COC match with the number of containers received? YES [✓ NO]
Did all bottle labels and tags agree with custody papers? YES [✓ NO]
Were all bottles used correct for the requested analyses? [✓ YES] NO
Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)... [✓ NA] YES NO
Were all VOC vials free of air bubbles? NA YES [✓ NO]
Was sufficient amount of sample sent in each bottle? [✓ YES] NO
Date VOC Trip Blank was made at ARI... NA 7-15-16
Was Sample Split by ARI: [✓ NA] YES Date/Time: ______ Equipment: ______ Split by: ______

Samples Logged by: TR Date: 8-2-16 Time: 1313

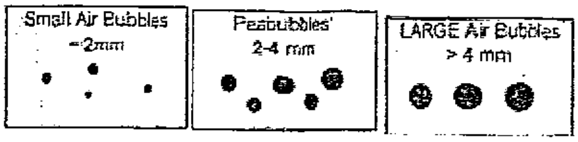
*** Notify Project Manager of discrepancies or concerns ***

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

2x Trip Blanks arrived that aren't listed on COC.
2 of 2 VOA vials for Trip Blanks have "pb" bubbles.

By: TR Date: 8-2-16



Small → "sm" (< 2 mm)
Peabubbles → "pb" (2 to < 4 mm)
Large → "lg" (4 to < 6 mm)
Headspace → "hs" (> 6 mm)

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: BEE6
Client: Kennedy Jenks
Project Event: 1696010.00
Project Name: Circle K

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	KJB-14-7	BEE6A	16-11526	Soil	08/01/16 09:50	08/02/16 08:33
2.	KJB-14-13	BEE6B	16-11527	Soil	08/01/16 10:05	08/02/16 08:33
3.	KJB-14-18	BEE6C	16-11528	Soil	08/01/16 10:20	08/02/16 08:33
4.	KJB-15-11	BEE6D	16-11529	Soil	08/01/16 11:25	08/02/16 08:33
5.	KJB-15-19	BEE6E	16-11530	Soil	08/01/16 11:40	08/02/16 08:33
6.	KJB-16-7.5	BEE6F	16-11531	Soil	08/01/16 12:10	08/02/16 08:33
7.	KJB-16-16	BEE6G	16-11532	Soil	08/01/16 12:30	08/02/16 08:33
8.	MW-17-8	BEE6H	16-11533	Soil	08/01/16 14:10	08/02/16 08:33
9.	MW-17-19	BEE6I	16-11534	Soil	08/01/16 14:25	08/02/16 08:33
10.	MW-18-12.5	BEE6J	16-11535	Soil	08/01/16 15:10	08/02/16 08:33
11.	MW-18-17	BEE6K	16-11536	Soil	08/01/16 15:15	08/02/16 08:33
12.	KJB-Dup	BEE6L	16-11537	Soil	08/01/16	08/02/16 08:33
13.	KJB-14-7	BEE6M	16-11538	Soil	08/01/16 09:50	08/02/16 08:33
14.	KJB-14-13	BEE6N	16-11539	Soil	08/01/16 10:05	08/02/16 08:33
15.	KJB-14-18	BEE6O	16-11540	Soil	08/01/16 10:20	08/02/16 08:33
16.	KJB-15-11	BEE6P	16-11541	Soil	08/01/16 11:25	08/02/16 08:33
17.	KJB-15-19	BEE6Q	16-11542	Soil	08/01/16 11:40	08/02/16 08:33
18.	KJB-16-7.5	BEE6R	16-11543	Soil	08/01/16 12:10	08/02/16 08:33
19.	KJB-16-16	BEE6S	16-11544	Soil	08/01/16 12:30	08/02/16 08:33
20.	MW-17-8	BEE6T	16-11545	Soil	08/01/16 14:10	08/02/16 08:33
21.	MW-17-19	BEE6U	16-11546	Soil	08/01/16 14:25	08/02/16 08:33
22.	MW-18-12.5	BEE6V	16-11547	Soil	08/01/16 15:10	08/02/16 08:33
23.	MW-18-17	BEE6W	16-11548	Soil	08/01/16 15:15	08/02/16 08:33
24.	KJB-Dup	BEE6X	16-11549	Soil	08/01/16	08/02/16 08:33
25.	KJB-15-7.5	BEE6Y	16-11550	Soil	08/01/16 11:15	08/02/16 08:33
26.	MW-17-11	BEE6Z	16-11551	Soil	08/01/16 14:20	08/02/16 08:33
27.	MW-18-7	BEE6AA	16-11552	Soil	08/01/16 15:00	08/02/16 08:33
28.	KJB-15	BEE6AB	16-11553	Water	08/01/16 11:50	08/02/16 08:33
29.	Trip Blank	BEE6AC	16-11555	Water	08/01/16	08/02/16 08:33

Analytical Resources,
Incorporated
Analytical Chemists and
Consultants

Data Reporting Qualifiers

Effective 12/31/13

Inorganic Data

U	Indicates that the target analyte was not detected at the reported concentration
*	Duplicate RPD is not within established control limits
B	Reported value is less than the CRDL but ≥ the Reporting Limit
N	Matrix Spike recovery not within established control limits
NA	Not Applicable, analyte not spiked
H	The natural concentration of the spiked element is so much greater than the concentration spiked that an accurate determination of spike recovery is not possible
L	Analyte concentration is ≤5 times the Reporting Limit and the replicate control limit defaults to ±1 RL instead of the normal 20% RPD

Organic Data

U	Indicates that the target analyte was not detected at the reported concentration
*	Flagged value is not within established control limits
B	Analyte detected in an associated Method Blank at a concentration greater than one-half of ARI's Reporting Limit or 5% of the regulatory limit or 5% of the analyte concentration in the sample.
J	Estimated concentration when the value is less than ARI's established reporting limits
D	The spiked compound was not detected due to sample extract dilution
E	Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.

Q	Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20%Drift or minimum RRF).
S	Indicates an analyte response that has saturated the detector. The calculated concentration is not valid; a dilution is required to obtain valid quantification of the analyte
NA	The flagged analyte was not analyzed for
NR	Spiked compound recovery is not reported due to chromatographic interference
NS	The flagged analyte was not spiked into the sample
M	Estimated value for an analyte detected and confirmed by an analyst but with low spectral match parameters. This flag is used only for GC-MS analyses
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification"
Y	The analyte is not detected at or above the reported concentration. The reporting limit is raised due to chromatographic interference. The Y flag is equivalent to the U flag with a raised reporting limit.
EMPC	Estimated Maximum Possible Concentration (EMPC) defined in EPA Statement of Work DLM02.2 as a value "calculated for 2,3,7,8-substituted isomers for which the quantitation and /or confirmation ion(s) has signal to noise in excess of 2.5, but does not meet identification criteria" **(Dioxin/Furan analysis only)**
C	The analyte was positively identified on only one of two chromatographic columns. Chromatographic interference prevented a positive identification on the second column
P	The analyte was detected on both chromatographic columns but the quantified values differ by ≥40% RPD with no obvious chromatographic interference
X	Analyte signal includes interference from polychlorinated diphenyl ethers. **(Dioxin/Furan analysis only)**
Z	Analyte signal includes interference from the sample matrix or perfluorokerosene ions. **(Dioxin/Furan analysis only)**

Geotechnical Data

A	The total of all fines fractions. This flag is used to report total fines when only sieve analysis is requested and balances total grain size with sample weight.
F	Samples were frozen prior to particle size determination
SM	Sample matrix was not appropriate for the requested analysis. This normally refers to samples contaminated with an organic product that interferes with the sieving process and/or moisture content, porosity and saturation calculations
SS	Sample did not contain the proportion of "fines" required to perform the pipette portion of the grain size analysis
W	Weight of sample in some pipette aliquots was below the level required for accurate weighting

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG
Page 1 of 1

Sample ID: KJB-14-7
SAMPLE

Lab Sample ID: BEE6M
LIMS ID: 16-11538
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT2/LH
Date Analyzed: 08/10/16 12:52

Sample Amount: 195 mg-dry-wt
Purge Volume: 10.0 mL
Moisture: 11.7%

CAS Number	Analyte	LOQ	Result	Q	TPHG ID
86290-81-5	Gasoline Range Hydrocarbons	5.1	< 5.1	U	---

Reported in mg/kg (ppm)

Volatile Surrogate Recovery

d8-Toluene	97.4%
Bromofluorobenzene	106%

Results corrected for soil moisture content per Section 11.10.5 of EPA Method 8000C.

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG **Sample ID: KJB-14-13**
Page 1 of 1 **SAMPLE**

Lab Sample ID: BEE6N
LIMS ID: 16-11539
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT2/LH
Date Analyzed: 08/10/16 13:13

Sample Amount: 163 mg-dry-wt
Purge Volume: 10.0 mL
Moisture: 15.6%

CAS Number	Analyte	LOQ	Result	Q	TPHG ID
86290-81-5	Gasoline Range Hydrocarbons	6.1	< 6.1	U	---

Reported in mg/kg (ppm)

Volatile Surrogate Recovery	
d8-Toluene	96.2%
Bromofluorobenzene	107%

Results corrected for soil moisture content per Section 11.10.5 of EPA Method 8000C.

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG
Page 1 of 1

Sample ID: KJB-14-18
SAMPLE

Lab Sample ID: BEE6O
LIMS ID: 16-11540
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT2/LH
Date Analyzed: 08/10/16 13:33

Sample Amount: 140 mg-dry-wt
Purge Volume: 10.0 mL
Moisture: 16.4%

CAS Number	Analyte	LOQ	Result	Q	TPHG ID
86290-81-5	Gasoline Range Hydrocarbons	7.2	< 7.2	U	---

Reported in mg/kg (ppm)

Volatile Surrogate Recovery	
d8-Toluene	97.0%
Bromofluorobenzene	106%

Results corrected for soil moisture content per Section 11.10.5 of EPA Method 8000C.

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG **Sample ID: KJB-15-11**
SAMPLE
Page 1 of 1

Lab Sample ID: BEE6P
LIMS ID: 16-11541
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT2/LH
Date Analyzed: 08/10/16 13:54

Sample Amount: 180 mg-dry-wt
Purge Volume: 10.0 mL
Moisture: 13.0%

CAS Number	**Analyte**	**LOQ**	**Result**	**Q**	**TPHG ID**
86290-81-5	Gasoline Range Hydrocarbons	5.5	< 5.5	U	---

Reported in mg/kg (ppm)

Volatile Surrogate Recovery	
d8-Toluene	97.8%
Bromofluorobenzene	103%

Results corrected for soil moisture content per Section 11.10.5 of EPA Method 8000C.

FORM I

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG
Page 1 of 1

Sample ID: KJB-15-19
SAMPLE

Lab Sample ID: BEE6Q
LIMS ID: 16-11542
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT2/LH
Date Analyzed: 08/10/16 14:14

Sample Amount: 165 mg-dry-wt
Purge Volume: 10.0 mL
Moisture: 10.6%

CAS Number	Analyte	LOQ	Result	Q	TPHG ID
86290-81-5	Gasoline Range Hydrocarbons	6.1	< 6.1	U	---

Reported in mg/kg (ppm)

Volatile Surrogate Recovery	
d8-Toluene	100%
Bromofluorobenzene	106%

Results corrected for soil moisture content per Section 11.10.5 of EPA Method 8000C.

FORM I

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG **Sample ID: KJB-16-7.5**
Page 1 of 1 **SAMPLE**

Lab Sample ID: BEE6R
LIMS ID: 16-11543
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT2/LH
Date Analyzed: 08/10/16 14:35

Sample Amount: 115 mg-dry-wt
Purge Volume: 10.0 mL
Moisture: 11.1%

CAS Number	Analyte	LOQ	Result	Q	TPHG ID
86290-81-5	Gasoline Range Hydrocarbons	8.7	< 8.7	U	---

Reported in mg/kg (ppm)

Volatile Surrogate Recovery

d8-Toluene	96.6%
Bromofluorobenzene	106%

Results corrected for soil moisture content per Section 11.10.5 of EPA Method 8000C.

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG **Sample ID: KJB-16-16**
Page 1 of 1 **SAMPLE**

Lab Sample ID: BEE6S
LIMS ID: 16-11544
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT2/LH
Date Analyzed: 08/10/16 14:55

Sample Amount: 125 mg-dry-wt
Purge Volume: 10.0 mL
Moisture: 18.8%

CAS Number	Analyte	LOQ	Result	Q	TPHG ID
86290-81-5	Gasoline Range Hydrocarbons	8.0	< 8.0	U	---

Reported in mg/kg (ppm)

Volatile Surrogate Recovery	
d8-Toluene	96.4%
Bromofluorobenzene	107%

Results corrected for soil moisture content per Section 11.10.5 of EPA Method 8000C.

FORM I

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG **Sample ID: MW-17-8**
Page 1 of 1 **SAMPLE**

Lab Sample ID: BEE6T
LIMS ID: 16-11545
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT2/LH
Date Analyzed: 08/10/16 15:16

Sample Amount: 161 mg-dry-wt
Purge Volume: 10.0 mL
Moisture: 11.0%

CAS Number	Analyte	LOQ	Result	Q	TPHG ID
86290-81-5	Gasoline Range Hydrocarbons	6.2	< 6.2	U	---

Reported in mg/kg (ppm)

Volatile Surrogate Recovery	
d8-Toluene	96.8%
Bromofluorobenzene	105%

Results corrected for soil moisture content per Section 11.10.5 of EPA Method 8000C.

FORM I

ANALYTICAL
RESOURCES
INCORPORATED

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG **Sample ID: MW-17-19**
Page 1 of 1 **SAMPLE**

Lab Sample ID: BEE6U
LIMS ID: 16-11546
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT2/LH
Date Analyzed: 08/10/16 15:36

Sample Amount: 189 mg-dry-wt
Purge Volume: 10.0 mL
Moisture: 10.2%

CAS Number	Analyte	LOQ	Result	Q	TPHG ID
86290-81-5	Gasoline Range Hydrocarbons	5.3	< 5.3	U	---

Reported in mg/kg (ppm)

Volatile Surrogate Recovery

d8-Toluene	97.8%
Bromofluorobenzene	106%

Results corrected for soil moisture content per Section 11.10.5 of EPA Method 8000C.

FORM I

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG **Sample ID: MW-18-12.5**
Page 1 of 1 **SAMPLE**

Lab Sample ID: BEE6V
LIMS ID: 16-11547
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT2/LH
Date Analyzed: 08/10/16 15:57

Sample Amount: 153 mg-dry-wt
Purge Volume: 10.0 mL
Moisture: 14.9%

CAS Number	Analyte	LOQ	Result	Q	TPHG ID
86290-81-5	Gasoline Range Hydrocarbons	6.5	< 6.5	U	---

Reported in mg/kg (ppm)

Volatile Surrogate Recovery

d8-Toluene	96.8%
Bromofluorobenzene	104%

Results corrected for soil moisture content per Section 11.10.5 of EPA Method 8000C.

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG **Sample ID: MW-18-17**
Page 1 of 1 **SAMPLE**

Lab Sample ID: BEE6W
LIMS ID: 16-11548
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT2/LH
Date Analyzed: 08/10/16 16:17

Sample Amount: 137 mg-dry-wt
Purge Volume: 10.0 mL
Moisture: 11.6%

CAS Number	Analyte	LOQ	Result	Q	TPHG ID
86290-81-5	Gasoline Range Hydrocarbons	7.3	< 7.3	U	---

Reported in mg/kg (ppm)

Volatile Surrogate Recovery	
d8-Toluene	97.4%
Bromofluorobenzene	106%

Results corrected for soil moisture content per Section 11.10.5 of EPA Method 8000C.

FORM I

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG **Sample ID: KJB-Dup**
SAMPLE
Page 1 of 1

Lab Sample ID: BEE6X
LIMS ID: 16-11549
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT2/LH
Date Analyzed: 08/10/16 16:38

Sample Amount: 152 mg-dry-wt
Purge Volume: 10.0 mL
Moisture: 12.3%

CAS Number	Analyte	LOQ	Result	Q	TPHG ID
86290-81-5	Gasoline Range Hydrocarbons	6.6	< 6.6	U	---

Reported in mg/kg (ppm)

Volatile Surrogate Recovery	
d8-Toluene	98.2%
Bromofluorobenzene	105%

Results corrected for soil moisture content per Section 11.10.5 of EPA Method 8000C.

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG
Page 1 of 1

Sample ID: MB-080416A
METHOD BLANK

Lab Sample ID: MB-080416A
LIMS ID: 16-11538
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: NA
Date Received: NA

Instrument/Analyst: NT3/LH
Date Analyzed: 08/04/16 11:41

Sample Amount: 200 mg-dry-wt
Purge Volume: 10.0 mL
Moisture: NA

CAS Number	Analyte	LOQ	Result	Q	TPHG ID
86290-81-5	Gasoline Range Hydrocarbons	5.0	< 5.0	U	---

Reported in mg/kg (ppm)

Volatile Surrogate Recovery	
d8-Toluene	101%
Bromofluorobenzene	101%

FORM I

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG **Sample ID: LCS-081016A**
Page 1 of 1
LAB CONTROL SAMPLE

Lab Sample ID: LCS-081016A
LIMS ID: 16-11538
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: NA
Date Received: NA

Instrument/Analyst LCS: NT2/LH
LCSD: NT2/LH
Date Analyzed LCS: 08/10/16 08:05
LCSD: 08/10/16 08:46

Sample Amount LCS: 200 mg-dry-wt
LCSD: 200 mg-dry-wt
Purge Volume LCS: 10.0 mL
LCSD: 10.0 mL
Moisture: NA

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Gasoline Range Hydrocarbons	52.5	50.0	105%	50.5	50.0	101%	3.9%

Reported in mg/kg (ppm)

RPD calculated using sample concentrations per SW846.

Volatile Surrogate Recovery

	LCS	**LCSD**
d8-Toluene	97.6%	97.0%
Bromofluorobenzene	100%	102%

FORM III

VOA SURROGATE RECOVERY SUMMARY

Matrix: Soil

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00

ARI ID	Client ID	Level	DCE	TOL	BFB	DCB	TOT OUT
MB-080416A	Method Blank	Med	NA	101%	101%	NA	0
LCS-081016A	Lab Control	Med	NA	97.6%	100%	NA	0
LCSD-081016A	Lab Control Dup	Med	NA	97.0%	102%	NA	0
BEE6M	KJB-14-7	Med	NA	97.4%	106%	NA	0
BEE6N	KJB-14-13	Med	NA	96.2%	107%	NA	0
BEE6O	KJB-14-18	Med	NA	97.0%	106%	NA	0
BEE6P	KJB-15-11	Med	NA	97.8%	103%	NA	0
BEE6Q	KJB-15-19	Med	NA	100%	106%	NA	0
BEE6R	KJB-16-7.5	Med	NA	96.6%	106%	NA	0
BEE6S	KJB-16-16	Med	NA	96.4%	107%	NA	0
BEE6T	MW-17-8	Med	NA	96.8%	105%	NA	0
BEE6U	MW-17-19	Med	NA	97.8%	106%	NA	0
BEE6V	MW-18-12.5	Med	NA	96.8%	104%	NA	0
BEE6W	MW-18-17	Med	NA	97.4%	106%	NA	0
BEE6X	KJB-Dup	Med	NA	98.2%	105%	NA	0

	LCS/MB LIMITS		QC LIMITS	
SW8260C	Low	Med	Low	Med
(DCE) = d4-1,2-Dichloroethane	80-129	80-124	78-151	80-124
(TOL) = d8-Toluene	80-120	80-120	80-120	80-120
(BFB) = Bromofluorobenzene	80-120	80-120	75-124	80-120
(DCB) = d4-1,2-Dichlorobenzene	80-120	80-120	80-120	80-120

Log Number Range: 16-11538 to 16-11549

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG
Page 1 of 1

Sample ID: KJB-15
SAMPLE

Lab Sample ID: BEE6AB
LIMS ID: 16-11553
Matrix: Water
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT2/LH
Date Analyzed: 08/10/16 10:29

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q	TPHG ID
71-43-2	Benzene	0.20	< 0.20	U	
108-88-3	Toluene	0.20	< 0.20	U	
100-41-4	Ethylbenzene	0.20	< 0.20	U	
179601-23-1	m,p-Xylene	0.40	< 0.40	U	
95-47-6	o-Xylene	0.20	< 0.20	U	

Reported in µg/L (ppb)

CAS Number	Analyte	LOQ	Result	Q	TPHG ID
86290-81-5	Gasoline Range Hydrocarbons	0.10	< 0.10	U	---

Reported in mg/L (ppm)

Volatile Surrogate Recovery

d8-Toluene	95.6%
Bromofluorobenzene	101%

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG **Sample ID: Trip Blank**
Page 1 of 1 **SAMPLE**

Lab Sample ID: BEE6AC
LIMS ID: 16-11555
Matrix: Water
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT2/LH
Date Analyzed: 08/10/16 10:08

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q	TPHG ID
71-43-2	Benzene	0.20	< 0.20	U	
108-88-3	Toluene	0.20	< 0.20	U	
100-41-4	Ethylbenzene	0.20	< 0.20	U	
179601-23-1	m,p-Xylene	0.40	< 0.40	U	
95-47-6	o-Xylene	0.20	< 0.20	U	

Reported in µg/L (ppb)

CAS Number	Analyte	LOQ	Result	Q	TPHG ID
86290-81-5	Gasoline Range Hydrocarbons	0.10	< 0.10	U	---

Reported in mg/L (ppm)

Volatile Surrogate Recovery	
d8-Toluene	96.8%
Bromofluorobenzene	103%

FORM I

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG
Page 1 of 1

Sample ID: MB-080416A
METHOD BLANK

Lab Sample ID: MB-080416A
LIMS ID: 16-11553
Matrix: Water
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: NA
Date Received: NA

Instrument/Analyst: NT3/LH
Date Analyzed: 08/04/16 11:41

Sample Amount: 10.0 mL
Purge Volume: 10.0 mL

CAS Number	Analyte	LOQ	Result	Q	TPHG ID
71-43-2	Benzene	0.20	< 0.20	U	
108-88-3	Toluene	0.20	< 0.20	U	
100-41-4	Ethylbenzene	0.20	< 0.20	U	
179601-23-1	m,p-Xylene	0.40	< 0.40	U	
95-47-6	o-Xylene	0.20	< 0.20	U	
	Reported in µg/L (ppb)				
86290-81-5	Gasoline Range Hydrocarbons	0.10	< 0.10	U	---
	Reported in mg/L (ppm)				

Volatile Surrogate Recovery

d8-Toluene	101%
Bromofluorobenzene	101%

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG
Page 1 of 1

Sample ID: LCS-080416A
LAB CONTROL SAMPLE

Lab Sample ID: LCS-080416A
LIMS ID: 16-11553
Matrix: Water
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: NA
Date Received: NA

Instrument/Analyst LCS: NT3/LH
LCSD: NT3/LH
Date Analyzed LCS: 08/04/16 10:23
LCSD: 08/04/16 10:49

Sample Amount LCS: 10.0 mL
LCSD: 10.0 mL
Purge Volume LCS: 10.0 mL
LCSD: 10.0 mL

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Benzene	10.0	10.0	100%	9.78	10.0	97.8%	2.2%
Toluene	9.76	10.0	97.6%	9.55	10.0	95.5%	2.2%
Ethylbenzene	9.49	10.0	94.9%	9.58	10.0	95.8%	0.9%
m,p-Xylene	19.8	20.0	99.0%	20.1	20.0	100%	1.5%
o-Xylene	9.79	10.0	97.9%	9.86	10.0	98.6%	0.7%

Reported in µg/L (ppb)

RPD calculated using sample concentrations per SW846.

Volatile Surrogate Recovery

	LCS	**LCSD**
d8-Toluene	103%	102%
Bromofluorobenzene	103%	104%

FORM III

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C/NWTPHG
Page 1 of 1

Sample ID: LCS-081016A
LAB CONTROL SAMPLE

Lab Sample ID: LCS-081016A
LIMS ID: 16-11555
Matrix: Water
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: NA
Date Received: NA

Instrument/Analyst LCS: NT2/LH
LCSD: NT2/LH
Date Analyzed LCS: 08/10/16 08:05
LCSD: 08/10/16 08:46

Sample Amount LCS: 10.0 mL
LCSD: 10.0 mL
Purge Volume LCS: 10.0 mL
LCSD: 10.0 mL

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Gasoline Range Hydrocarbons	1.05	1.00	105%	1.01	1.00	101%	3.9%

Reported in mg/L (ppm)

RPD calculated using sample concentrations per SW846.

Volatile Surrogate Recovery

	LCS	**LCSD**
d8-Toluene	97.6%	97.0%
Bromofluorobenzene	100%	102%

VOA SURROGATE RECOVERY SUMMARY

Matrix: Water

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00

ARI ID	Client ID	PV	DCE	TOL	BFB	DCB	TOT OUT
MB-080416A	Method Blank	10	NA	101%	101%	NA	0
LCS-080416A	Lab Control	10	NA	103%	103%	NA	0
LCSD-080416A	Lab Control Dup	10	NA	102%	104%	NA	0
BEE6AB	KJB-15	10	NA	95.6%	101%	NA	0
LCS-081016A	Lab Control	10	NA	97.6%	100%	NA	0
LCSD-081016A	Lab Control Dup	10	NA	97.0%	102%	NA	0
BEE6AC	Trip Blank	10	NA	96.8%	103%	NA	0

SW8260C	LCS/MB LIMITS	QC LIMITS
(DCE) = d4-1,2-Dichloroethane	(80-129)	(80-129)
(TOL) = d8-Toluene	(80-120)	(80-120)
(BFB) = Bromofluorobenzene	(80-120)	(80-120)
(DCB) = d4-1,2-Dichlorobenzene	(80-120)	(80-120)

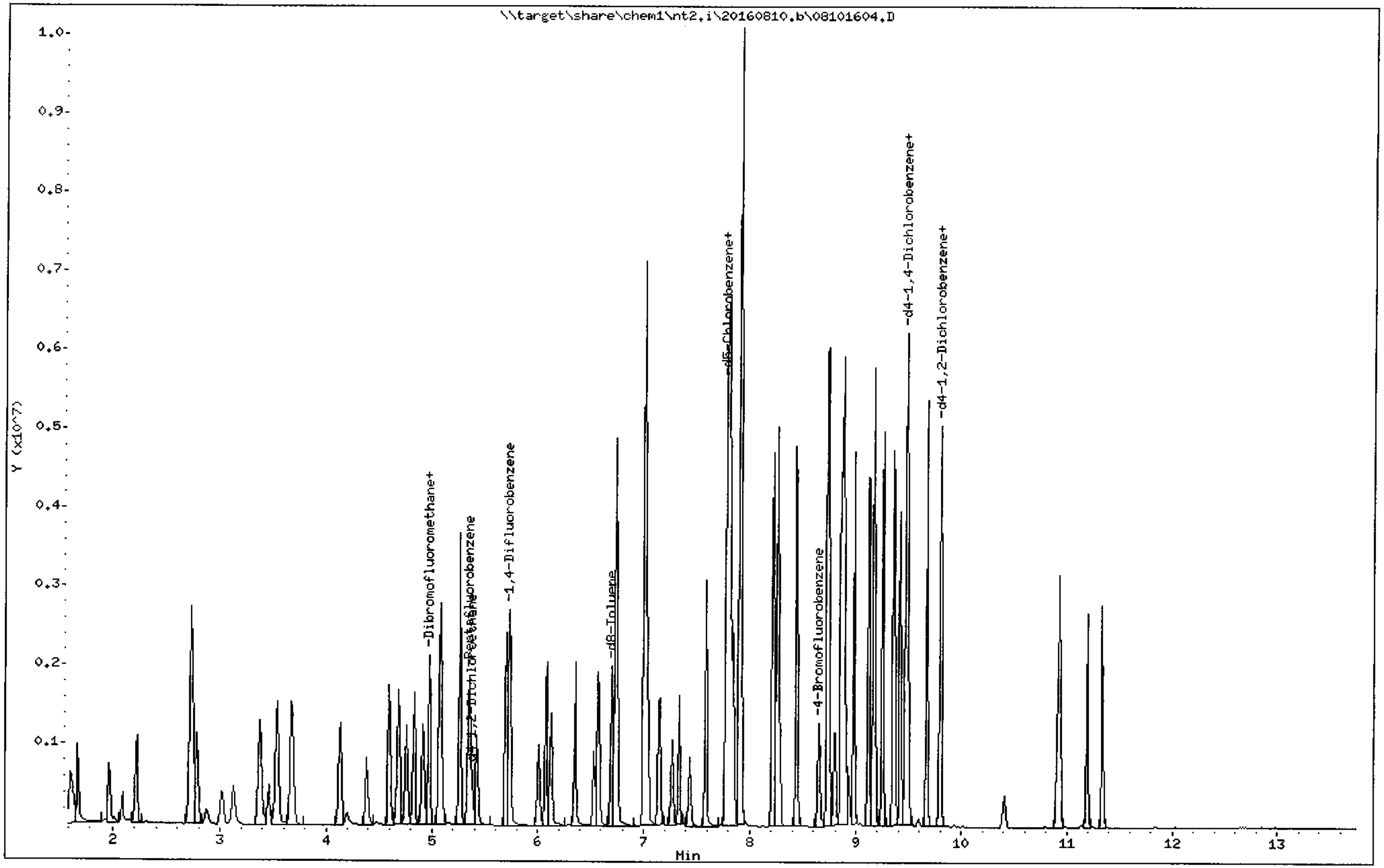
Prep Method: SW5030B
Log Number Range: 16-11553 to 16-11555

Data File: \\target\share\chem1\nt2.i\20160810.b\08101604.D
Date : 10-AUG-2016 08:26
Client ID: 8260
Sample Info: ICV/LCS,10,10,0,8260

Column phase: RTXVMS

Instrument: nt2.i

Operator: LH
Column diameter: 0.18

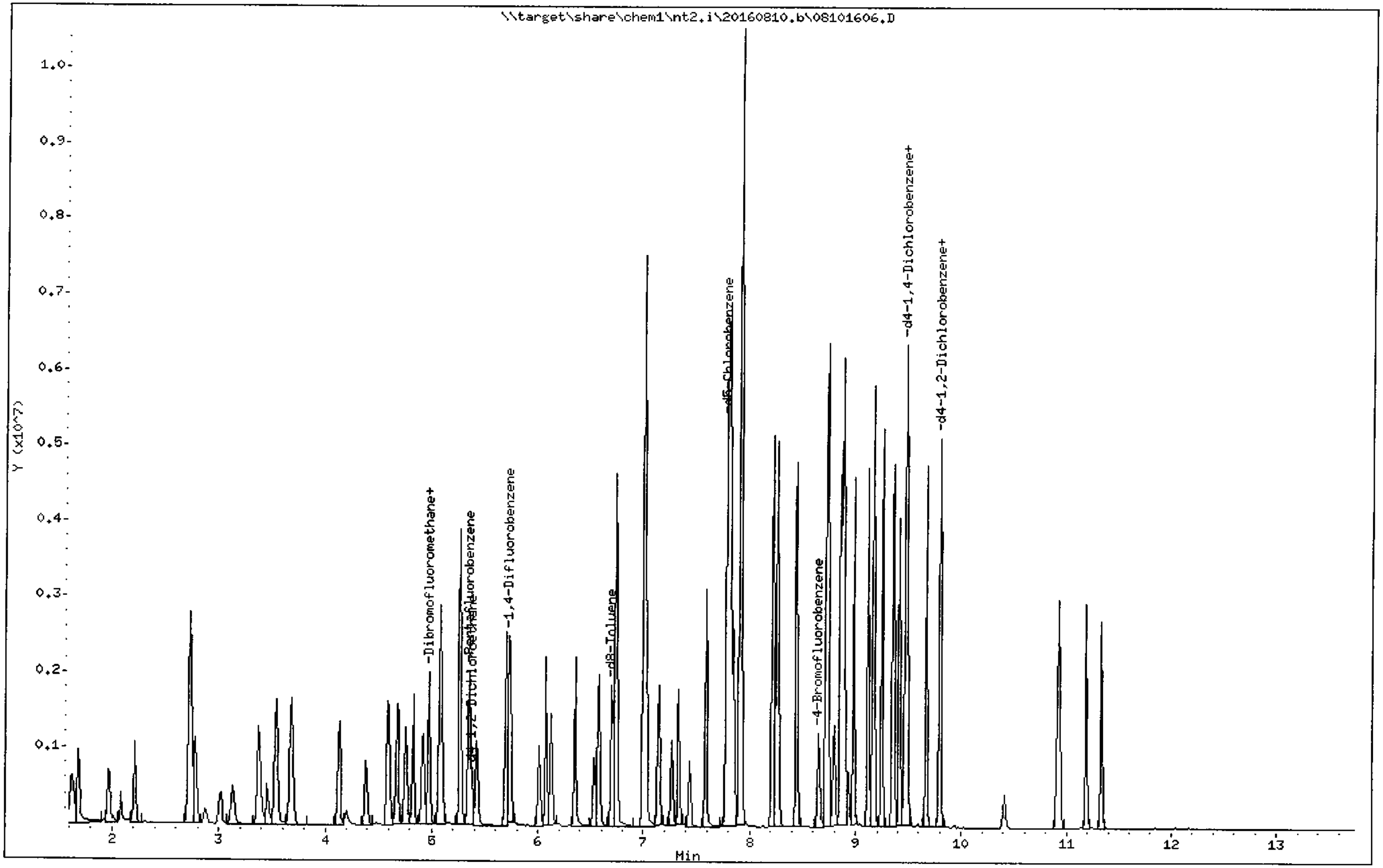


Data File: \\target\share\chem1\nt2.i\20160810.b\08101606.D
Date : 10-AUG-2016 09:06
Client ID: LCSD
Sample Info: LCSD,10,10,0,8260

Column phase: RTXVMS

Instrument: nt2.i

Operator: LH
Column diameter: 0.18

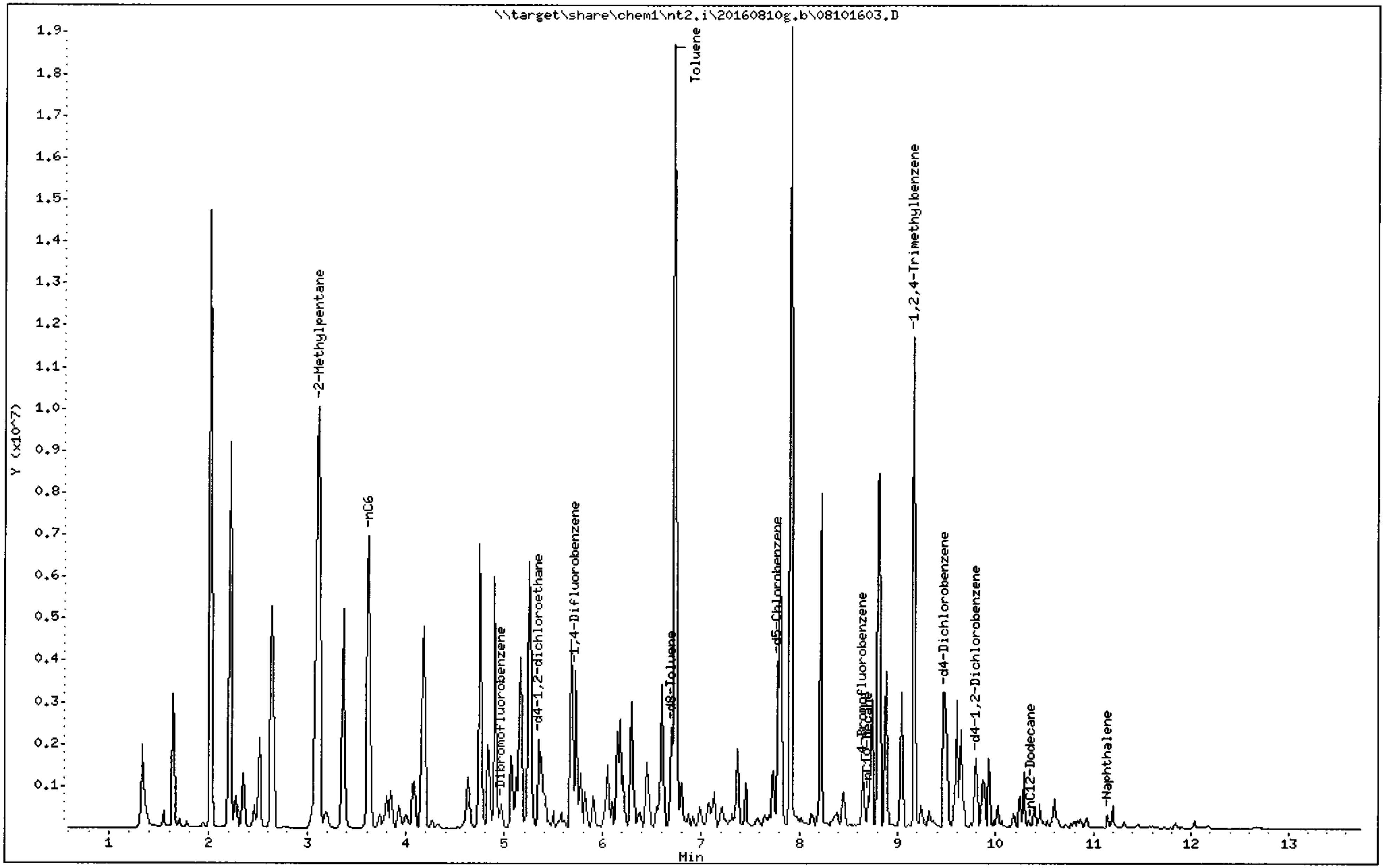


Data File: \\target\share\chem1\nt2.i\20160810g.b\08101603.D
Date : 10-AUG-2016 08:05
Client ID:
Sample Info: SEH0079-ICV1,10,10,0,GAS

Column phase: RTXVMS

Instrument: nt2.i

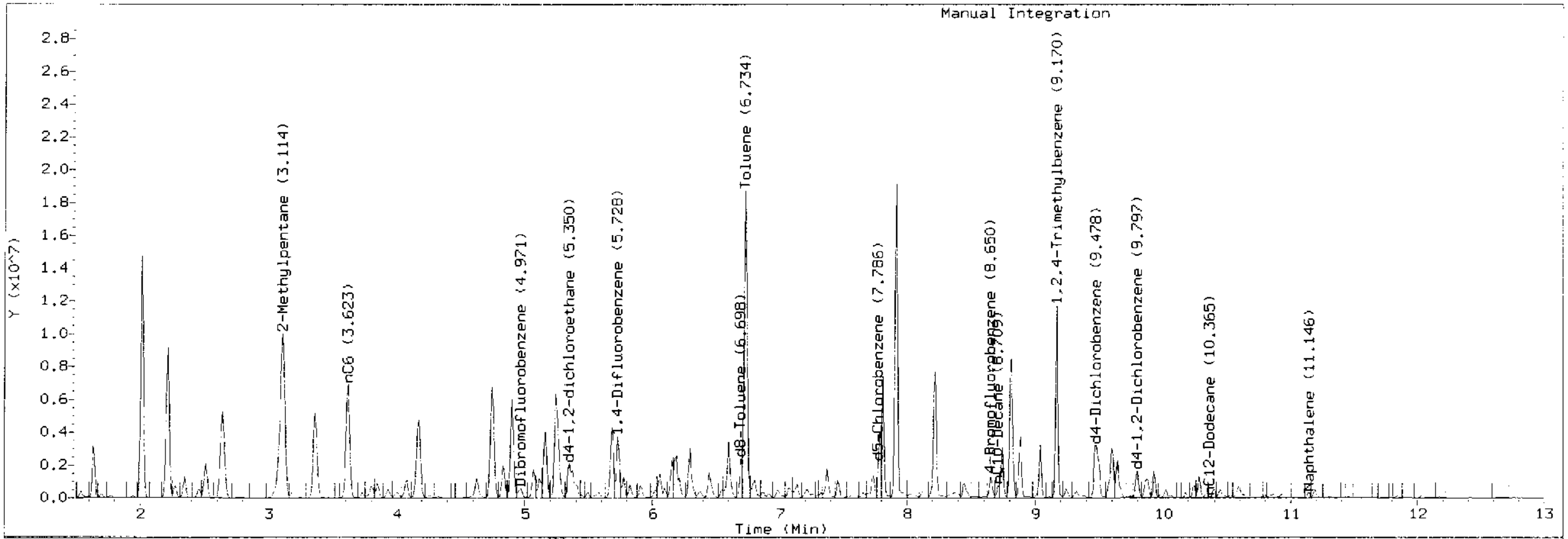
Operator: LH
Column diameter: 0.18



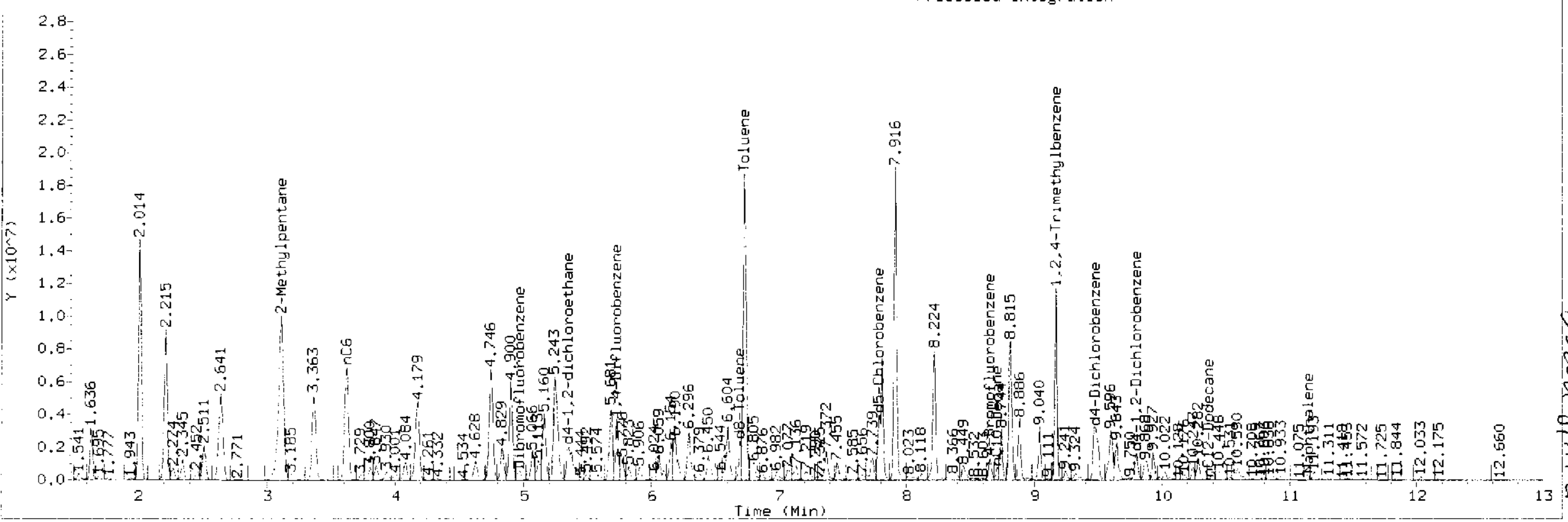
TPHG Manual Integrations Report

Datafile: NT2, 20160810g.b/08101603.D   Injection: 10-AUG-2016 08:05
Lab ID:SEH0079-ICV1

Manual Integration



Processed Integration

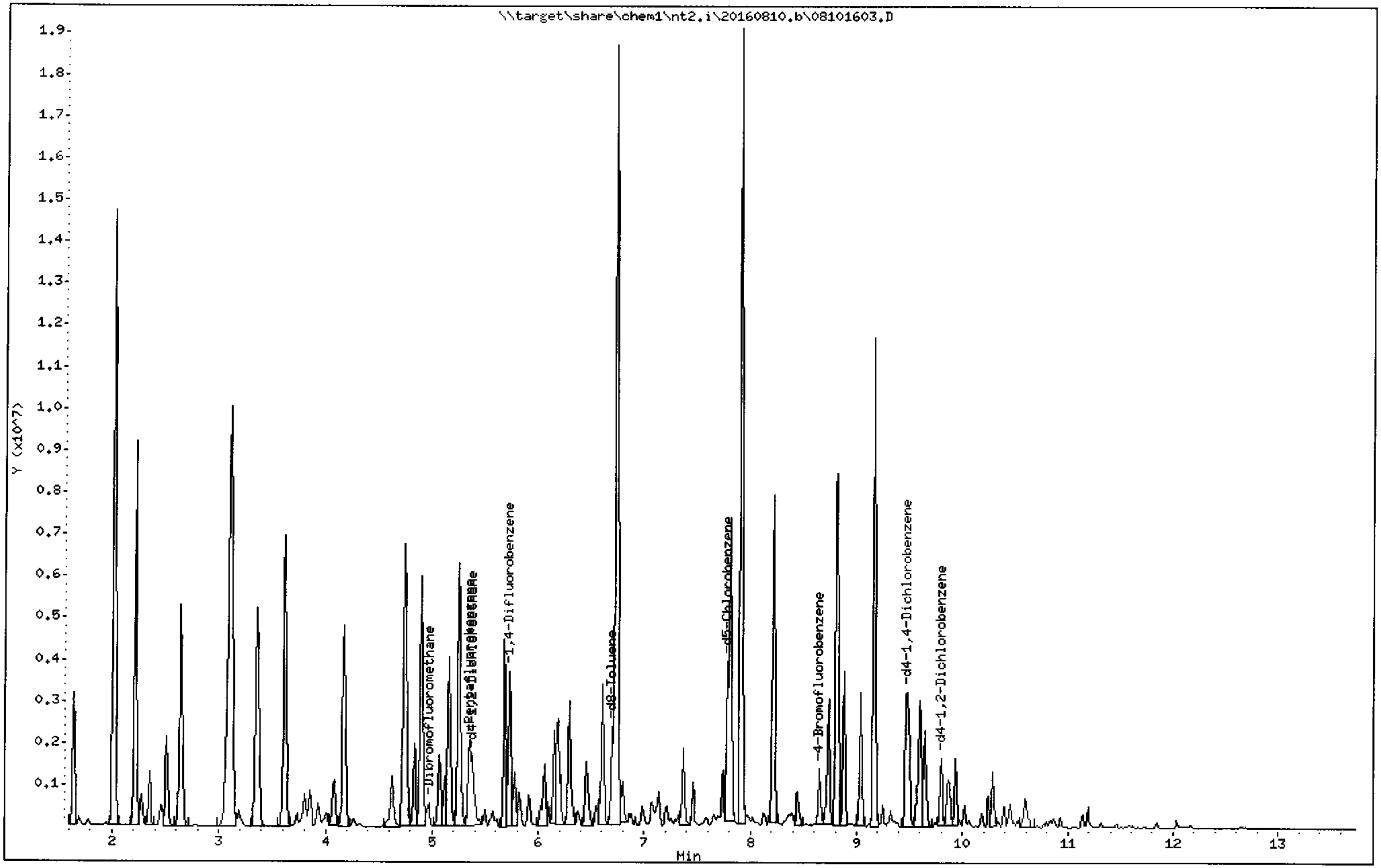


Data File: \\target\share\chem1\nt2.i\20160810.b\08101603.D
Date : 10-AUG-2016 08:05
Client ID: GAS
Sample Info: GICV/LCS,10,10,0,GAS

Column phase: RTXVMS

Instrument: nt2.i

Operator: LH
Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810g.b\08101605.D

Date : 10-AUG-2016 08:46

Client ID:

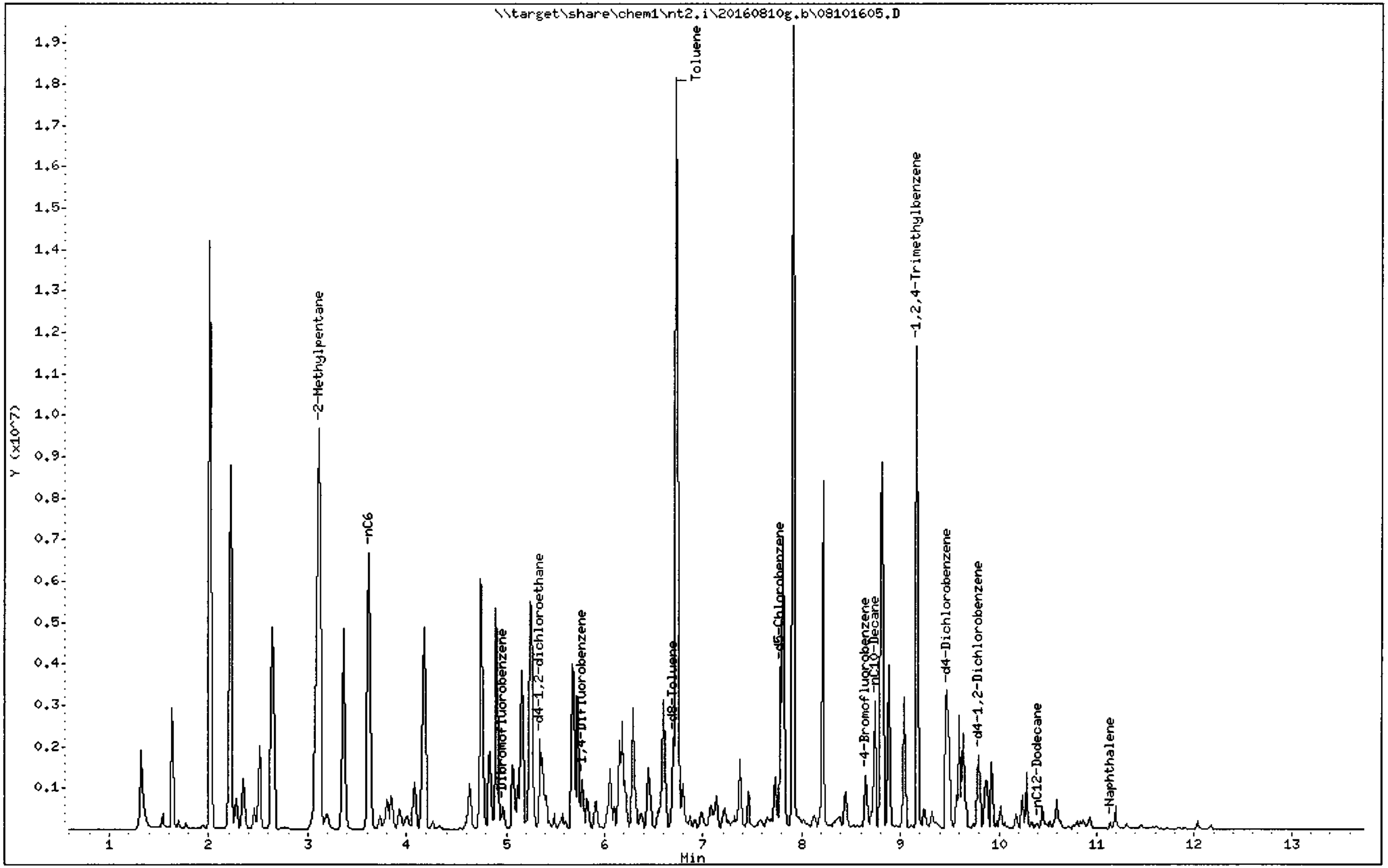
Instrument: nt2.i

Sample Info: GLCSD,10,10,0,GAS

Operator: LH

Column phase: RTXVMS

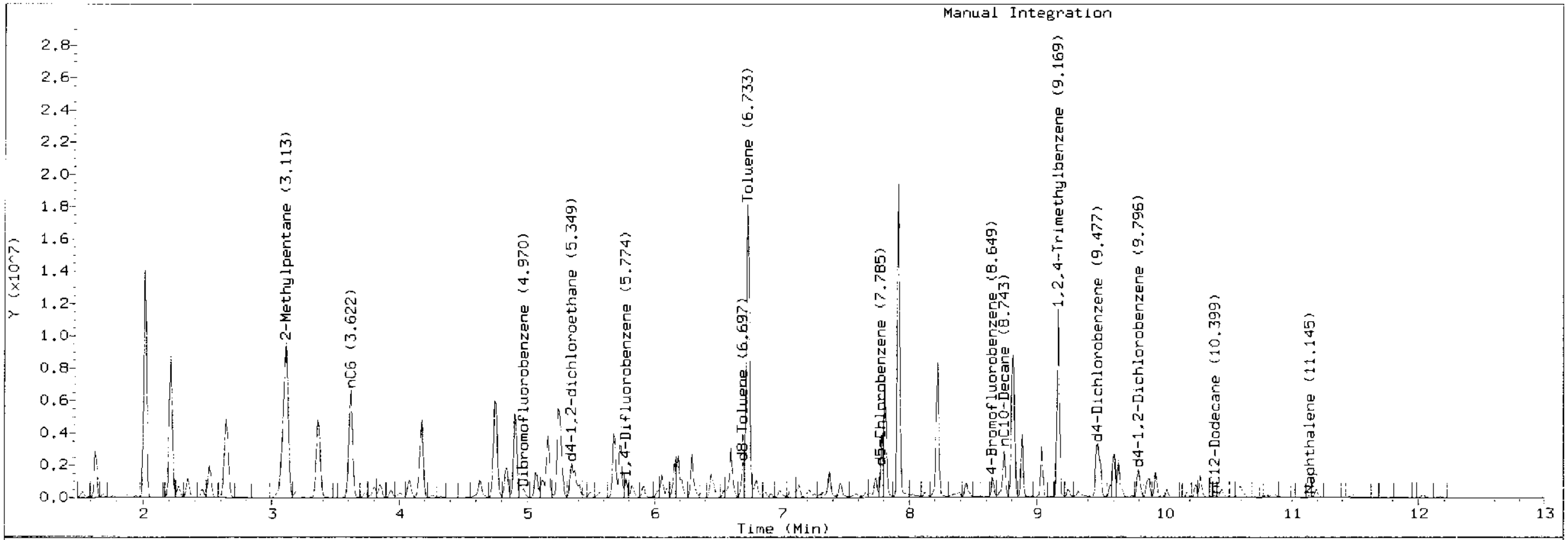
Column diameter: 0.18

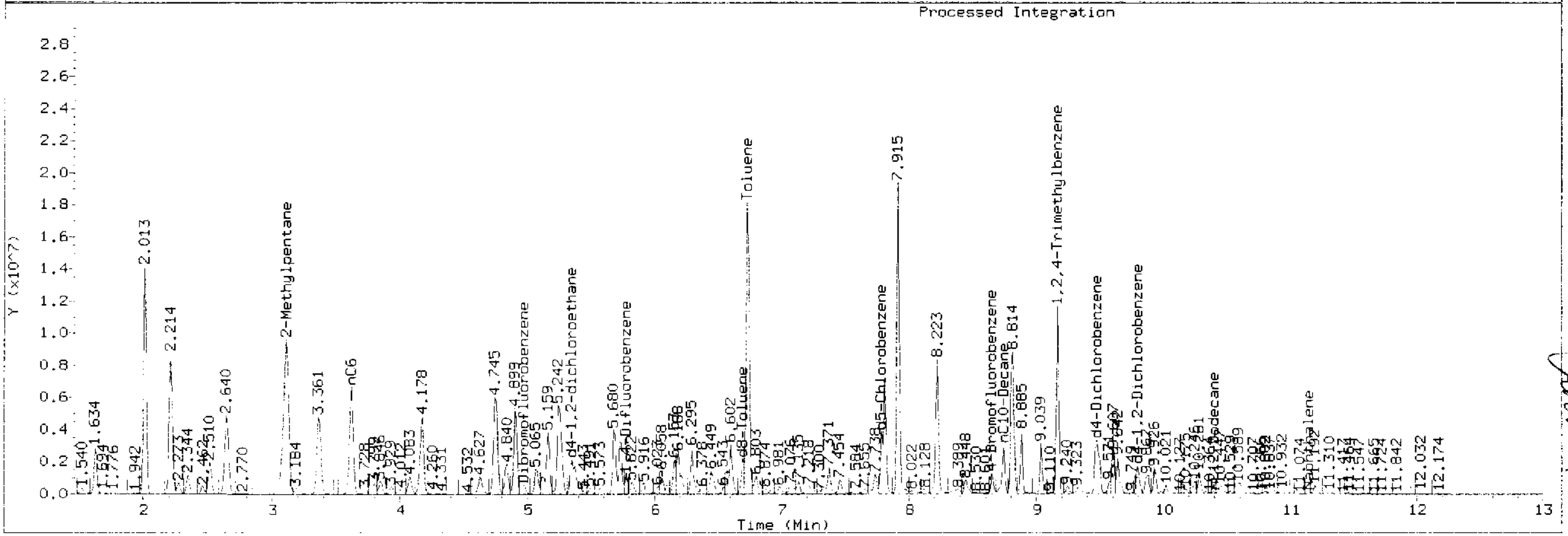


TPHG Manual Integrations Report

Datafile: NT2, 20160810g.b/08101605.D Injection: 10-AUG-2016 08:46

Lab ID:GLCSD





8/11/16

Data File: \\target\share\chem1\nt2.i\20160810.b\08101605.D

Date : 10-AUG-2016 08:46

Client ID: GLCSD

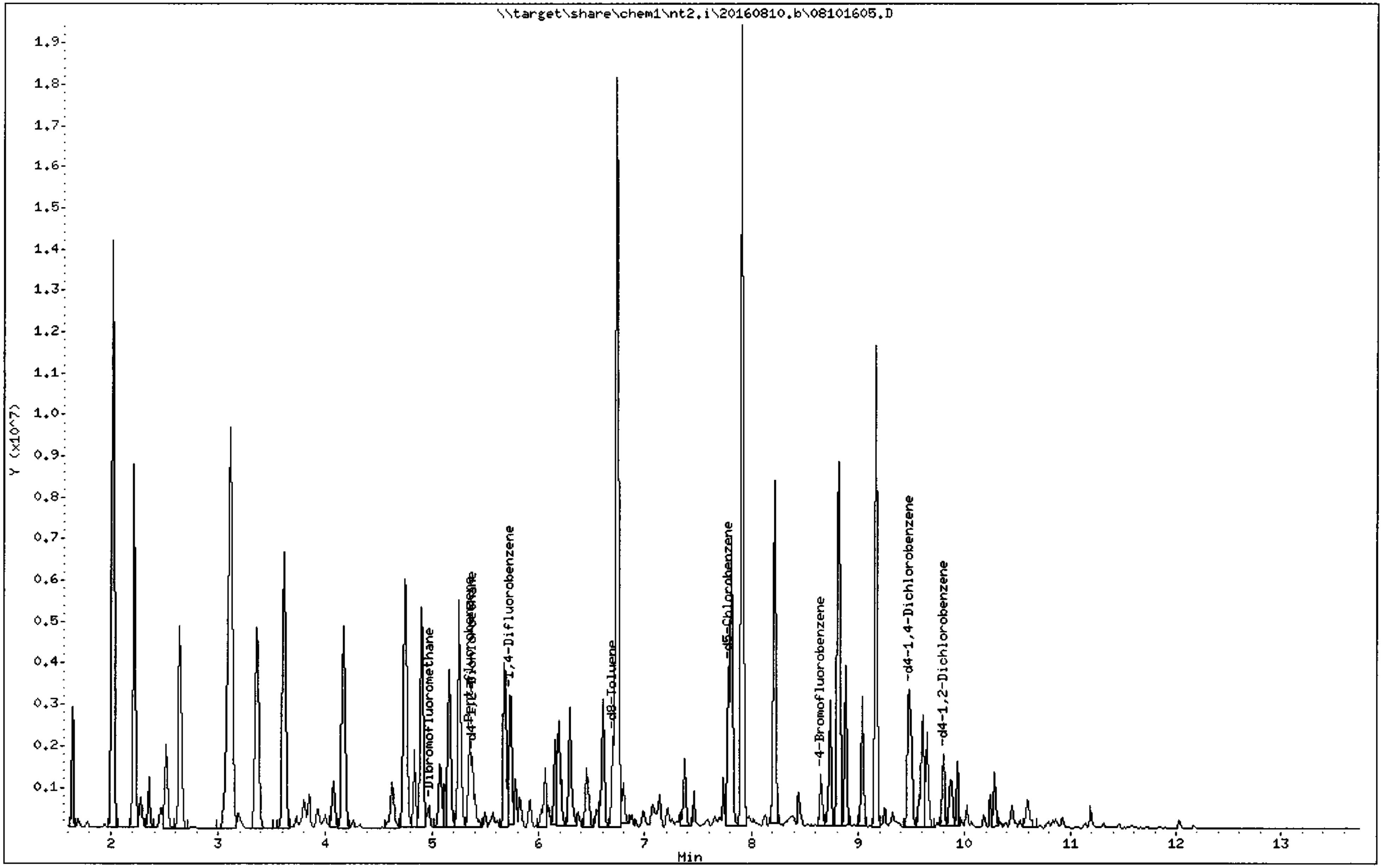
Sample Info: GLCSD,10,10,0,GAS

Column phase: RTXVMS

Instrument: nt2.i

Operator: LH

Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810g.b\08101608.D

Page 1

Date : 10-AUG-2016 09:47

Client ID:

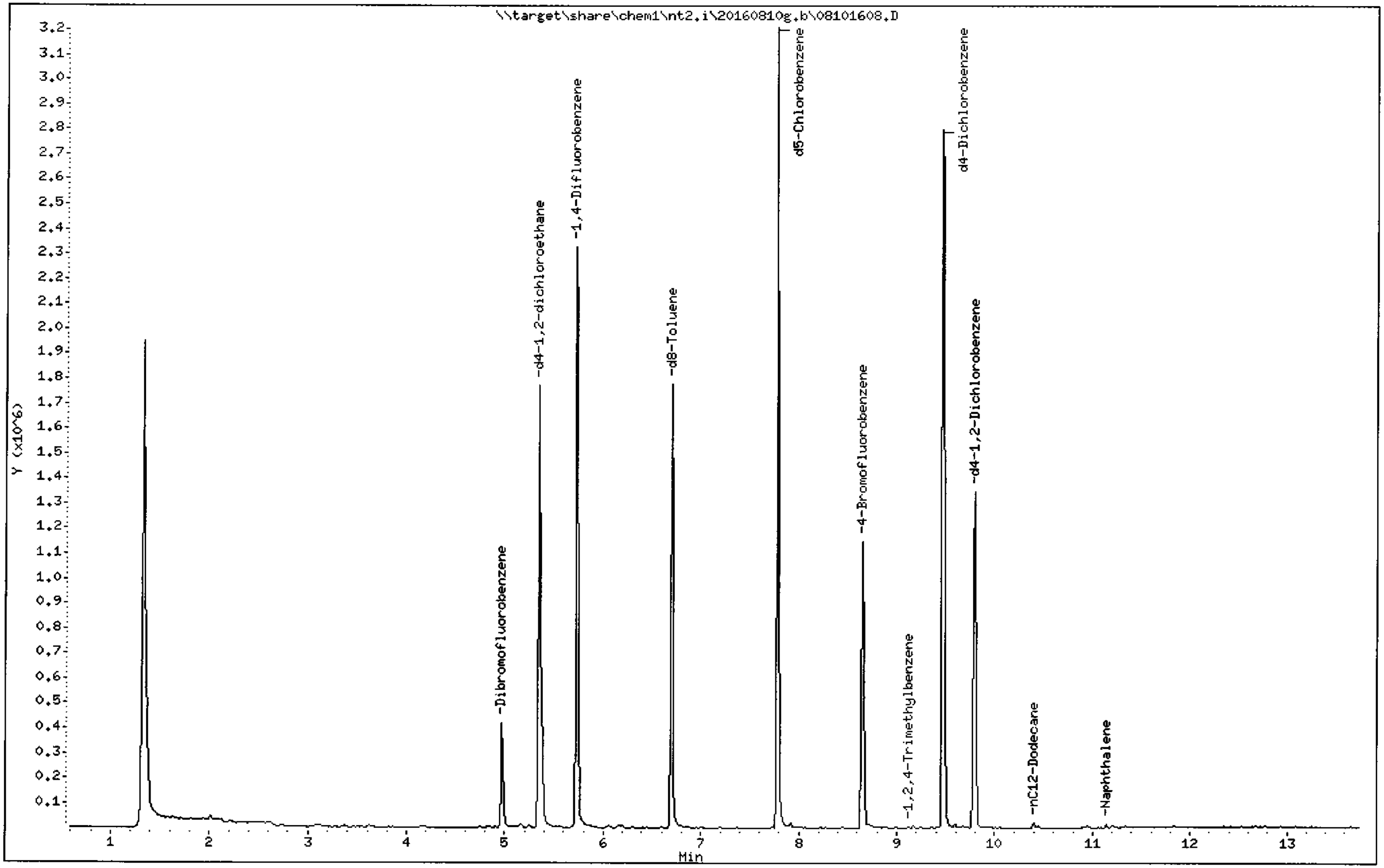
Instrument: nt2.i

Sample Info: MB,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18

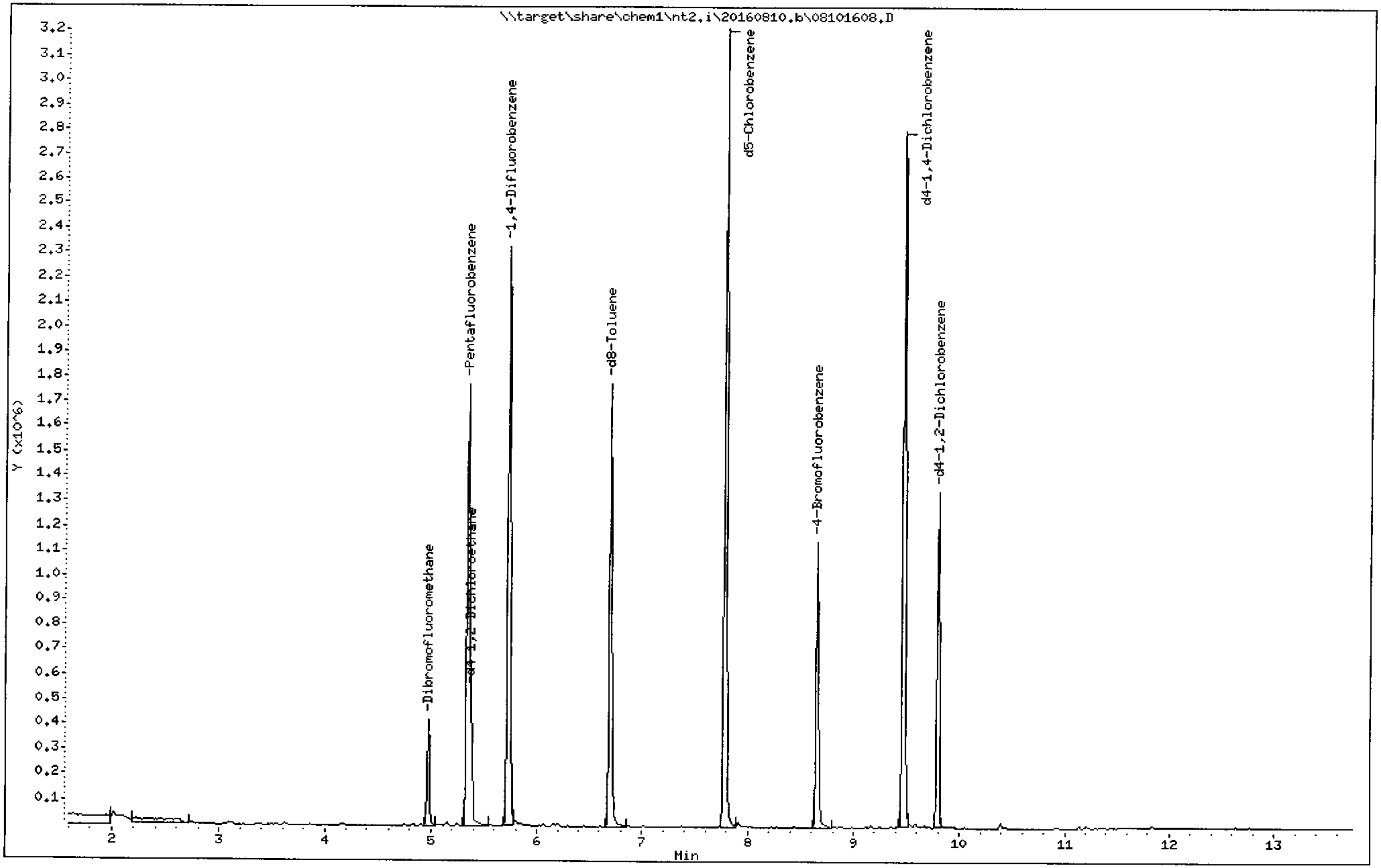


Data File: \\target\share\chem1\nt2.i\20160810.b\08101608.D
Date : 10-AUG-2016 09:47
Client ID: MB
Sample Info: MB,10,10,0,

Column phase: RTXVMS

Instrument: nt2.i

Operator: LH
Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810g.b\08101629.D

Date : 10-AUG-2016 16:58

Client ID:

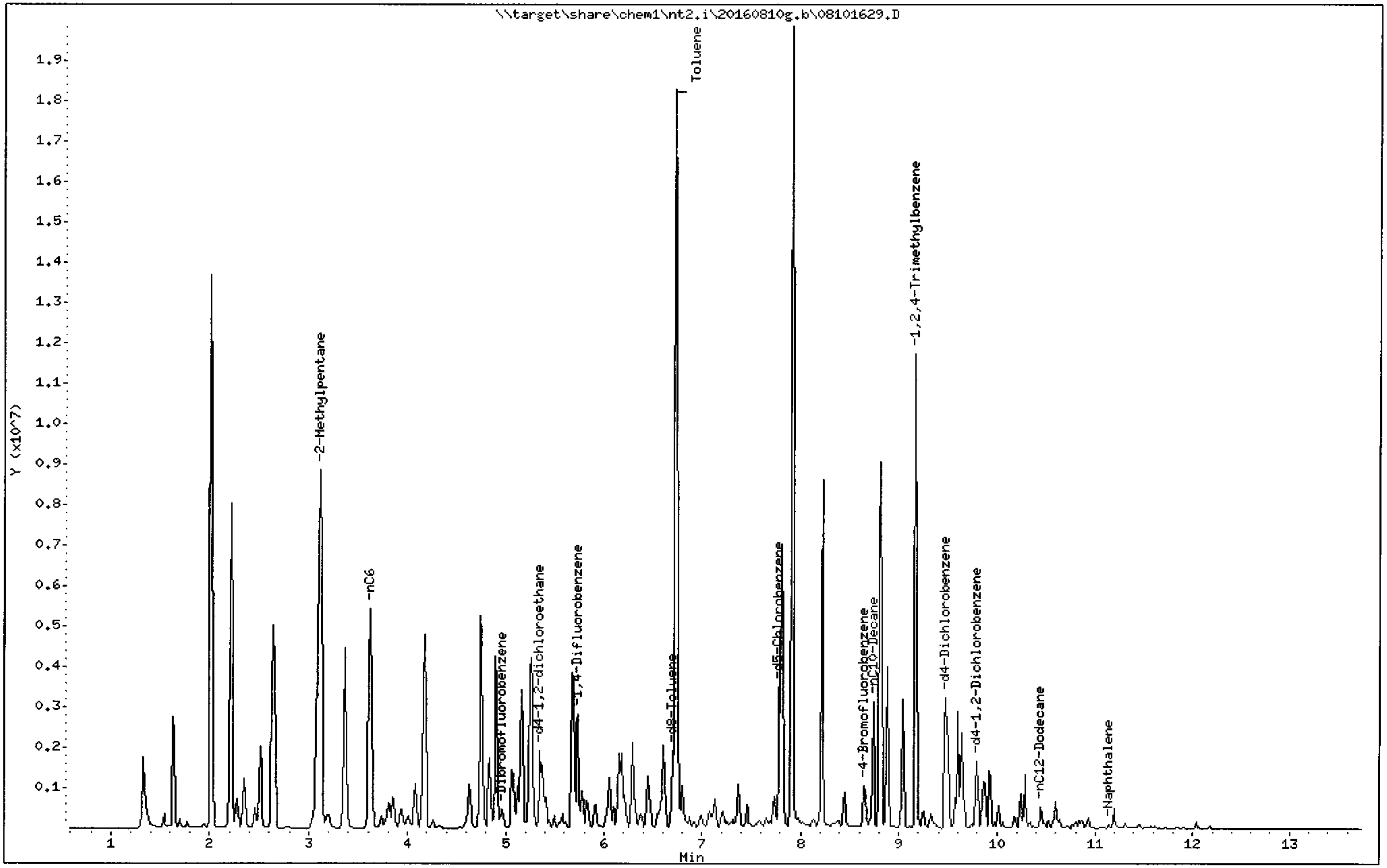
Instrument: nt2.i

Sample Info: GCCV,10,10,0,

Operator: LH

Column phase: RTXVMS

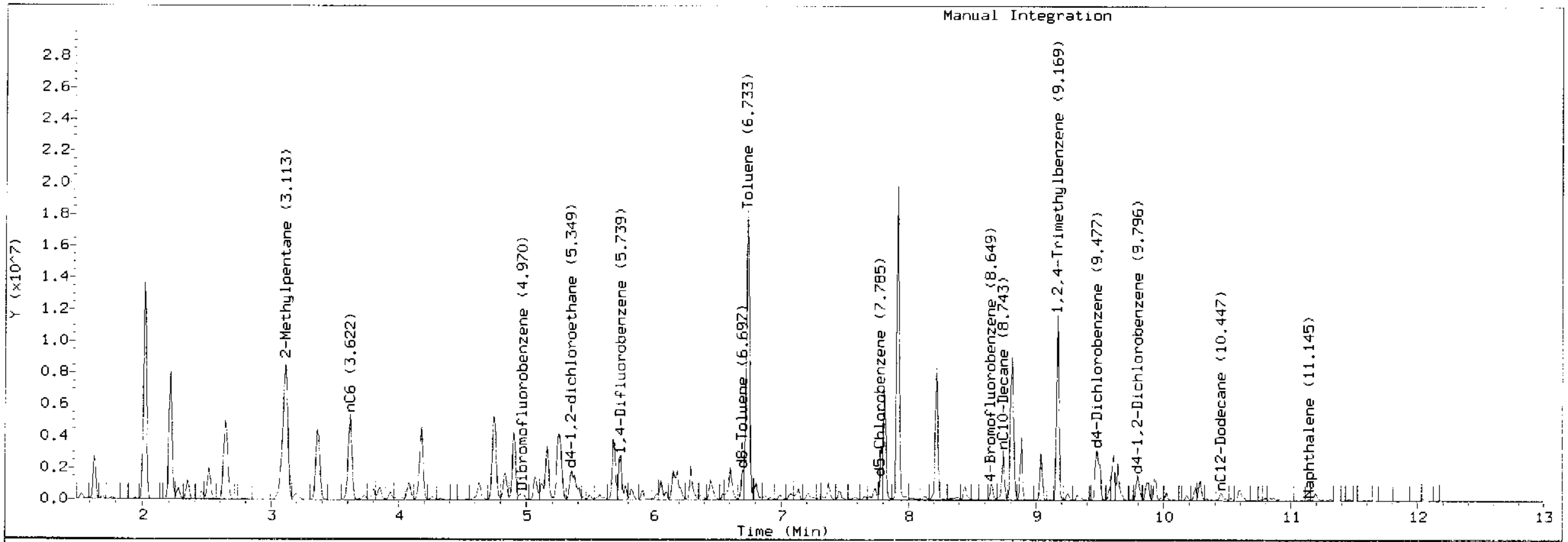
Column diameter: 0.18



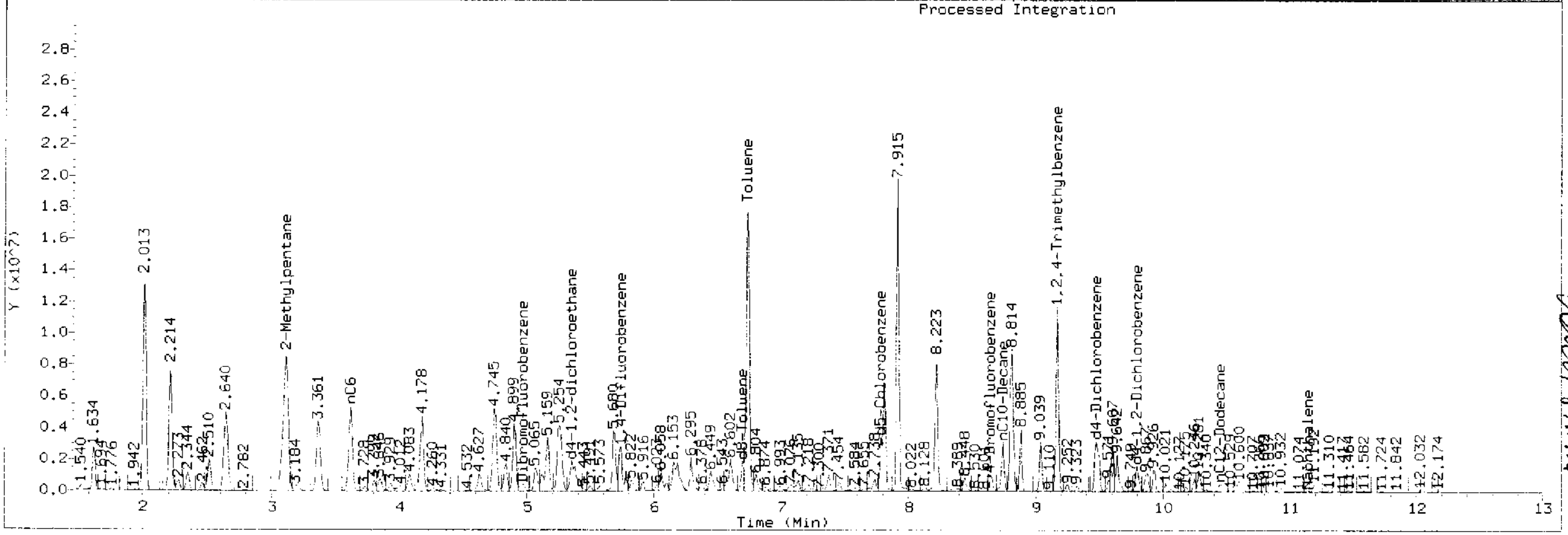
TPHG Manual Integrations Report

Datafile: NT2, 20160810g.b/08101629.D   Injection: 10-AUG-2016 16:58
Lab ID:GCCV

Manual Integration



Processed Integration



Data File: \\target\share\chem1\nt2.i\20160810.b\08101629.D

Date : 10-AUG-2016 16:58

Client ID: GCCV

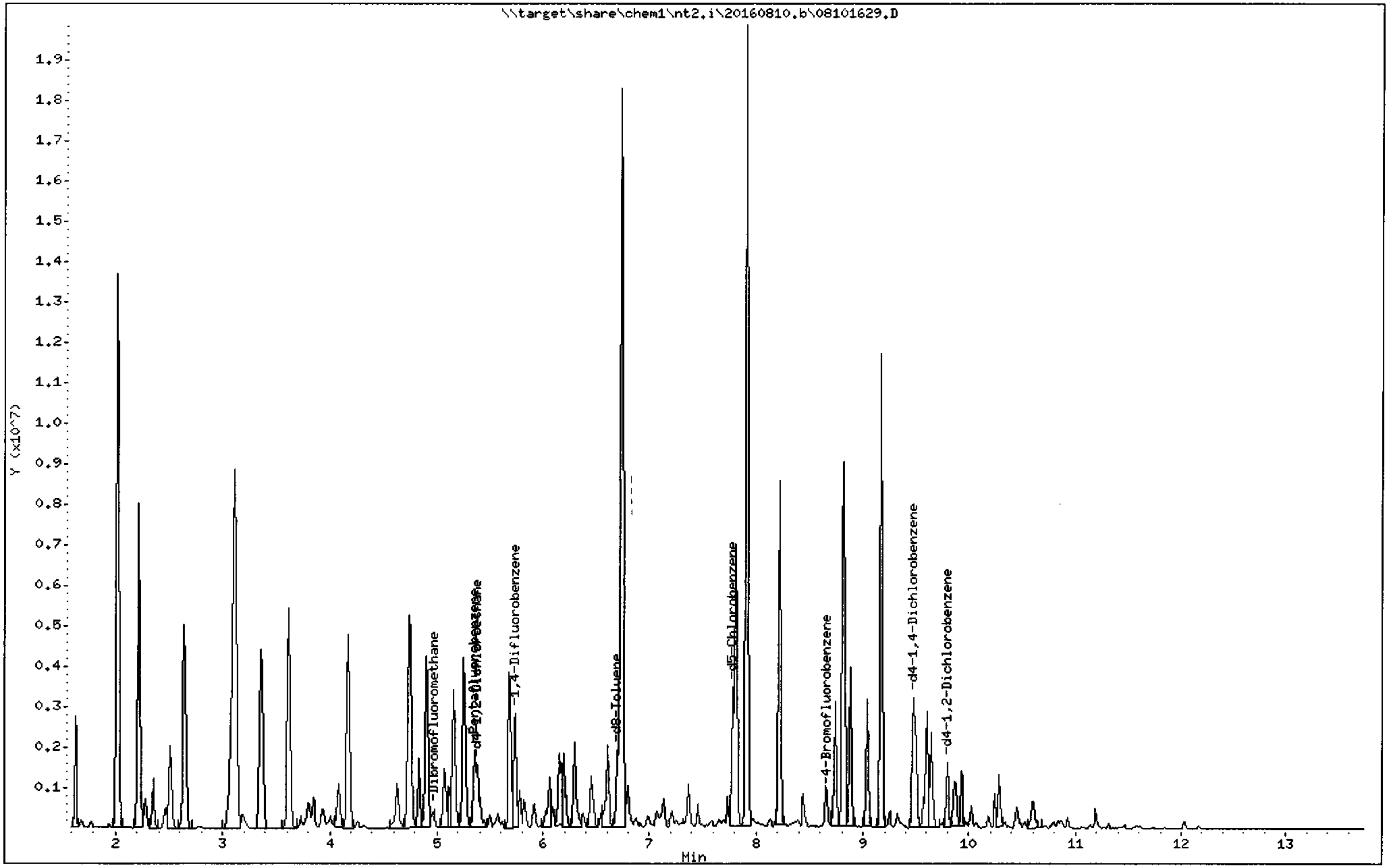
Instrument: nt2.i

Sample Info: GCCV,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810g.b\08101609.D

Date : 10-AUG-2016 10:08

Client ID: Trip Blank

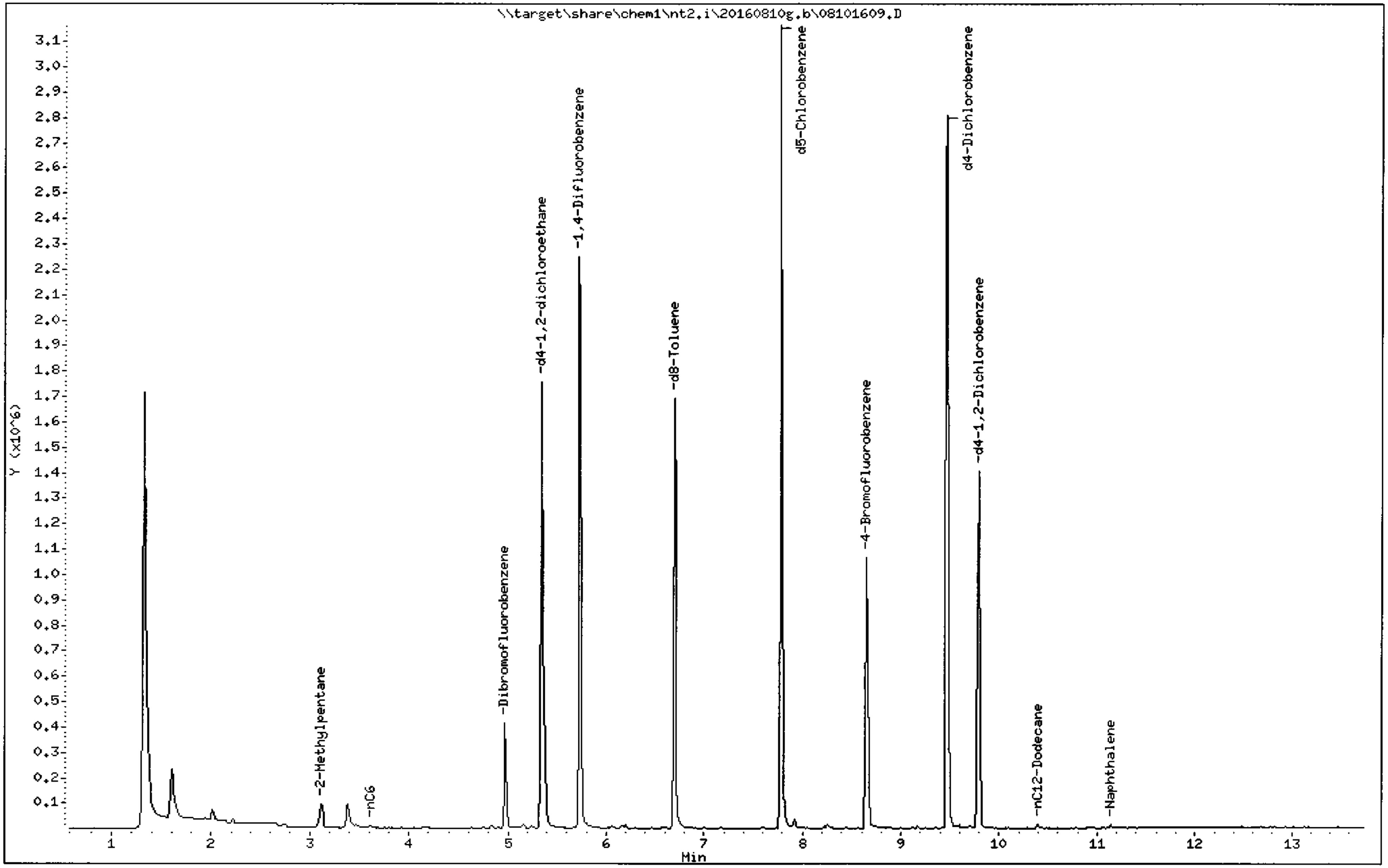
Instrument: nt2.i

Sample Info: BEE6AC,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810.b\08101609.D

Date : 10-AUG-2016 10:08

Client ID: Trip Blank

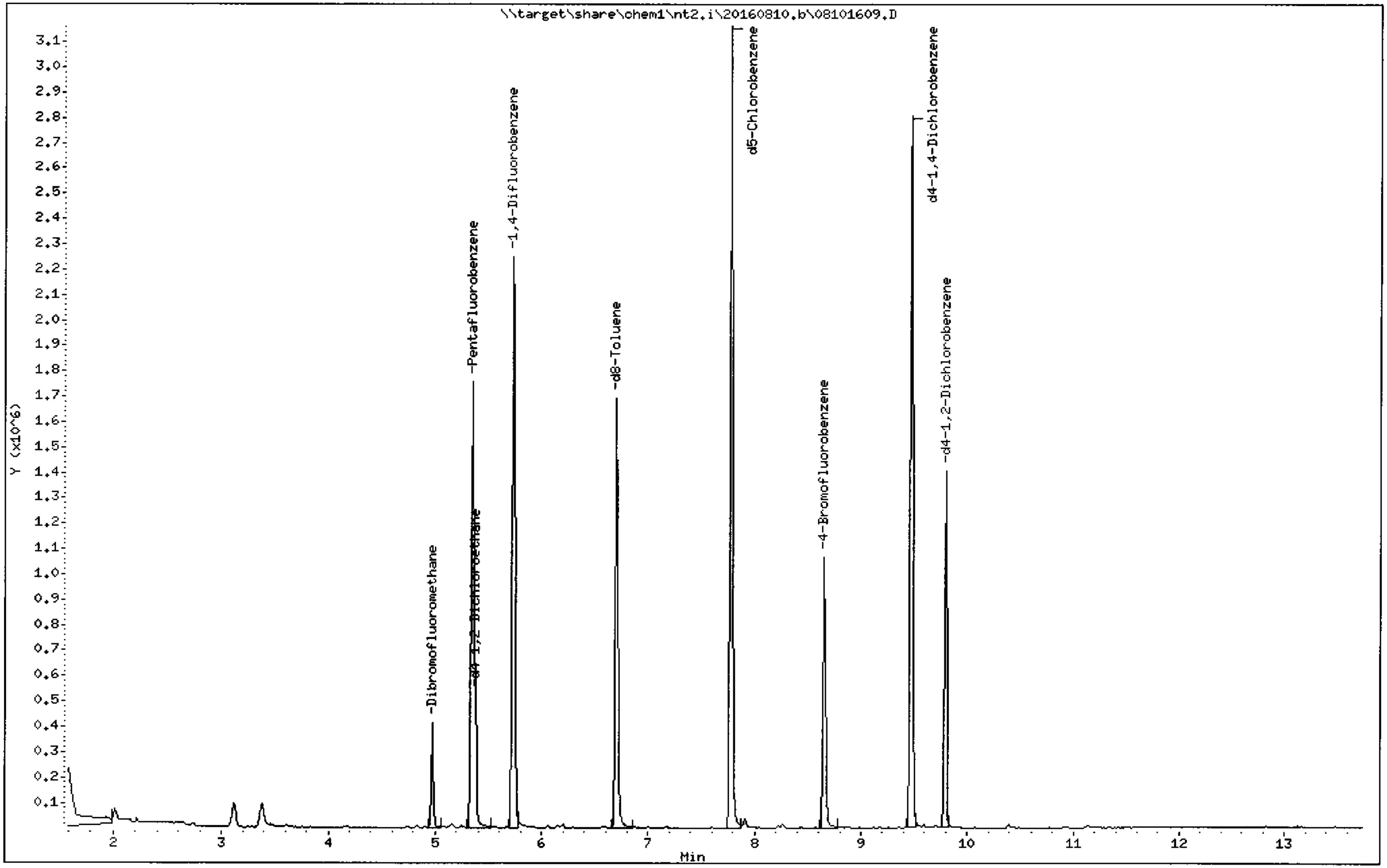
Instrument: nt2.i

Sample Info: BEE6AC,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18

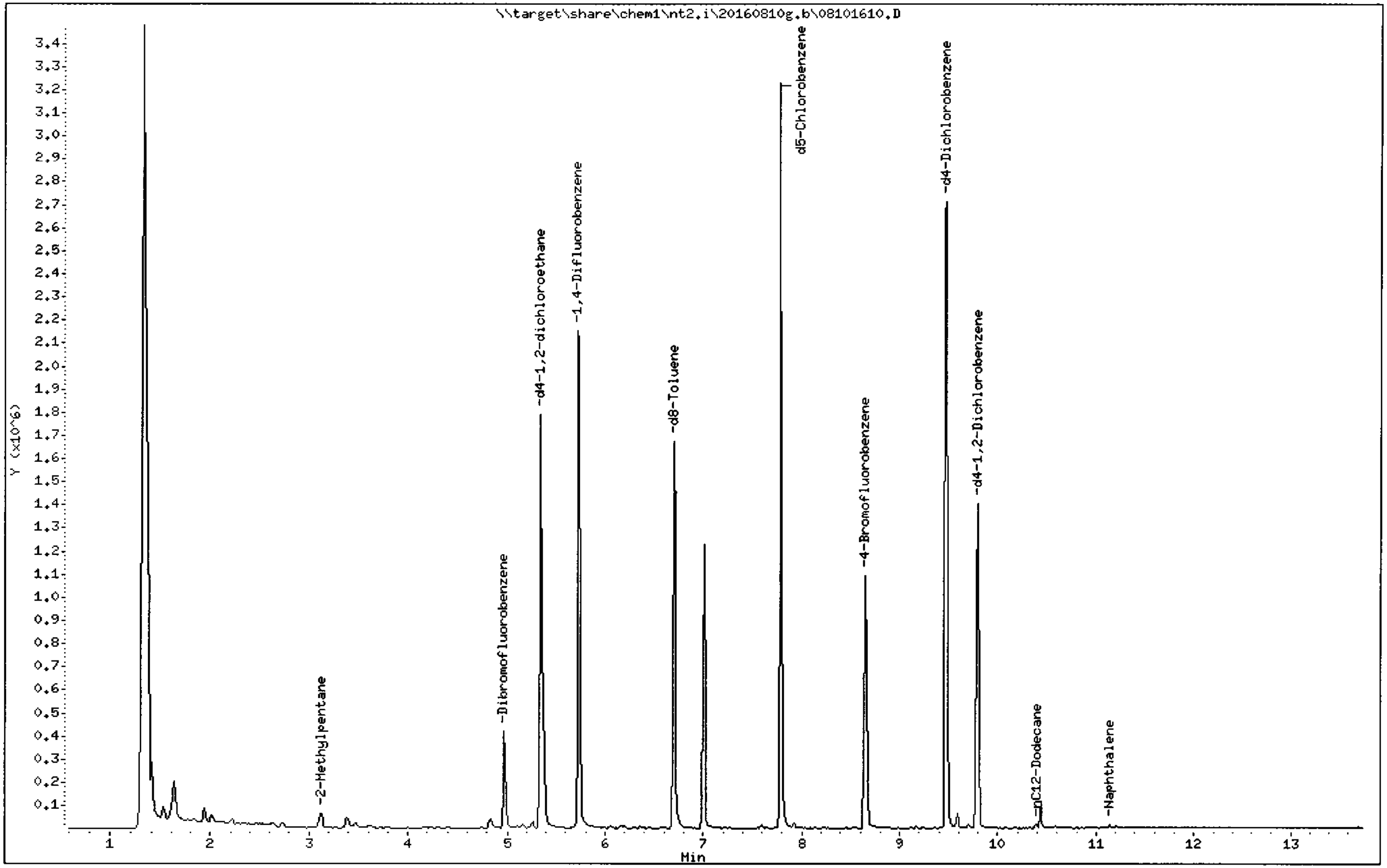


Data File: \\target\share\chem1\nt2.i\20160810g.b\08101610.D
Date : 10-AUG-2016 10:29
Client ID: KJB-15
Sample Info: BEE6AB,10,10,0,

Column phase: RTXVMS

Instrument: nt2.i

Operator: LH
Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810.b\08101610.D

Date : 10-AUG-2016 10:29

Client ID: KJB-15

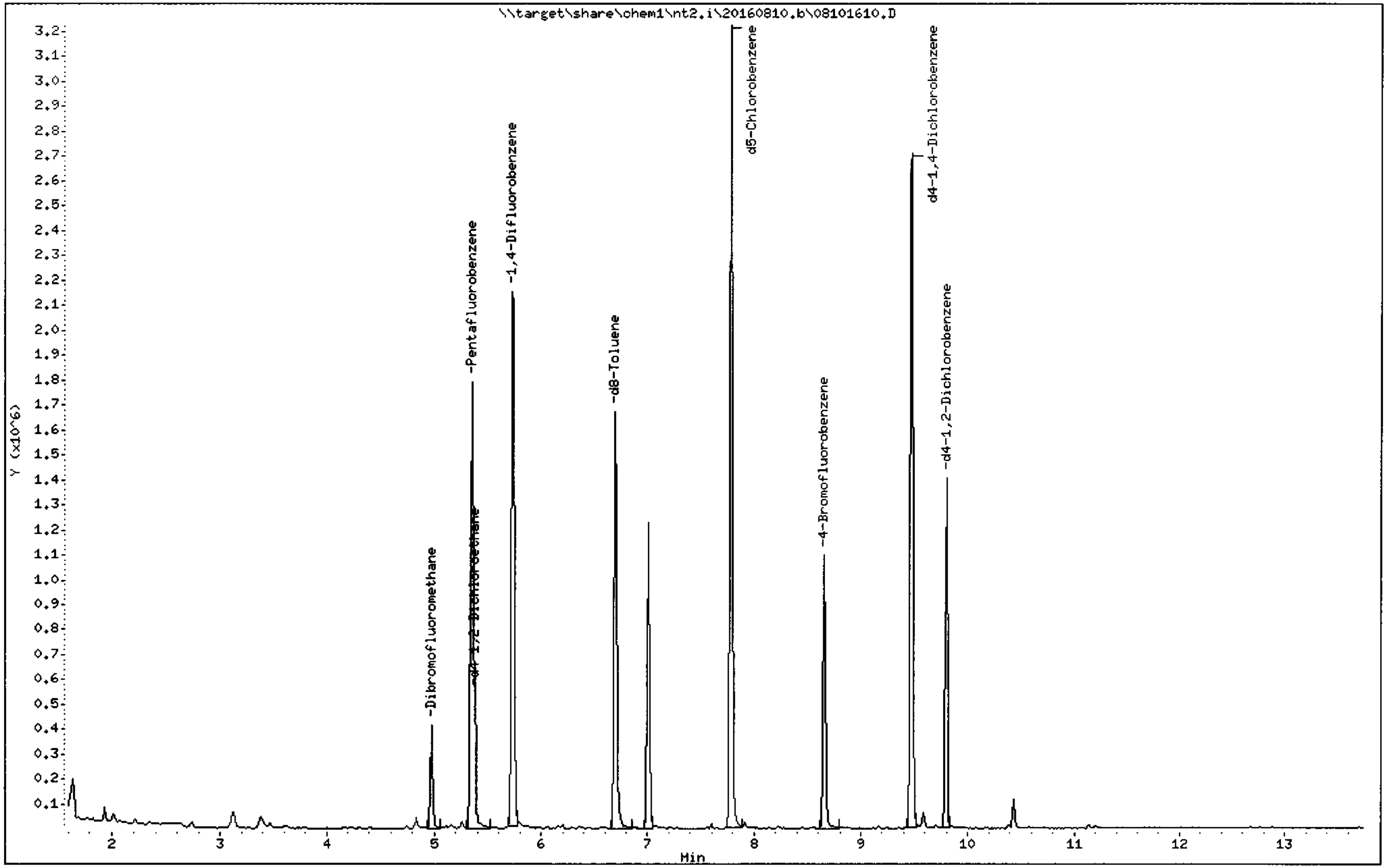
Instrument: nt2.i

Sample Info: BEE6AB,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810g.b\08101617.D

Date : 10-AUG-2016 12:52

Client ID: KJB-14-7

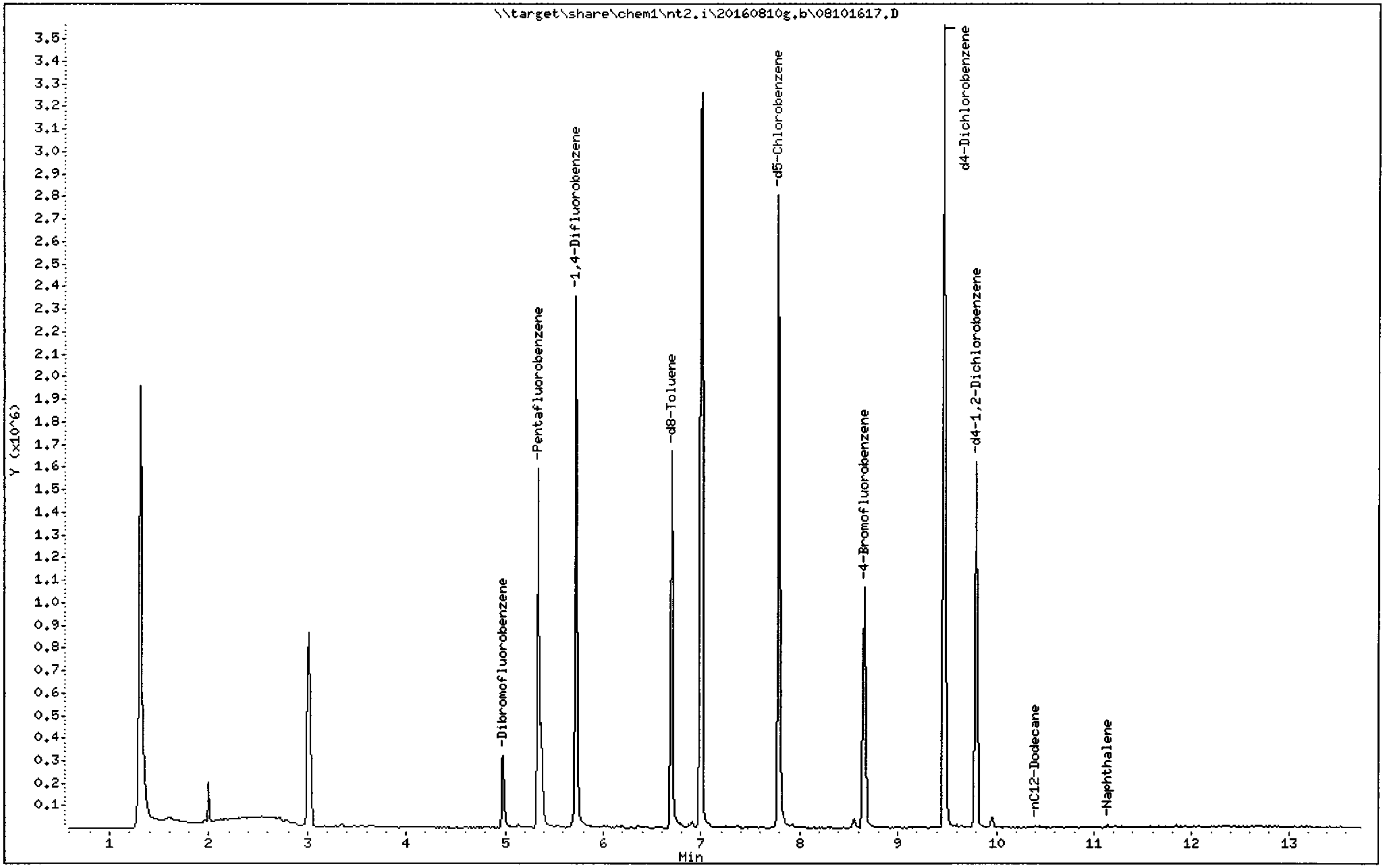
Sample Info: BEE6M,10,10,0,

Column phase: RTXVMS

Instrument: nt2.i

Operator: LH

Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810.b\08101617.D

Date : 10-AUG-2016 12:52

Client ID: KJB-14-7

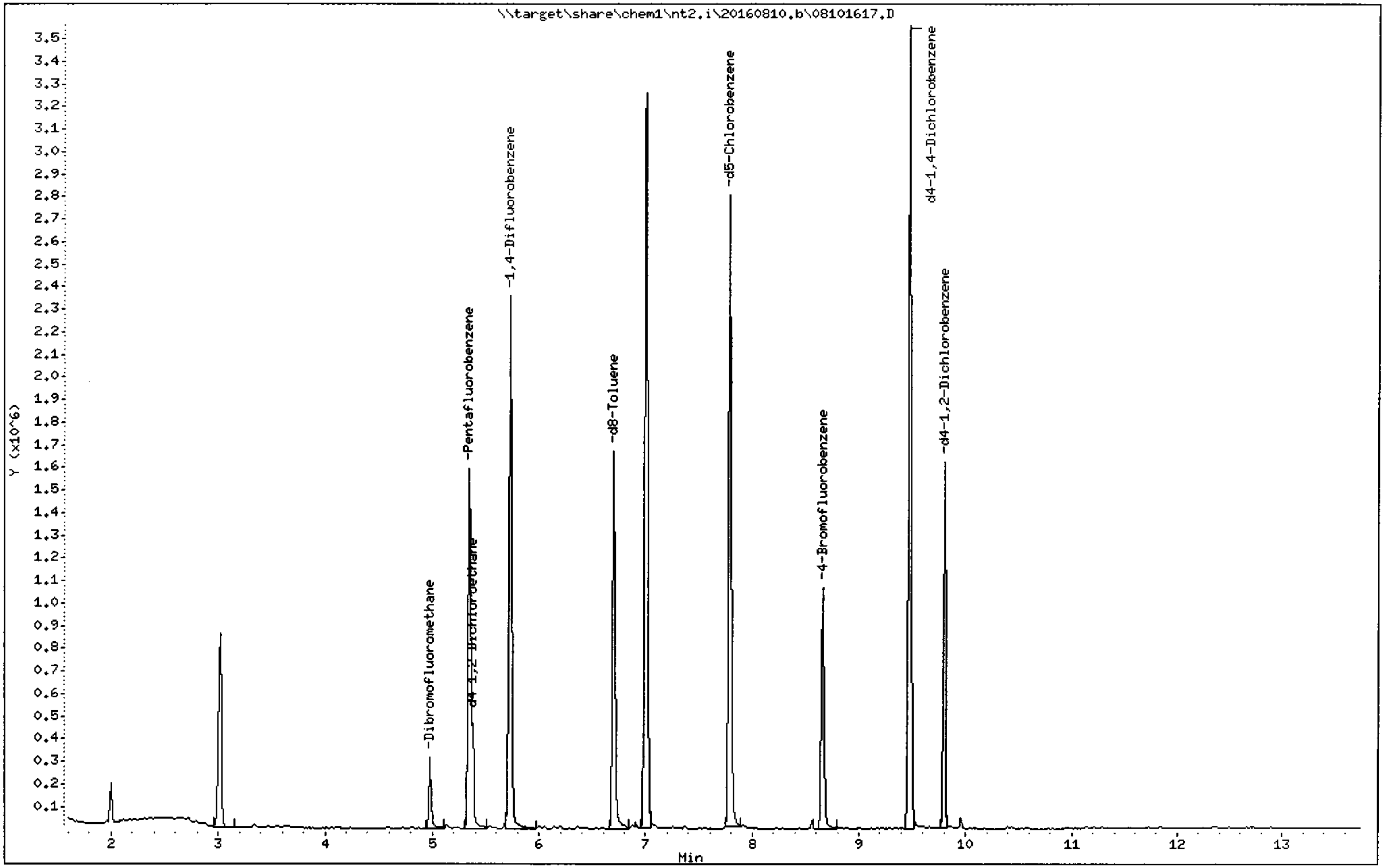
Instrument: nt2.i

Sample Info: BEE6M,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810g.b\08101618.D

Page 1

Date : 10-AUG-2016 13:13

Client ID: KJB-14-13

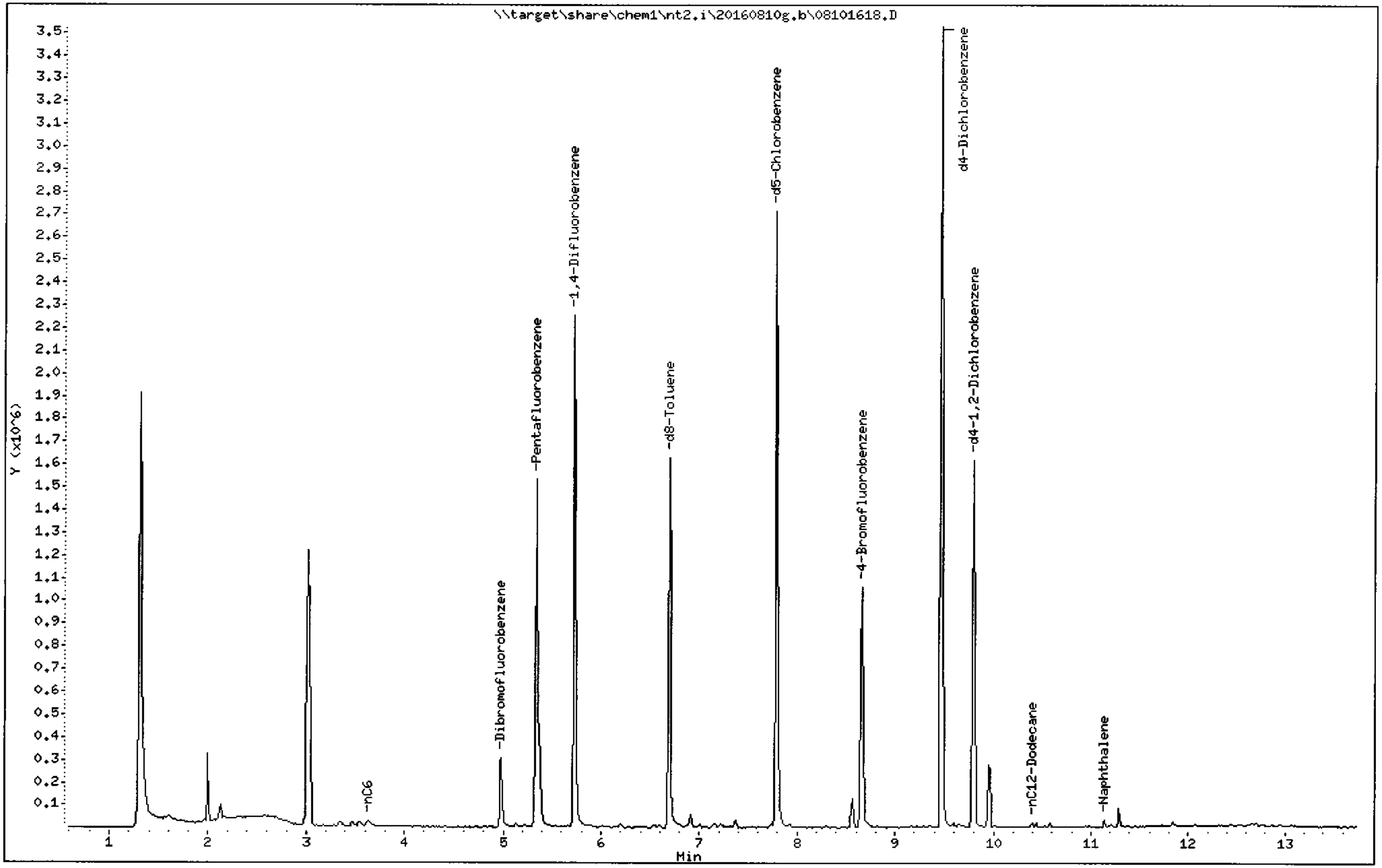
Instrument: nt2.i

Sample Info: BEE6N,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810.b\08101618.D

Date : 10-AUG-2016 13:13

Client ID: KJB-14-13

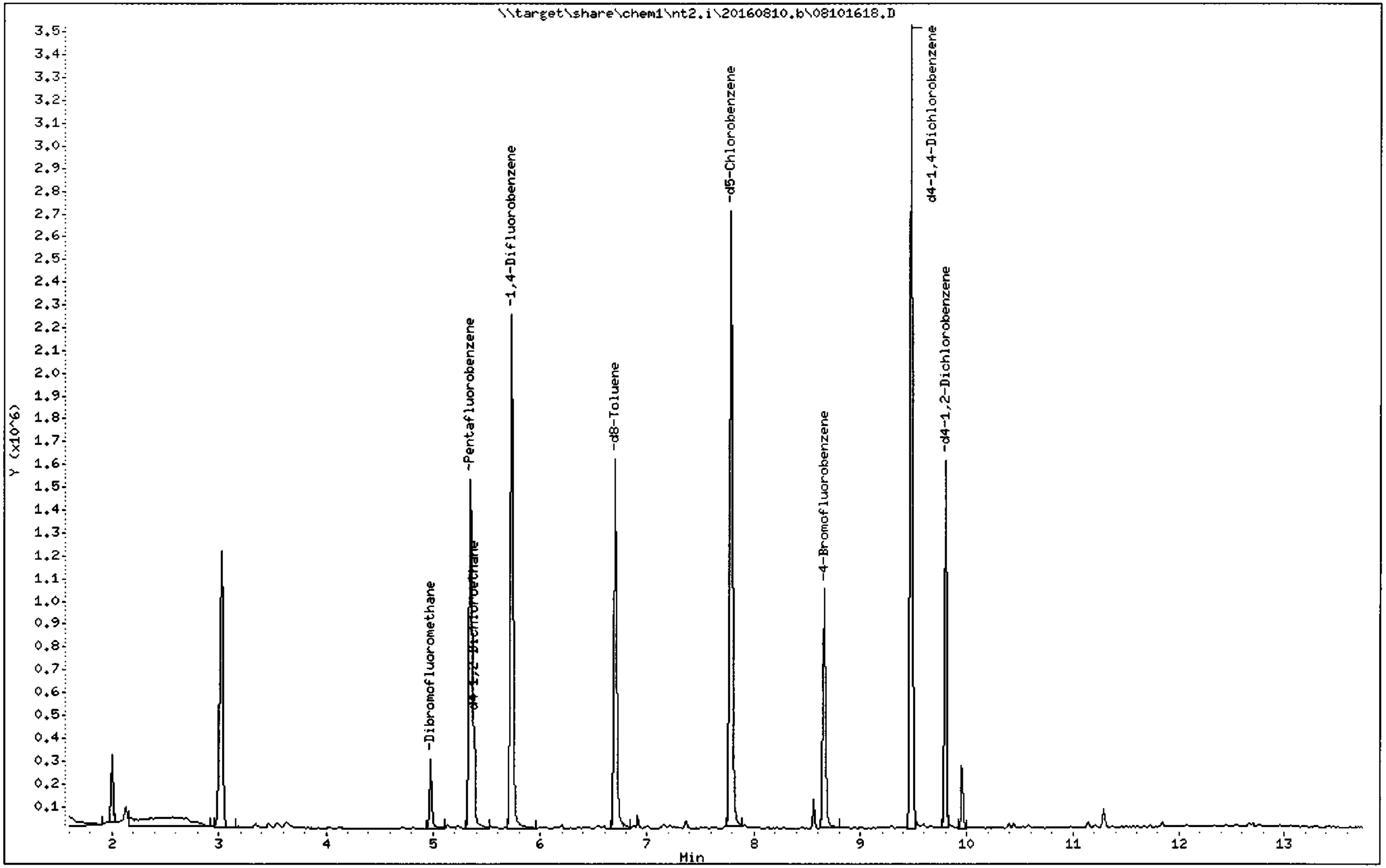
Sample Info: BEE6N,10,10,0,

Column phase: RTXVMS

Instrument: nt2.i

Operator: LH

Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810g.b\08101619.D

Date : 10-AUG-2016 13:33

Client ID: KJB-14-18

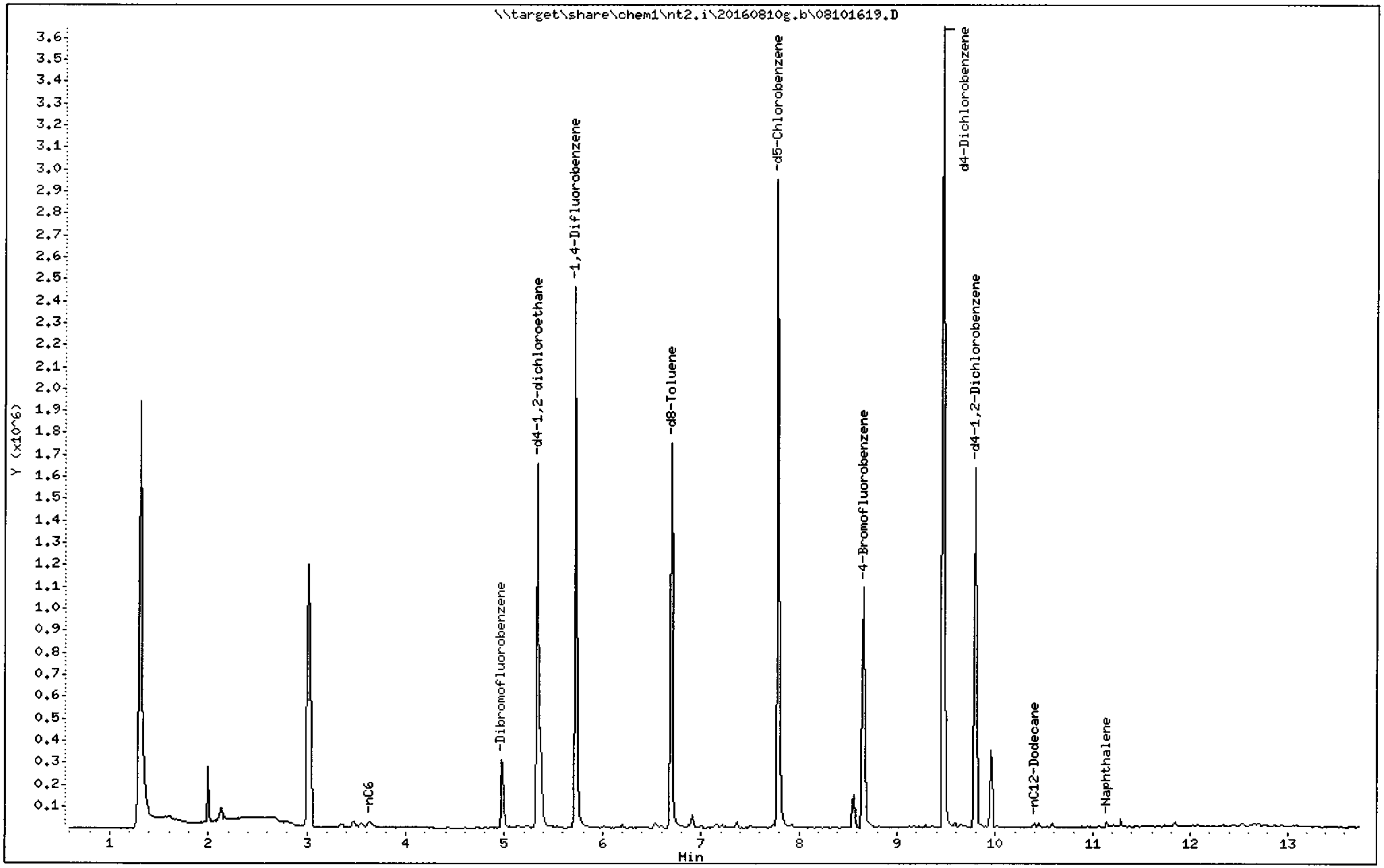
Instrument: nt2.i

Sample Info: BEE60,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18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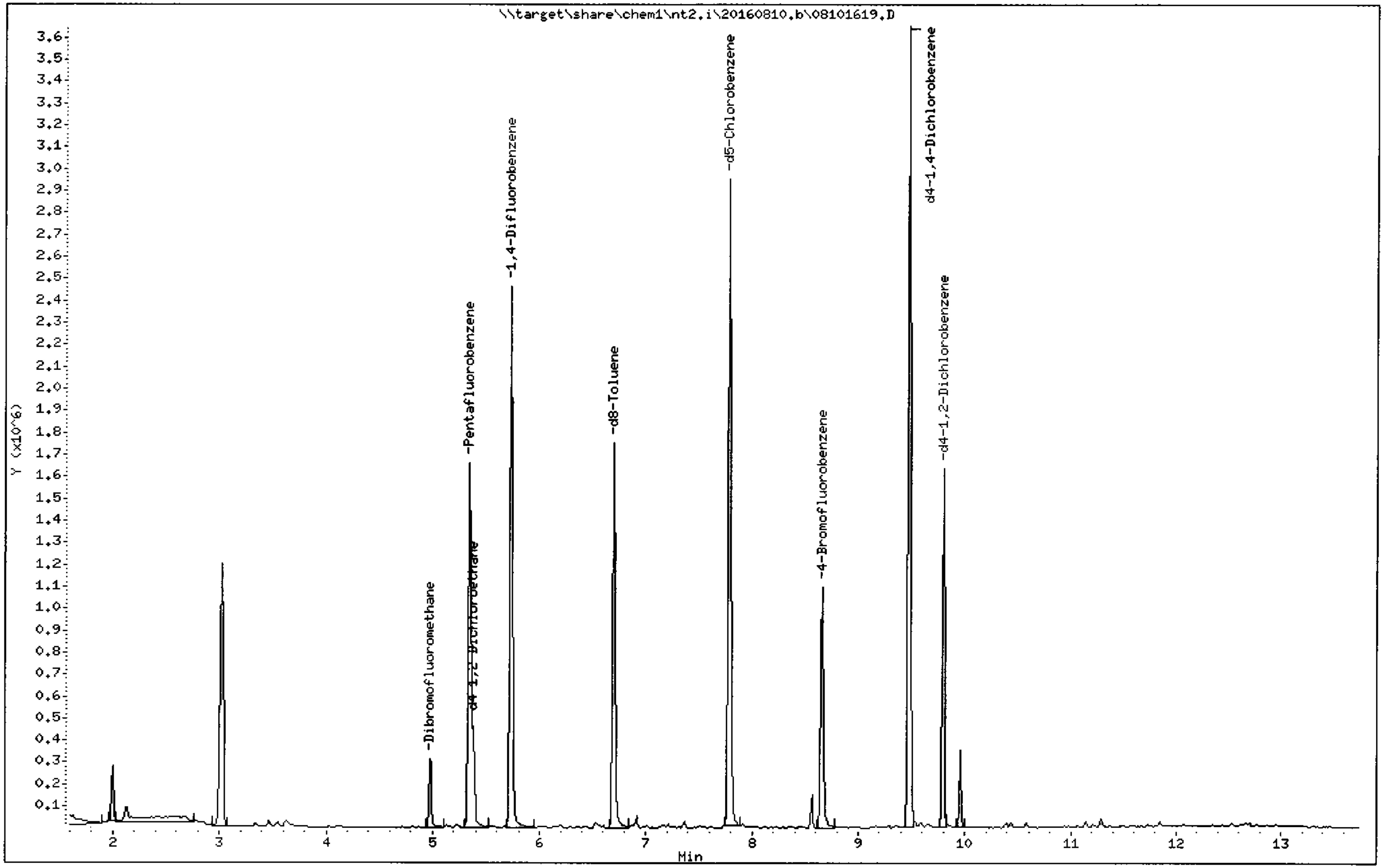
Data File: \\target\share\chem1\nt2.i\20160810.b\08101619.D
Date : 10-AUG-2016 13:33
Client ID: KJB-14-18
Sample Info: BEE60,10,10,0,

Column phase: RTXVMS

Instrument: nt2.i

Operator: LH
Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810g.b\08101620.D

Date : 10-AUG-2016 13:54

Client ID: KJB-15-11

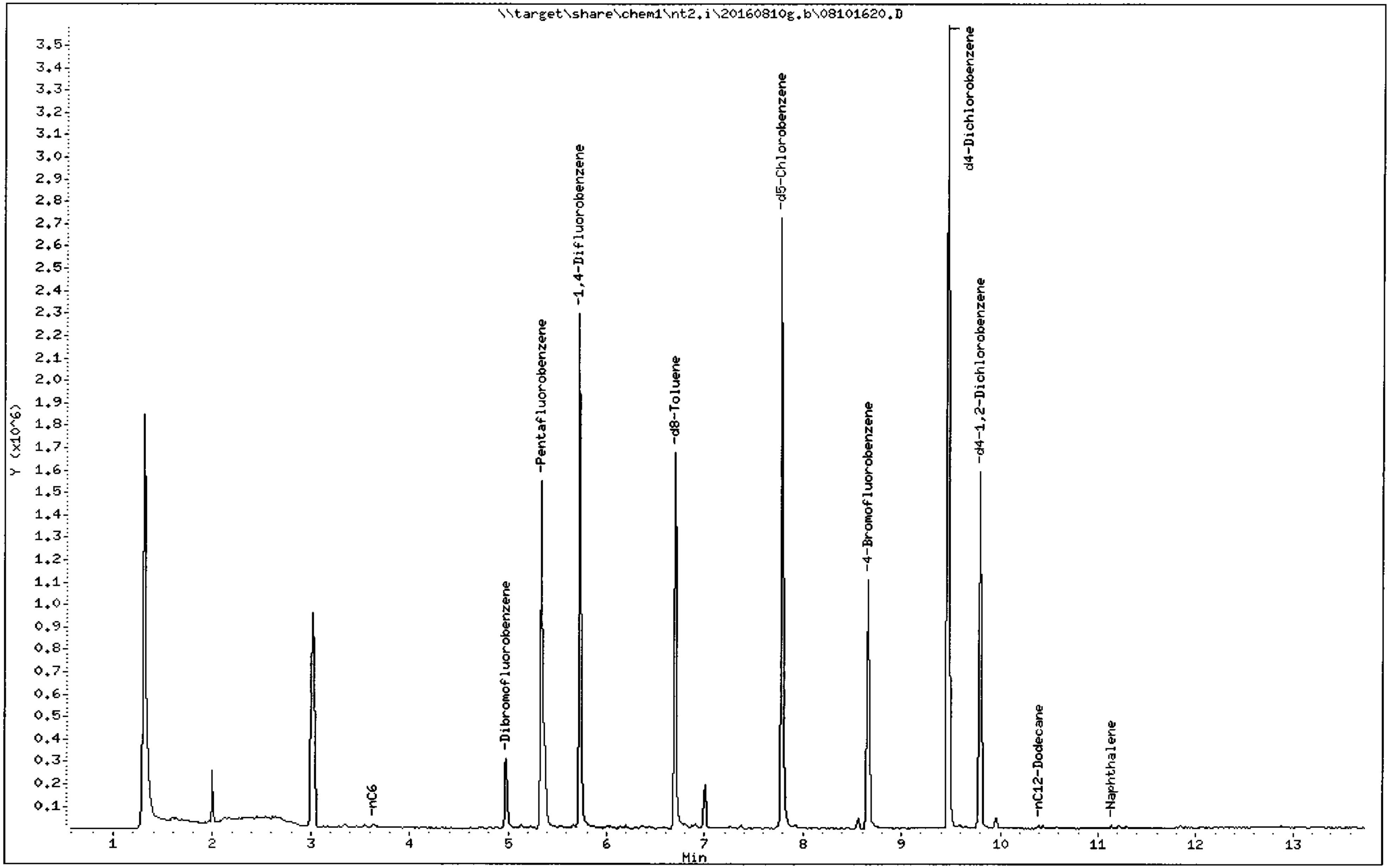
Instrument: nt2.i

Sample Info: BEE6P,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810.b\08101620.D

Date : 10-AUG-2016 13:54

Client ID: KJB-15-11

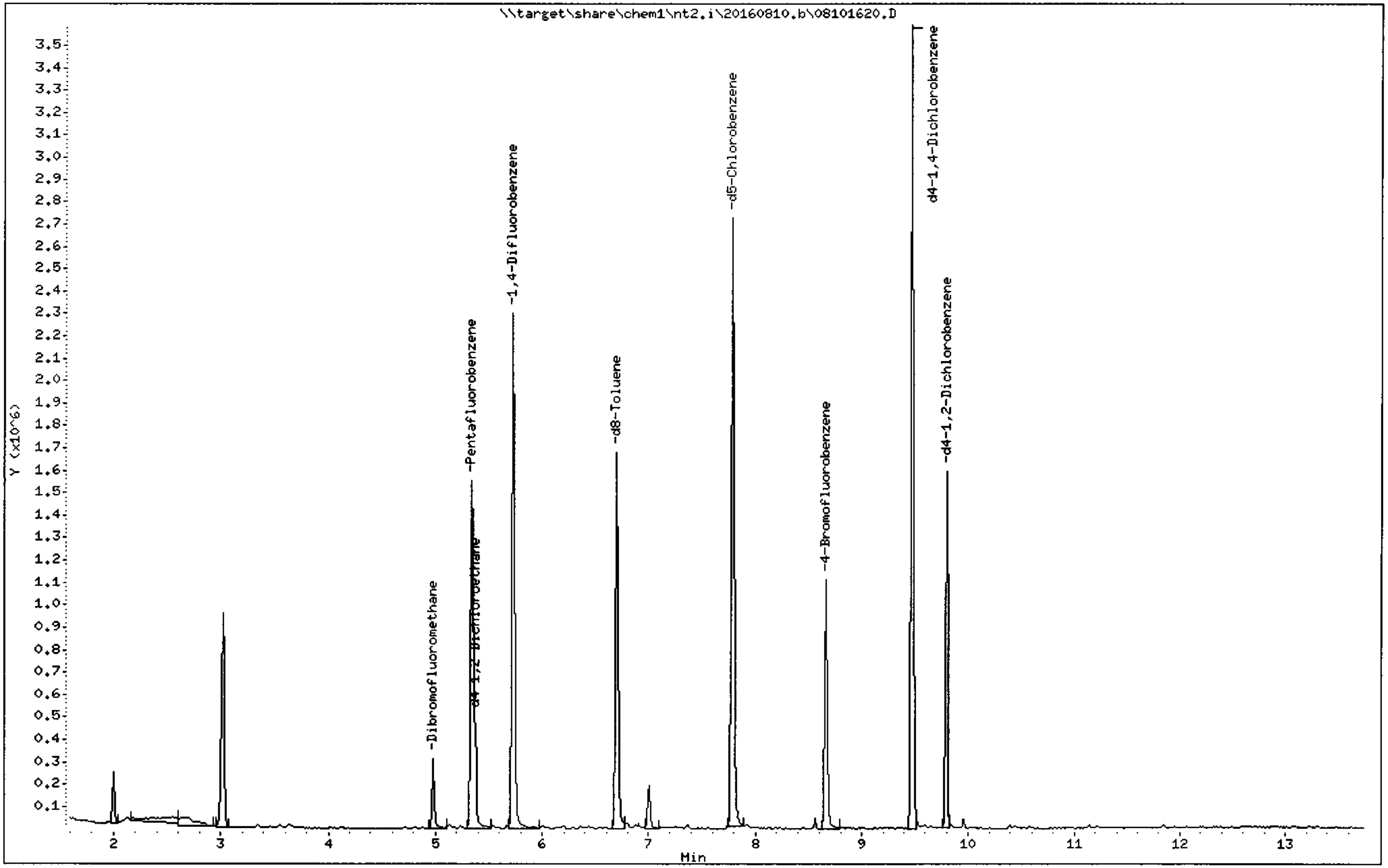
Instrument: nt2.i

Sample Info: BEE6P,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810g.b\08101621.D

Date : 10-AUG-2016 14:14

Client ID: KJB-15-19

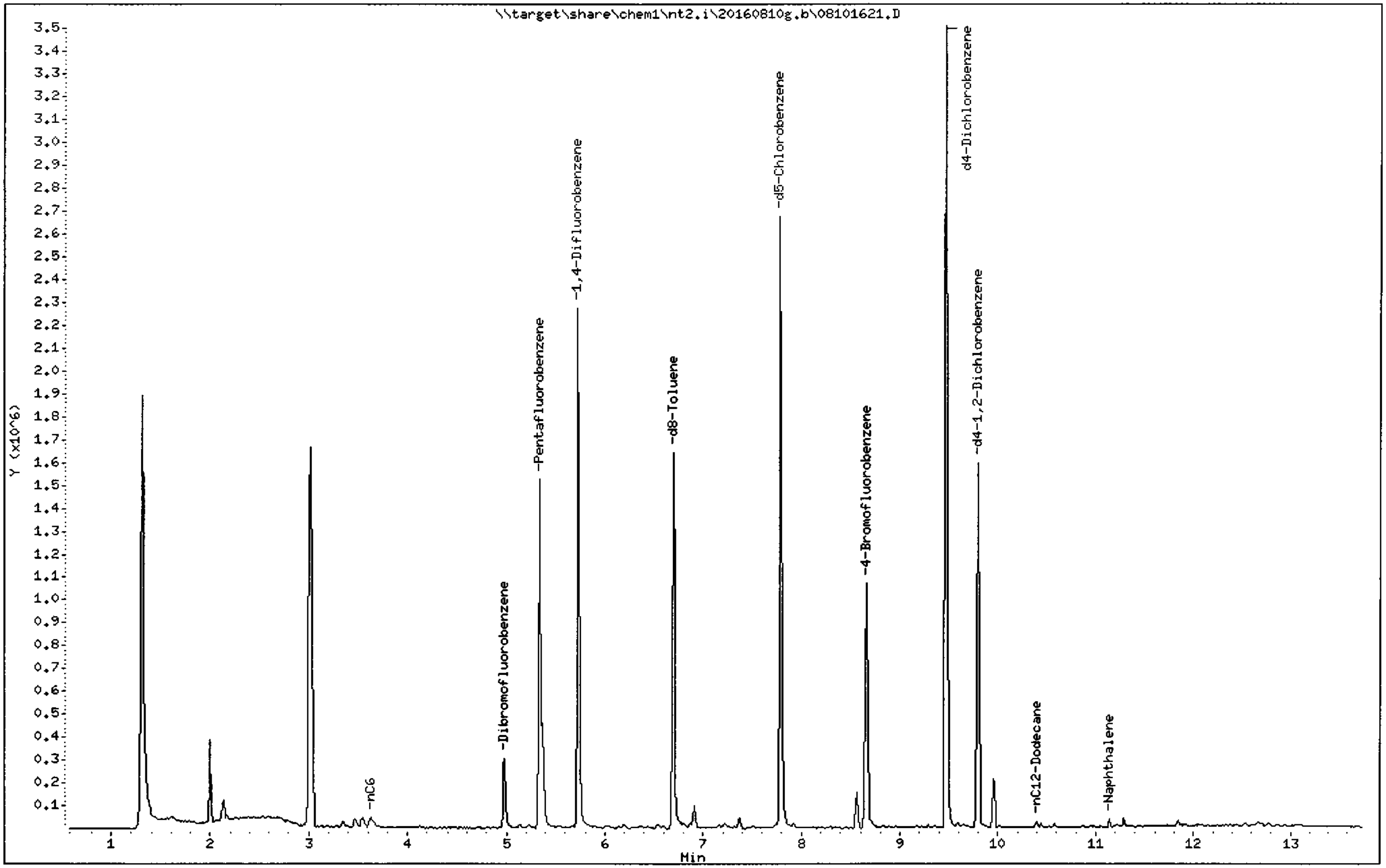
Sample Info: BEE6Q,10,10,0,

Column phase: RTXVMS

Instrument: nt2.i

Operator: LH

Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810.b\08101621.D

Date : 10-AUG-2016 14:14

Client ID: KJB-15-19

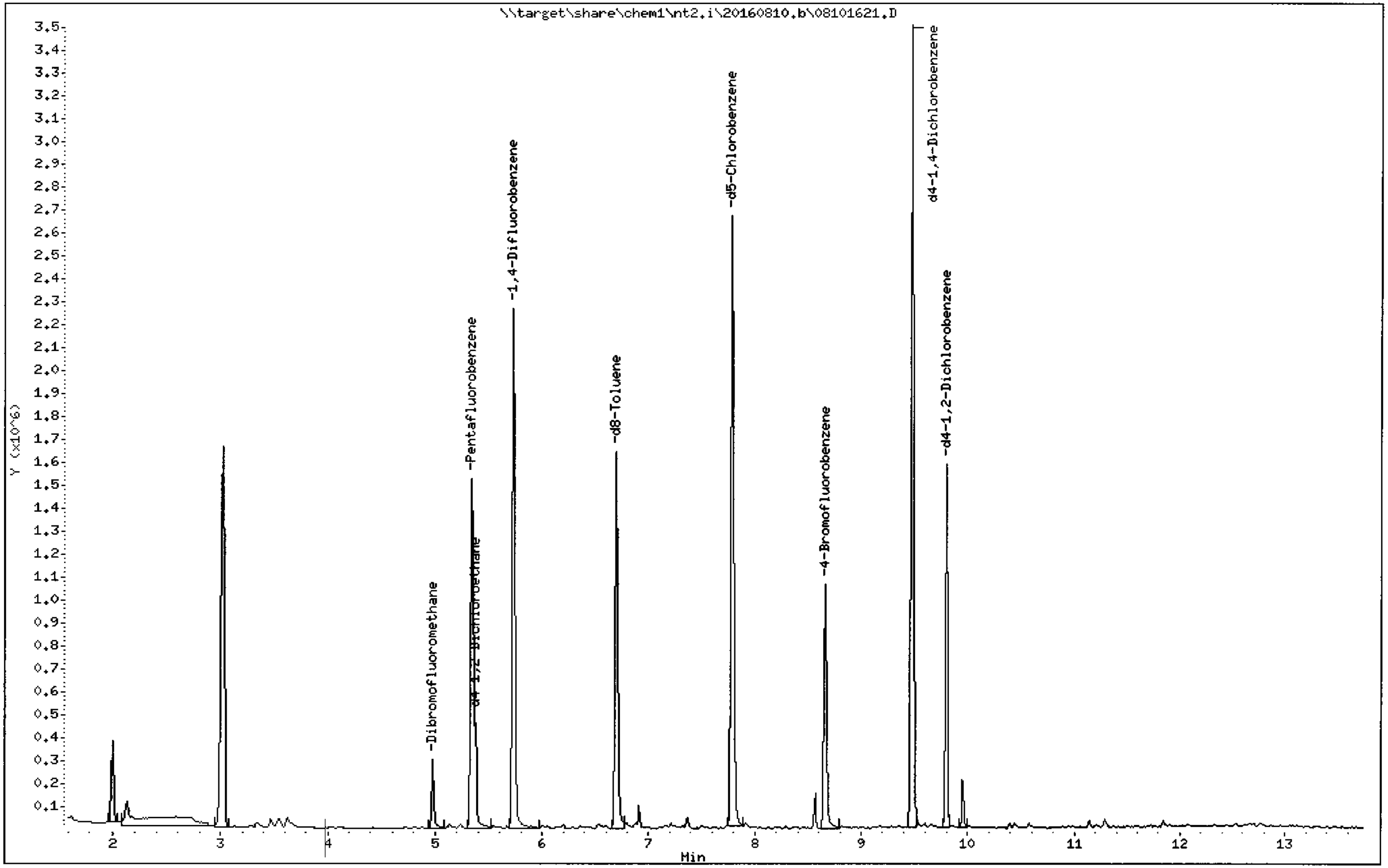
Instrument: nt2.i

Sample Info: BEE6Q,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810g.b\08101622.D

Date : 10-AUG-2016 14:35

Client ID: KJB-16-7.5

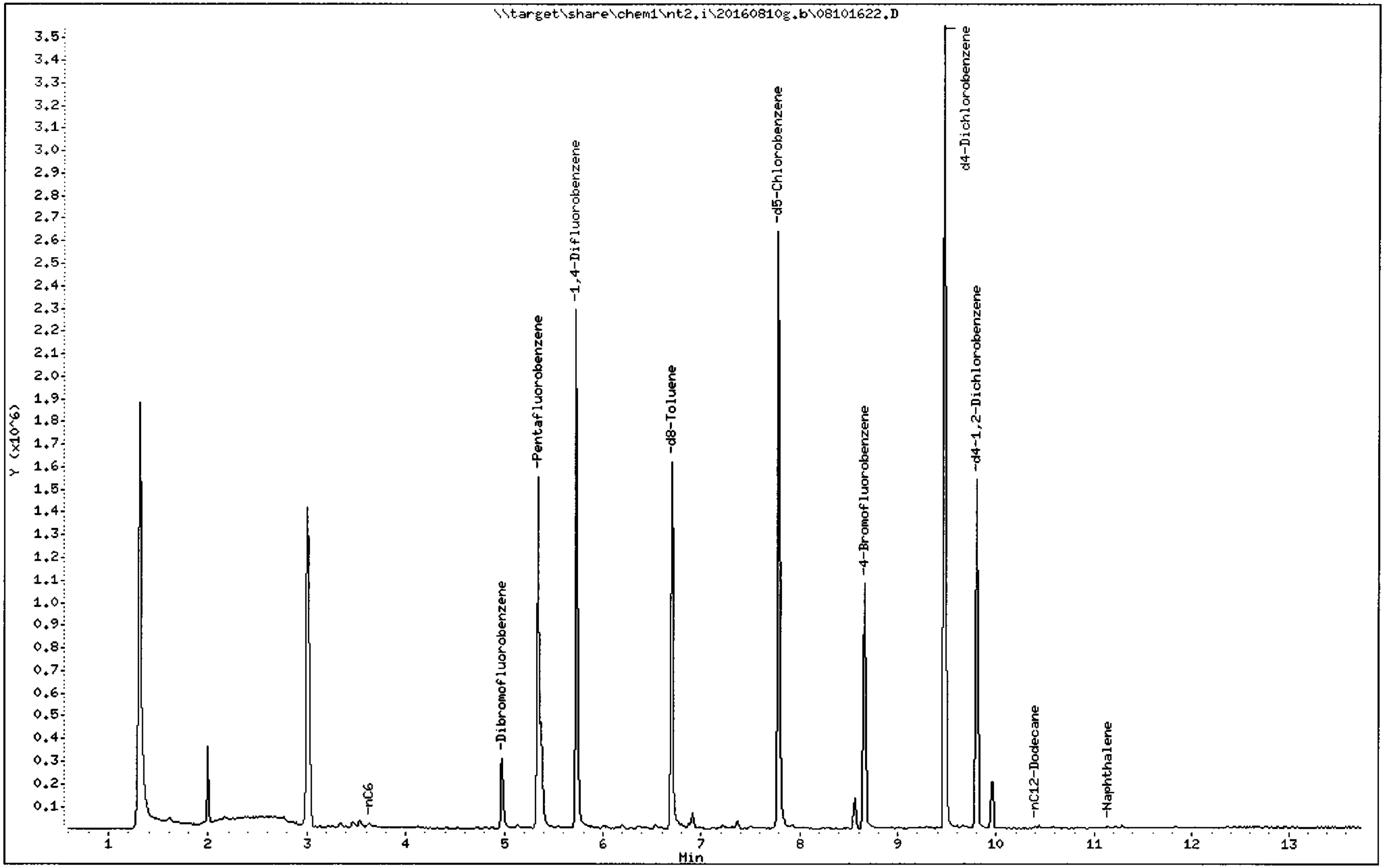
Instrument: nt2.i

Sample Info: BEE6R,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18

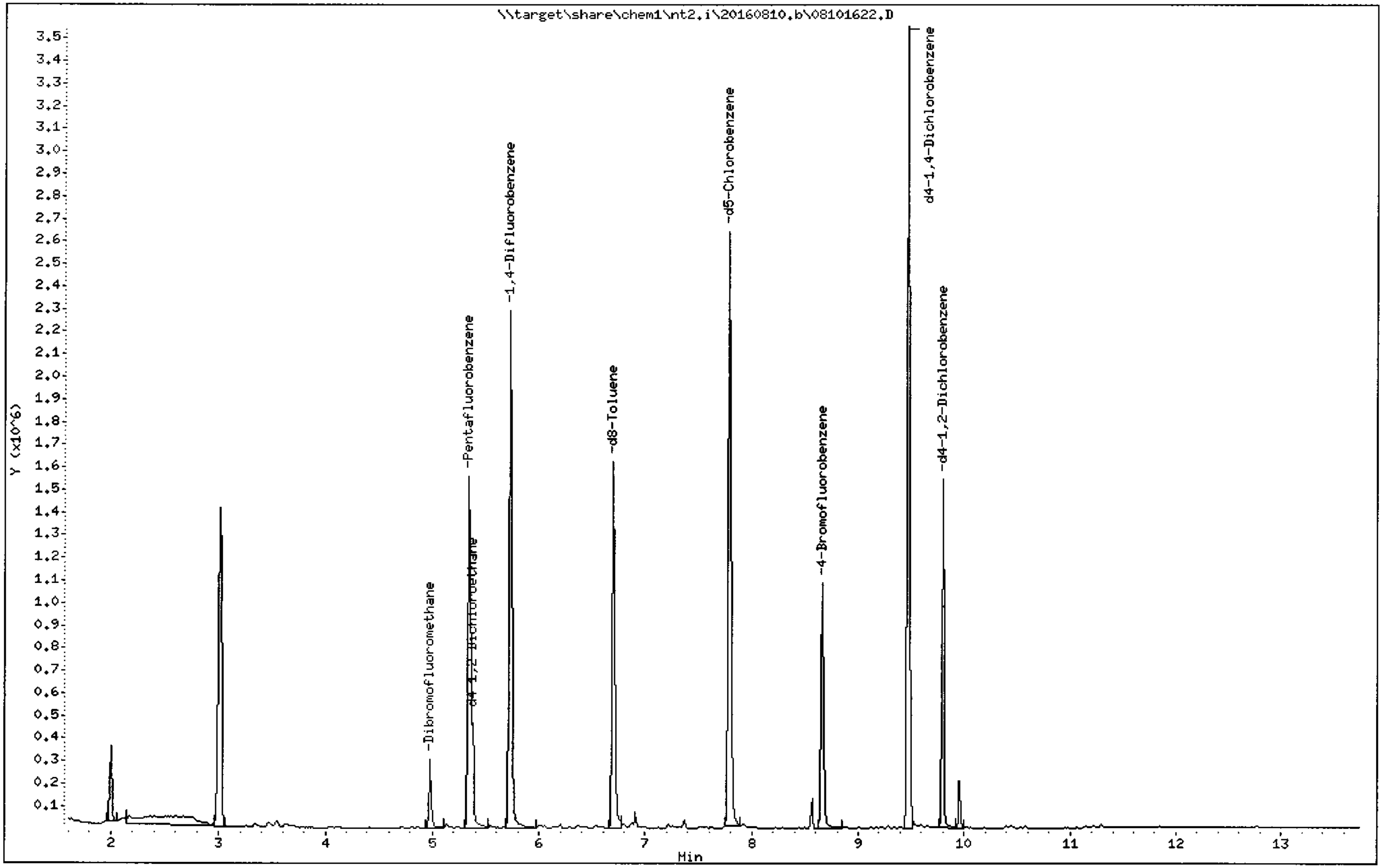


Data File: \\target\share\chem1\nt2.i\20160810.b\08101622.D
Date : 10-AUG-2016 14:35
Client ID: KJB-16-7.5
Sample Info: BEE6R,10,10,0,

Column phase: RTXVMS

Instrument: nt2.i

Operator: LH
Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810g.b\08101623.D

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Date : 10-AUG-2016 14:55

Client ID: KJB-16-16

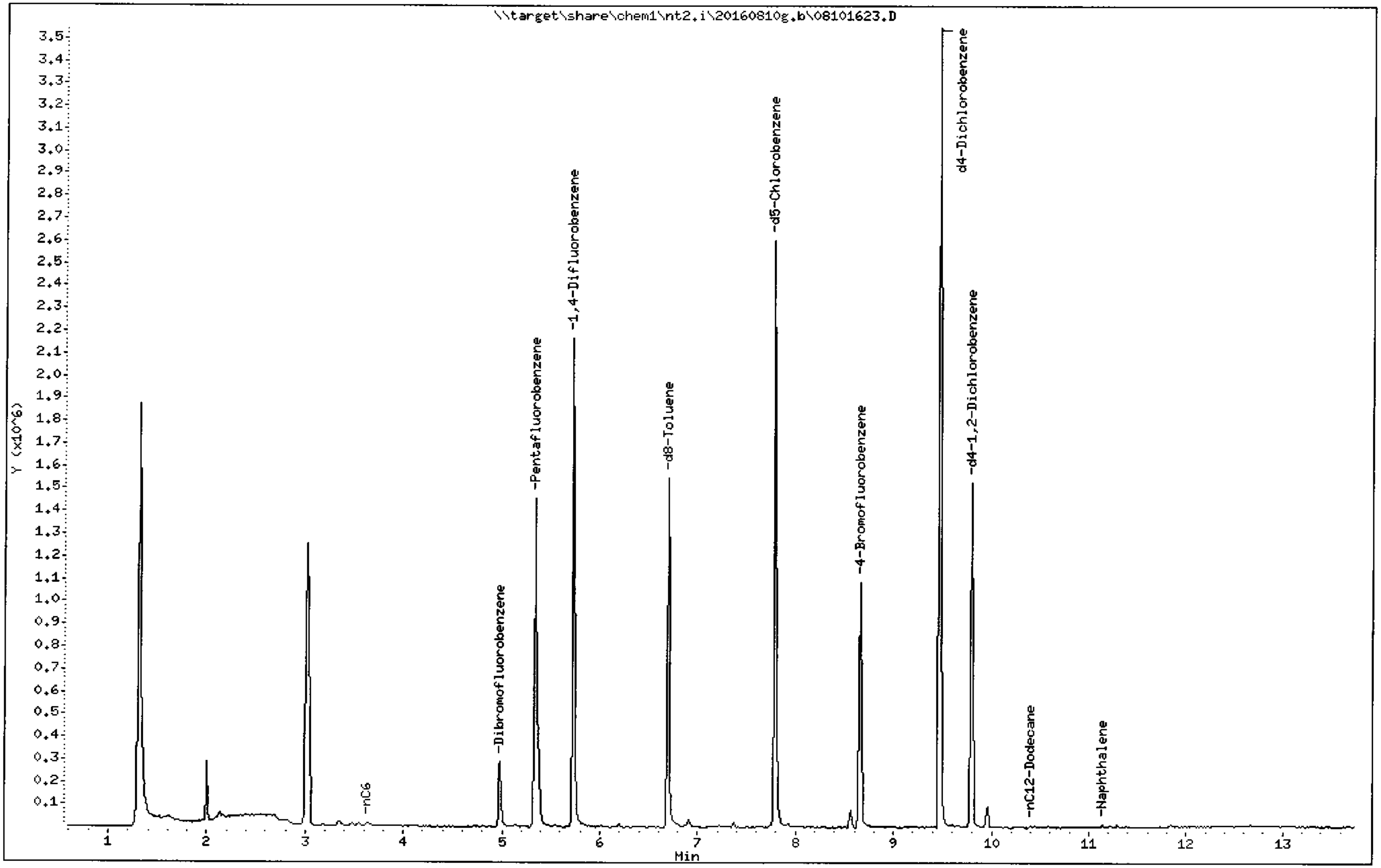
Instrument: nt2.i

Sample Info: BEE6S,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18


\\target\share\chem1\nt2.i\20160810g.b\08101623.D

Data File: \\target\share\chem1\nt2.i\20160810.b\08101623.D

Date : 10-AUG-2016 14:55

Client ID: KJB-16-16

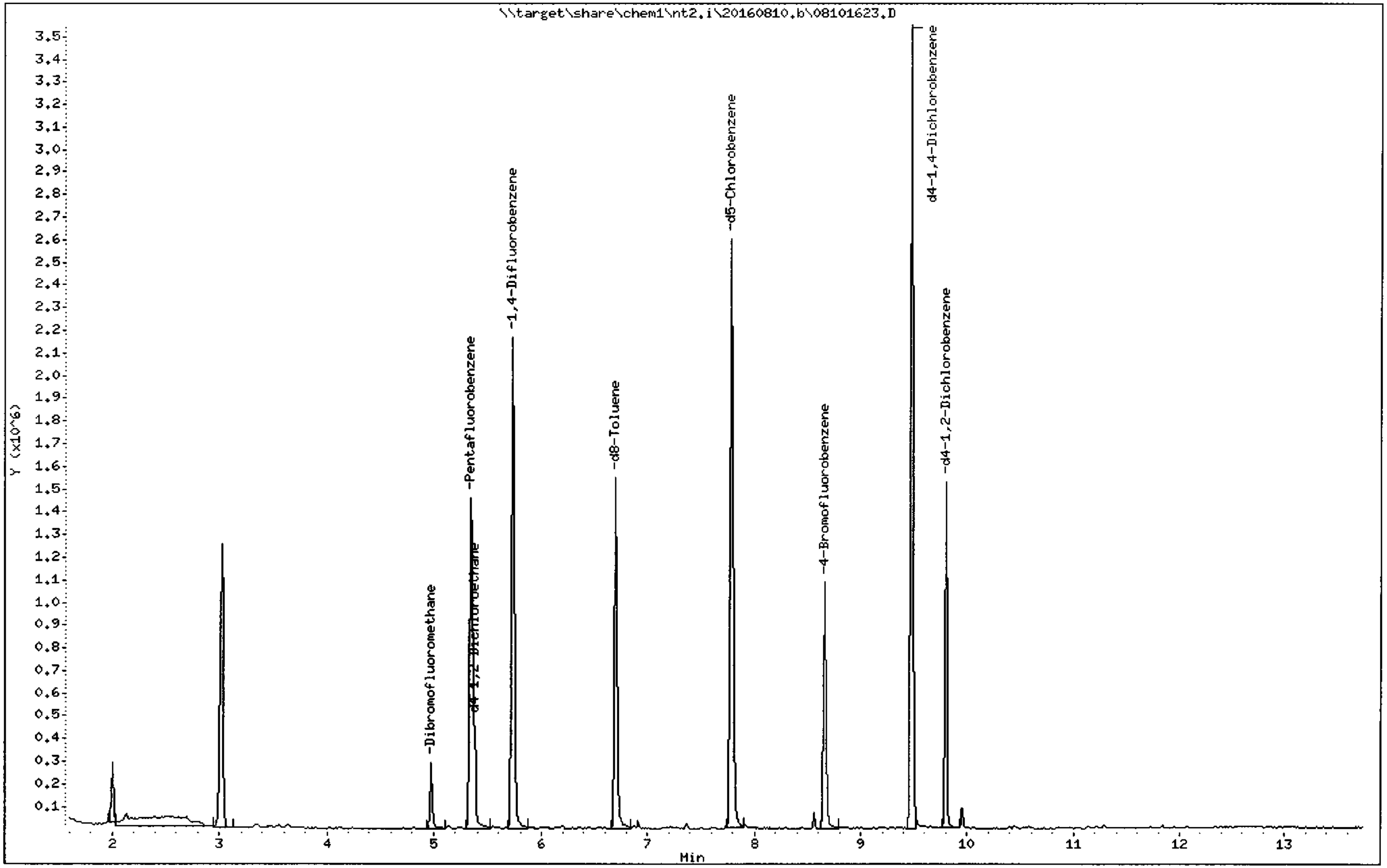
Sample Info: BEE6S,10,10,0,

Column phase: RTXVMS

Instrument: nt2.i

Operator: LH

Column diameter: 0.18

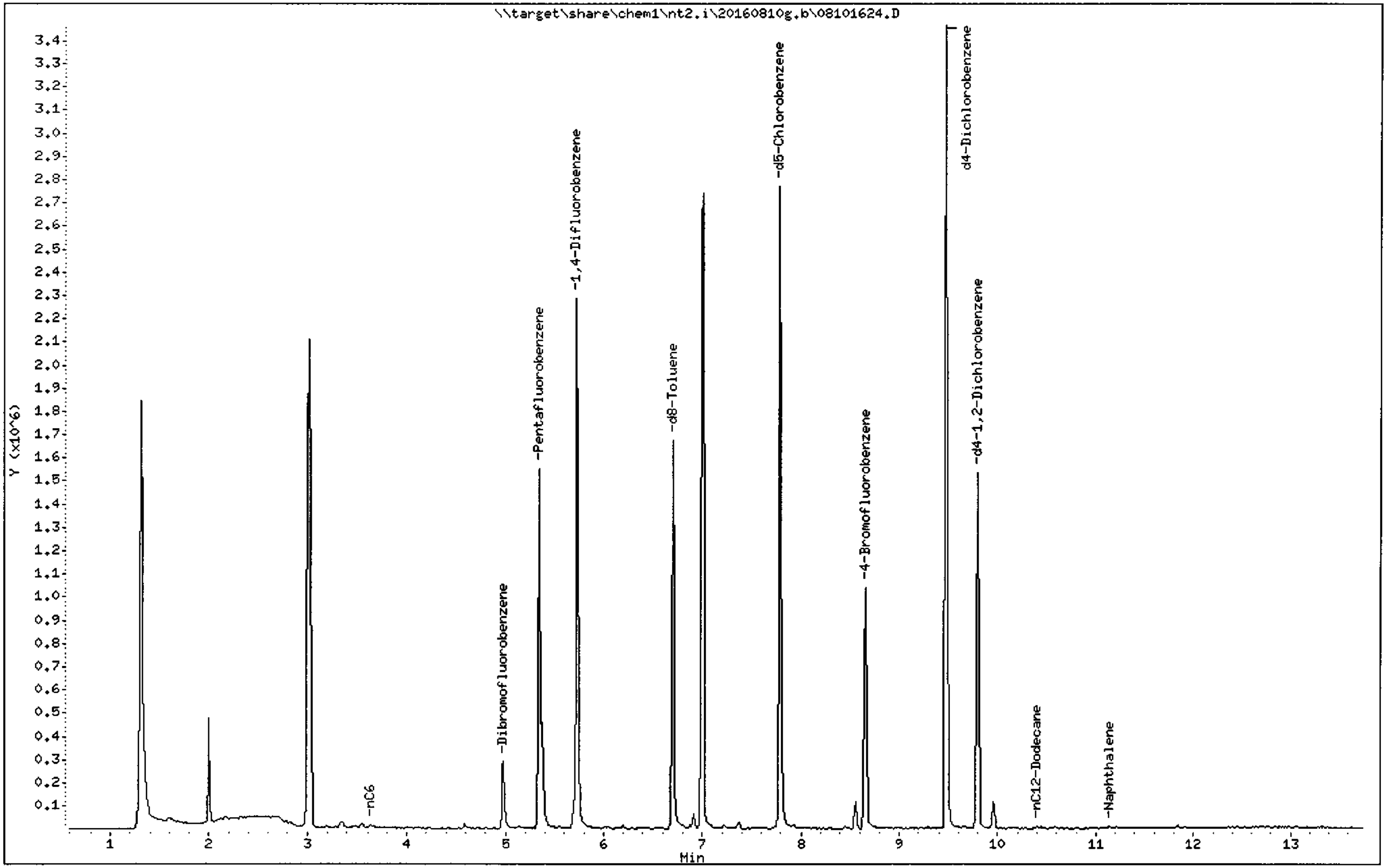


Data File: \\target\share\chem1\nt2.i\20160810g.b\08101624.D
Date : 10-AUG-2016 15:16
Client ID: MW-17-8
Sample Info: BEE6T,10,10,0,

Column phase: RTXVMS

Instrument: nt2.i

Operator: LH
Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810.b\08101624.D

Date : 10-AUG-2016 15:16

Client ID: MW-17-8

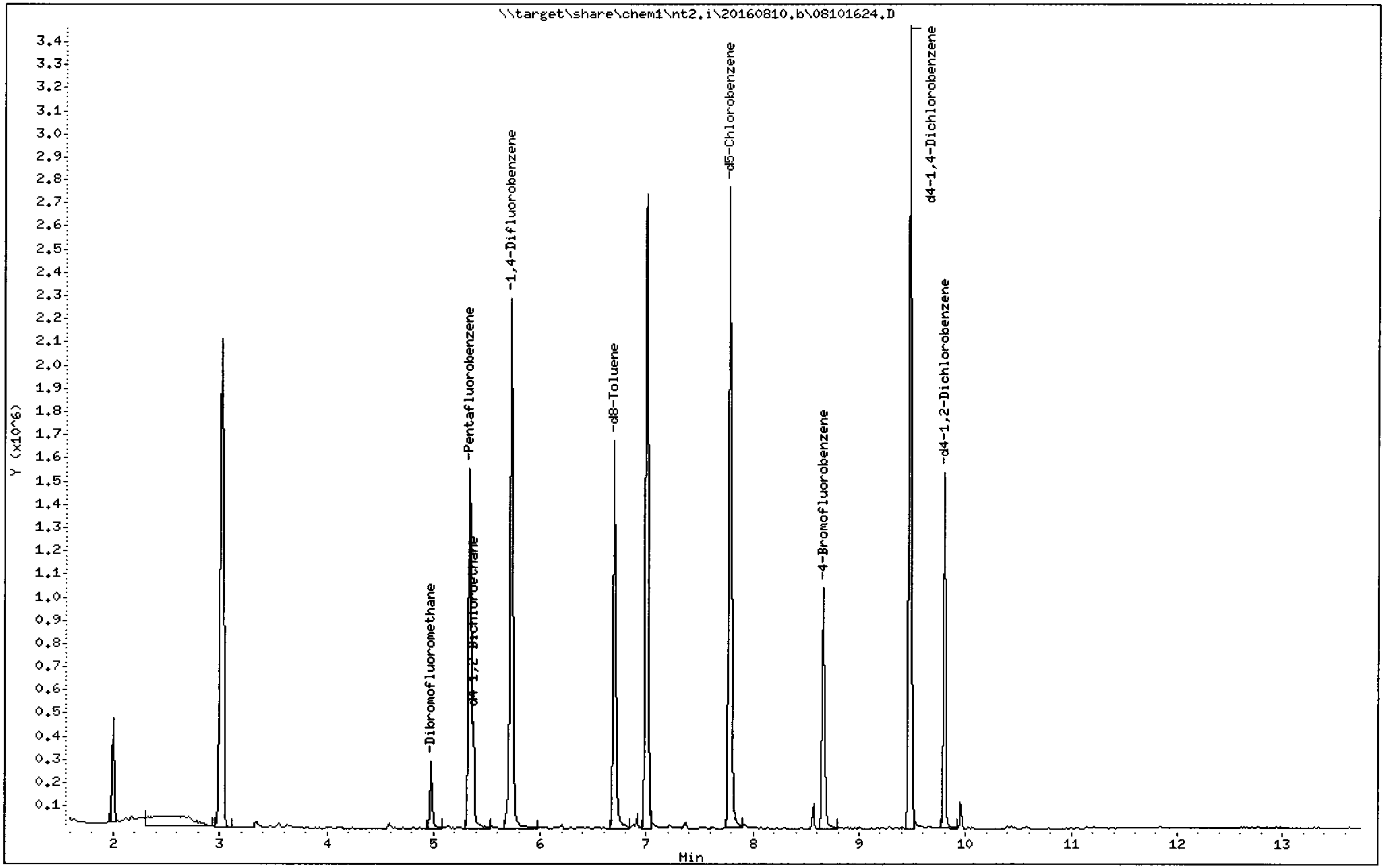
Instrument: nt2.i

Sample Info: BEE6T,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810g.b\08101625.D

Date : 10-AUG-2016 15:36

Client ID: MW-17-19

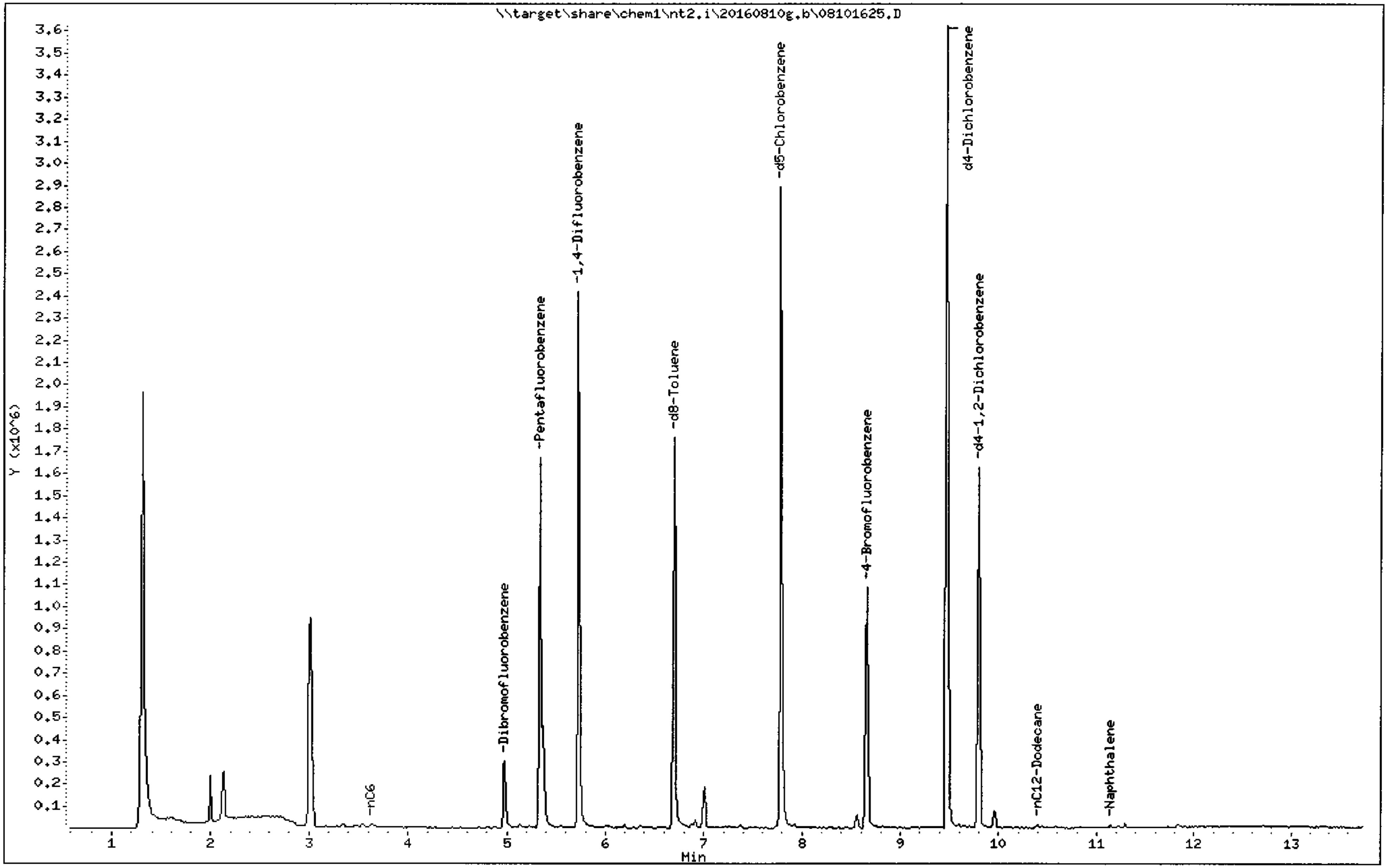
Instrument: nt2.i

Sample Info: BEE6U,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18

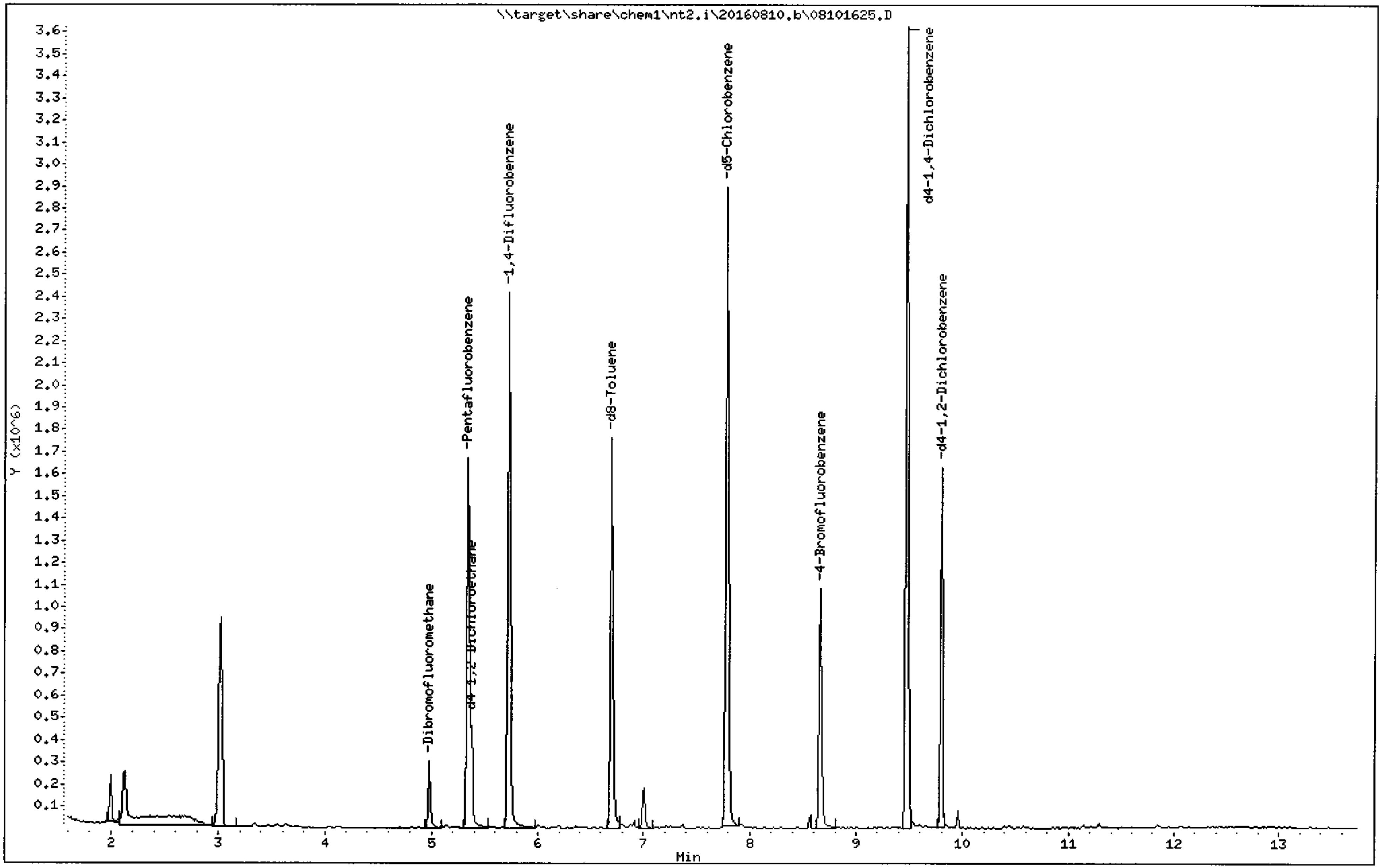


Data File: \\target\share\chem1\nt2.i\20160810.b\08101625.D
Date : 10-AUG-2016 15:36
Client ID: MW-17-19
Sample Info: BEE6U,10,10,0,

Column phase: RTXVMS

Instrument: nt2.i

Operator: LH
Column diameter: 0.18



\\target\share\chem1\nt2.i\20160810.b\08101625.D

Data File: \\target\share\chem1\nt2.i\20160810g.b\08101626.D

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Date : 10-AUG-2016 15:57

Client ID: MW-18-12.5

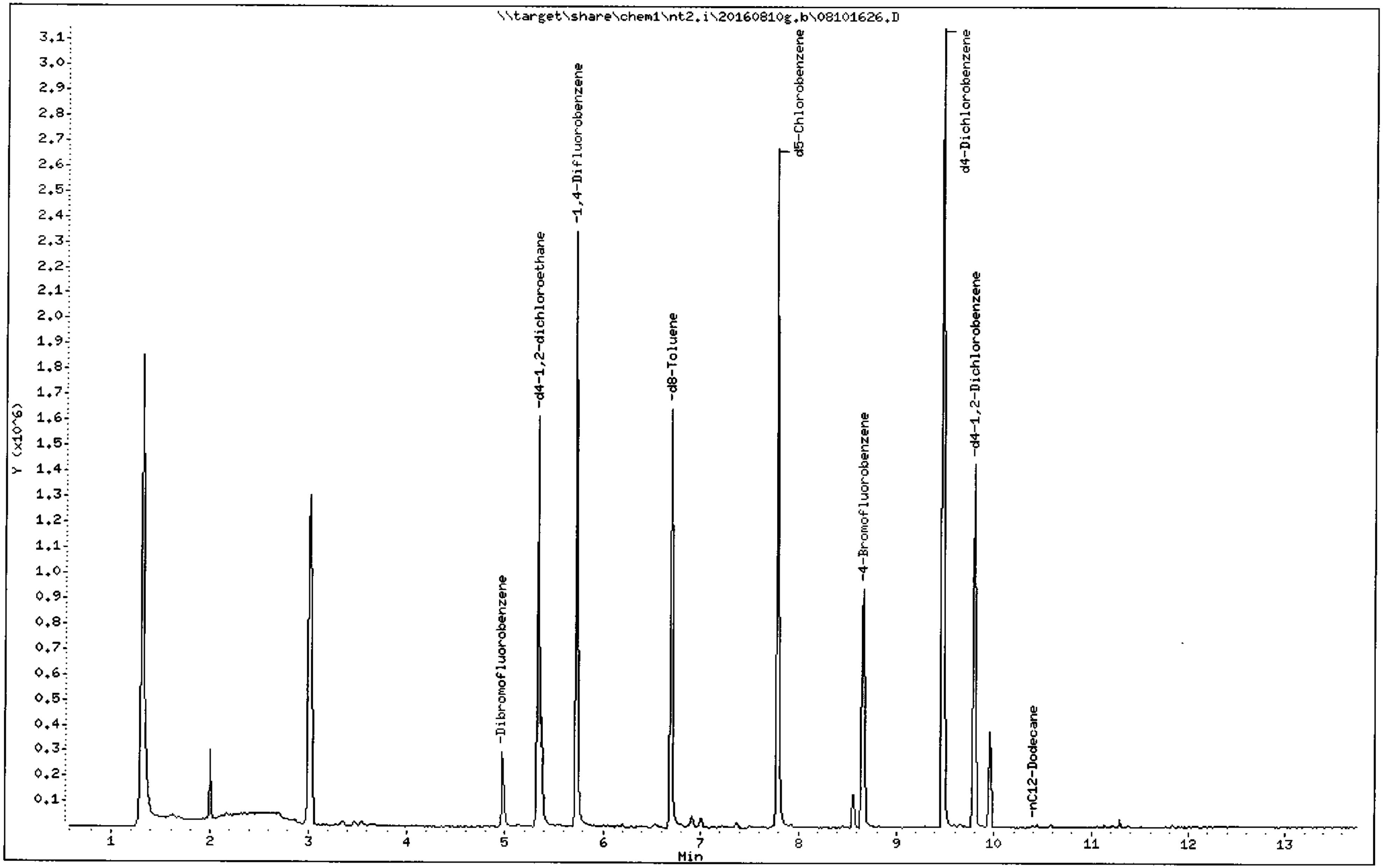
Instrument: nt2.i

Sample Info: BEE6V,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810.b\08101626.D

Date : 10-AUG-2016 15:57

Client ID: MW-18-12.5

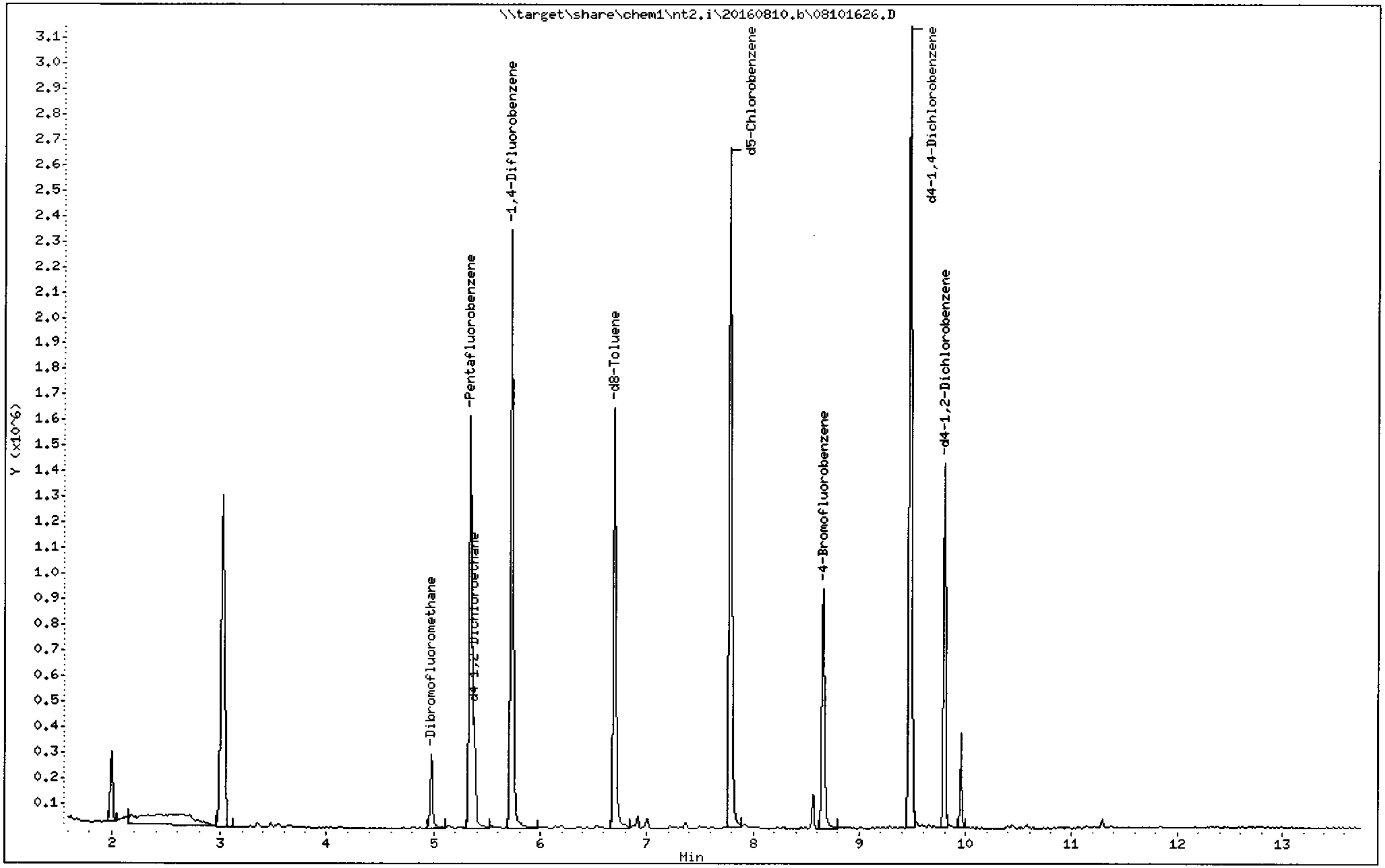
Instrument: nt2.i

Sample Info: BEE6V,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810g.b\08101627.D

Page 1

Date : 10-AUG-2016 16:17

Client ID: MW-18-17

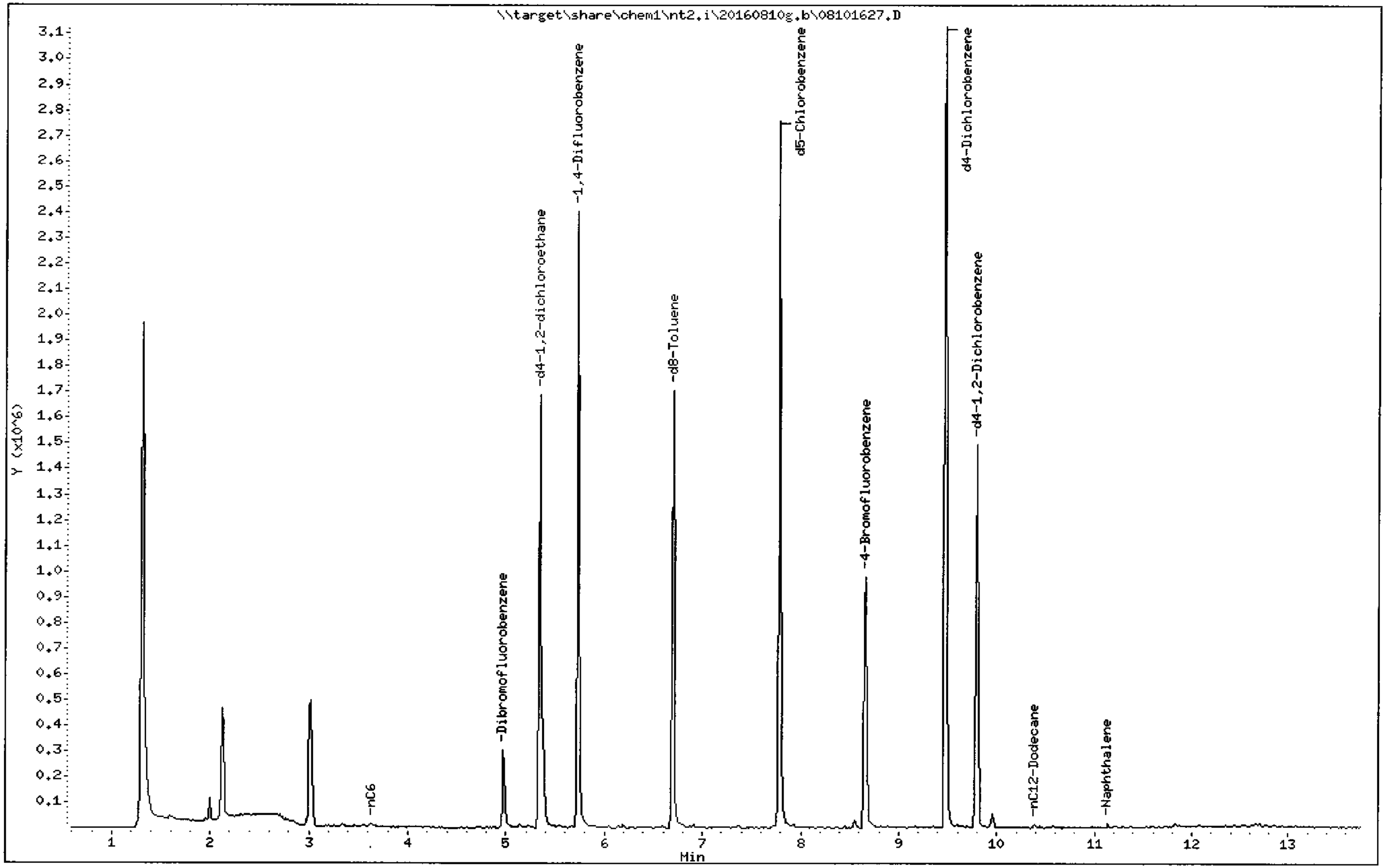
Instrument: nt2.i

Sample Info: BEE6W,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810.b\08101627.D

Date : 10-AUG-2016 16:17

Client ID: MW-18-17

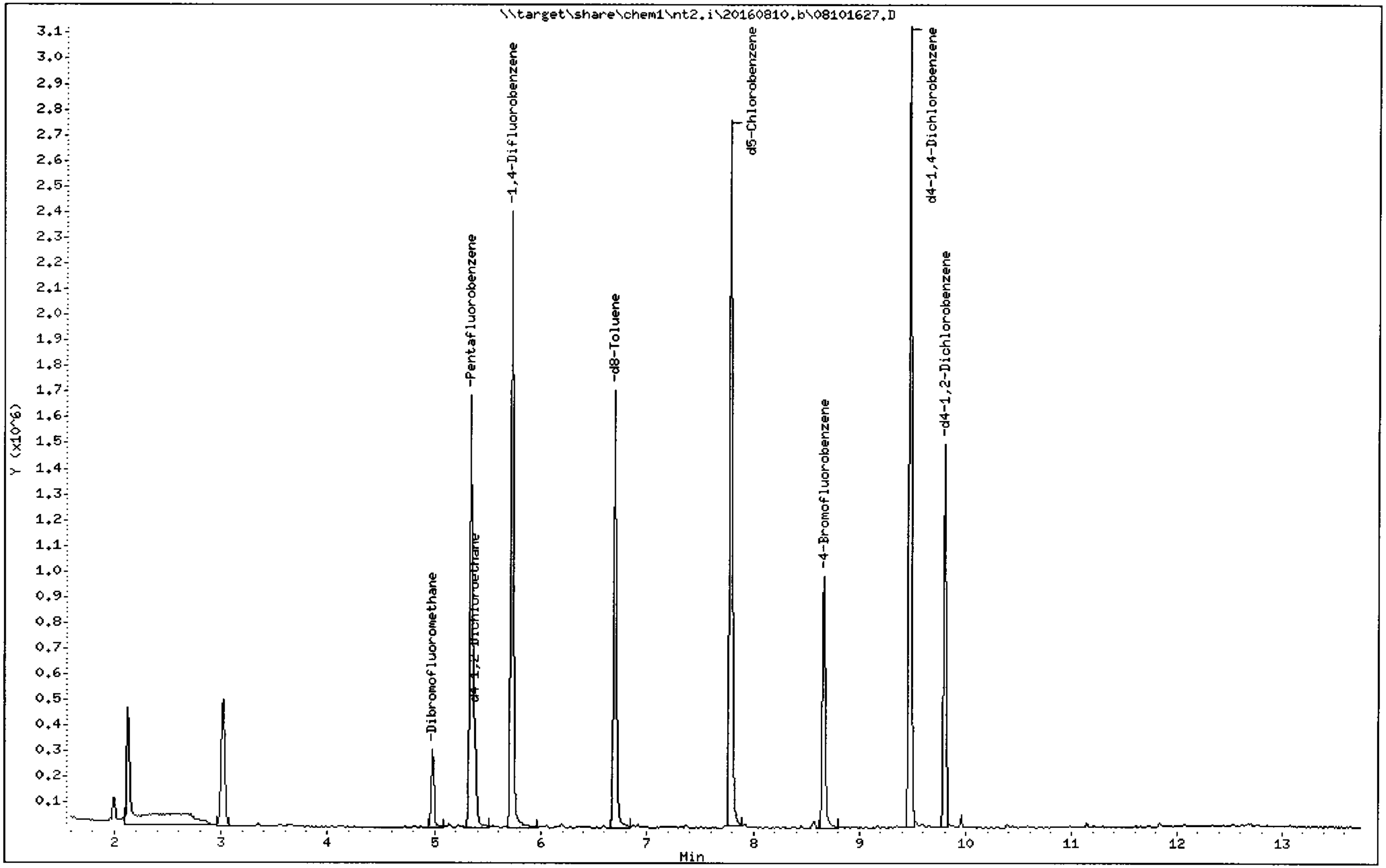
Sample Info: BEE6W,10,10,0,

Column phase: RTXVMS

Instrument: nt2.i

Operator: LH

Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810g.b\08101628.D

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Date : 10-AUG-2016 16:38

Client ID: KJB-Dup

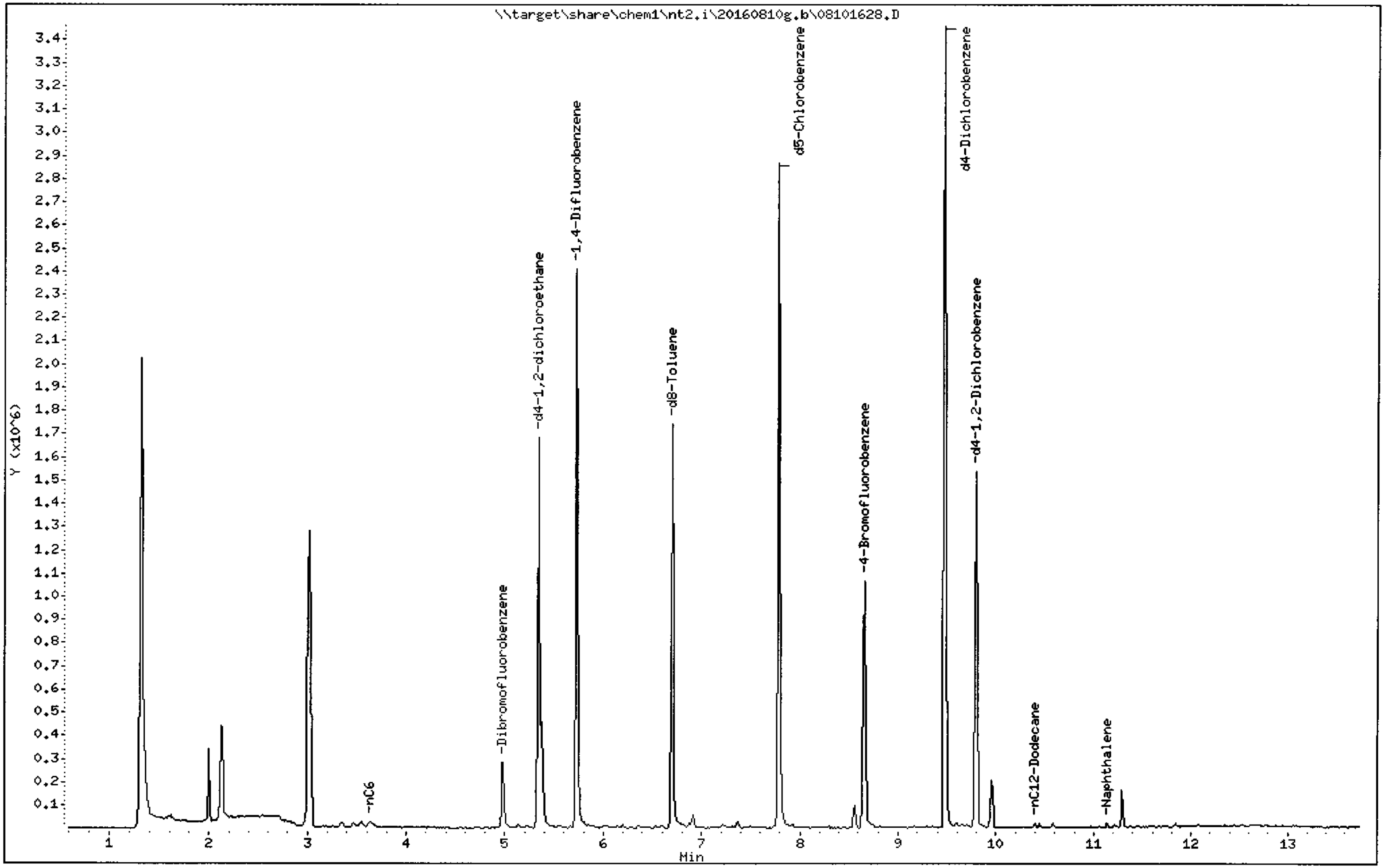
Instrument: nt2.i

Sample Info: BEE6X,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18



Data File: \\target\share\chem1\nt2.i\20160810.b\08101628.D

Date : 10-AUG-2016 16:38

Client ID: KJB-Dup

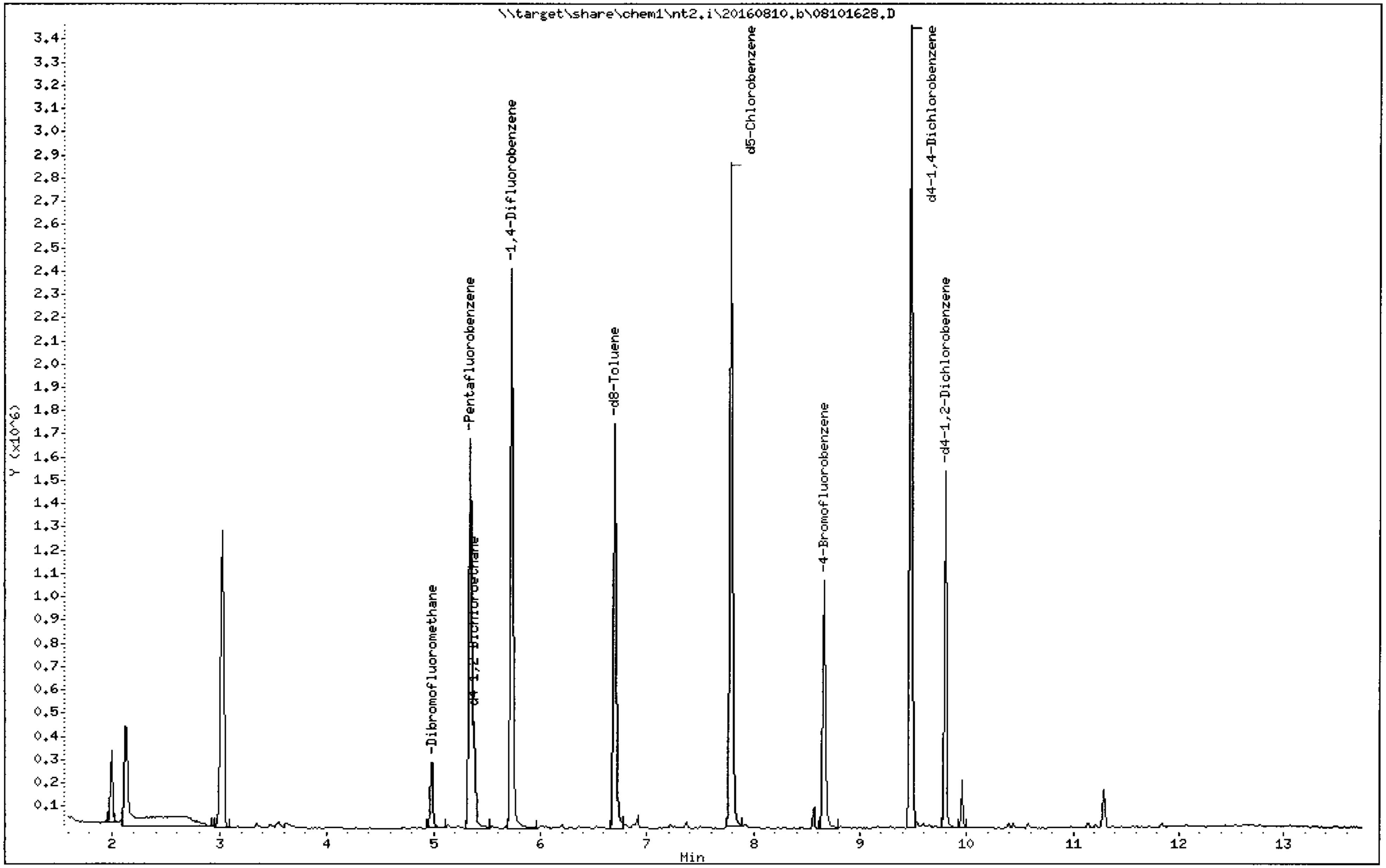
Instrument: nt2.i

Sample Info: BEE6X,10,10,0,

Operator: LH

Column phase: RTXVMS

Column diameter: 0.18



ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C
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Sample ID: KJB-14-7
SAMPLE

Lab Sample ID: BEE6A
LIMS ID: 16-11526
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT5/PAB
Date Analyzed: 08/03/16 16:54

Sample Amount: 5.49 g-dry-wt
Purge Volume: 5.0 mL
Moisture: 11.7%

CAS Number	Analyte	LOQ	Result	Q
71-43-2	Benzene	0.9	< 0.9	U
108-88-3	Toluene	0.9	< 0.9	U
100-41-4	Ethylbenzene	0.9	< 0.9	U
179601-23-1	m,p-Xylene	0.9	< 0.9	U
95-47-6	o-Xylene	0.9	< 0.9	U

Reported in µg/kg (ppb)

Volatile Surrogate Recovery	
d8-Toluene	97.6%
Bromofluorobenzene	96.7%
d4-1,2-Dichlorobenzene	101%

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Volatiles by P&T GC/MS-Method SW8260C
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Sample ID: KJB-14-13
SAMPLE

Lab Sample ID: BEE6B
LIMS ID: 16-11527
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT5/PAB
Date Analyzed: 08/03/16 17:17

Sample Amount: 3.60 g-dry-wt
Purge Volume: 5.0 mL
Moisture: 15.6%

CAS Number	Analyte	LOQ	Result	Q
71-43-2	Benzene	1.4	< 1.4	U
108-88-3	Toluene	1.4	< 1.4	U
100-41-4	Ethylbenzene	1.4	< 1.4	U
179601-23-1	m,p-Xylene	1.4	< 1.4	U
95-47-6	o-Xylene	1.4	< 1.4	U

Reported in µg/kg (ppb)

Volatile Surrogate Recovery	
d8-Toluene	97.7%
Bromofluorobenzene	90.6%
d4-1,2-Dichlorobenzene	101%

FORM I

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C
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Sample ID: KJB-14-18
SAMPLE

Lab Sample ID: BEE6C
LIMS ID: 16-11528
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT5/PAB
Date Analyzed: 08/03/16 17:40

Sample Amount: 4.49 g-dry-wt
Purge Volume: 5.0 mL
Moisture: 16.4%

CAS Number	**Analyte**	**LOQ**	**Result**	**Q**
71-43-2	Benzene	1.1	< 1.1	U
108-88-3	Toluene	1.1	< 1.1	U
100-41-4	Ethylbenzene	1.1	< 1.1	U
179601-23-1	m,p-Xylene	1.1	< 1.1	U
95-47-6	o-Xylene	1.1	< 1.1	U

Reported in µg/kg (ppb)

Volatile Surrogate Recovery

d8-Toluene	97.3%
Bromofluorobenzene	95.8%
d4-1,2-Dichlorobenzene	101%

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Volatiles by P&T GC/MS-Method SW8260C
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Sample ID: KJB-15-11
SAMPLE

Lab Sample ID: BEE6D
LIMS ID: 16-11529
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT5/PAB
Date Analyzed: 08/03/16 18:02

Sample Amount: 4.64 g-dry-wt
Purge Volume: 5.0 mL
Moisture: 13.0%

CAS Number	Analyte	LOQ	Result	Q
71-43-2	Benzene	1.1	< 1.1	U
108-88-3	Toluene	1.1	< 1.1	U
100-41-4	Ethylbenzene	1.1	< 1.1	U
179601-23-1	m,p-Xylene	1.1	< 1.1	U
95-47-6	o-Xylene	1.1	< 1.1	U

Reported in µg/kg (ppb)

Volatile Surrogate Recovery

d8-Toluene	97.9%
Bromofluorobenzene	96.6%
d4-1,2-Dichlorobenzene	101%

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Volatiles by P&T GC/MS-Method SW8260C
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Sample ID: KJB-15-19
SAMPLE

Lab Sample ID: BEE6E
LIMS ID: 16-11530
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT5/PAB
Date Analyzed: 08/03/16 18:25

Sample Amount: 4.16 g-dry-wt
Purge Volume: 5.0 mL
Moisture: 10.6%

CAS Number	**Analyte**	**LOQ**	**Result**	**Q**
71-43-2	Benzene	1.2	< 1.2	U
108-88-3	Toluene	1.2	< 1.2	U
100-41-4	Ethylbenzene	1.2	< 1.2	U
179601-23-1	m,p-Xylene	1.2	< 1.2	U
95-47-6	o-Xylene	1.2	< 1.2	U

Reported in µg/kg (ppb)

Volatile Surrogate Recovery

d8-Toluene	96.4%
Bromofluorobenzene	92.0%
d4-1,2-Dichlorobenzene	102%

FORM I

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C
Page 1 of 1

Sample ID: KJB-16-7.5
SAMPLE

Lab Sample ID: BEE6F
LIMS ID: 16-11531
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT5/PAB
Date Analyzed: 08/03/16 18:48

Sample Amount: 4.44 g-dry-wt
Purge Volume: 5.0 mL
Moisture: 11.1%

CAS Number	Analyte	LOQ	Result	Q
71-43-2	Benzene	1.1	< 1.1	U
108-88-3	Toluene	1.1	< 1.1	U
100-41-4	Ethylbenzene	1.1	< 1.1	U
179601-23-1	m,p-Xylene	1.1	< 1.1	U
95-47-6	o-Xylene	1.1	< 1.1	U

Reported in µg/kg (ppb)

Volatile Surrogate Recovery

d8-Toluene	97.9%
Bromofluorobenzene	96.6%
d4-1,2-Dichlorobenzene	101%

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C
Page 1 of 1

Sample ID: KJB-16-16
SAMPLE

Lab Sample ID: BEE6G
LIMS ID: 16-11532
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT5/PAB
Date Analyzed: 08/03/16 19:10

Sample Amount: 3.97 g-dry-wt
Purge Volume: 5.0 mL
Moisture: 18.8%

CAS Number	Analyte	LOQ	Result	Q
71-43-2	Benzene	1.3	< 1.3	U
108-88-3	Toluene	1.3	< 1.3	U
100-41-4	Ethylbenzene	1.3	< 1.3	U
179601-23-1	m,p-Xylene	1.3	< 1.3	U
95-47-6	o-Xylene	1.3	< 1.3	U

Reported in µg/kg (ppb)

Volatile Surrogate Recovery	
d8-Toluene	96.5%
Bromofluorobenzene	90.0%
d4-1,2-Dichlorobenzene	105%

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Volatiles by P&T GC/MS-Method SW8260C
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Sample ID: MW-17-8
SAMPLE

Lab Sample ID: BEE6H
LIMS ID: 16-11533
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT5/PAB
Date Analyzed: 08/03/16 19:33

Sample Amount: 4.12 g-dry-wt
Purge Volume: 5.0 mL
Moisture: 11.0%

CAS Number	Analyte	LOQ	Result	Q
71-43-2	Benzene	1.2	< 1.2	U
108-88-3	Toluene	1.2	< 1.2	U
100-41-4	Ethylbenzene	1.2	< 1.2	U
179601-23-1	m,p-Xylene	1.2	< 1.2	U
95-47-6	o-Xylene	1.2	< 1.2	U

Reported in µg/kg (ppb)

Volatile Surrogate Recovery	
d8-Toluene	98.1%
Bromofluorobenzene	97.5%
d4-1,2-Dichlorobenzene	102%

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Volatiles by P&T GC/MS-Method SW8260C
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Sample ID: MW-17-19
SAMPLE

Lab Sample ID: BEE6I
LIMS ID: 16-11534
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT5/PAB
Date Analyzed: 08/03/16 19:56

Sample Amount: 5.10 g-dry-wt
Purge Volume: 5.0 mL
Moisture: 10.2%

CAS Number	**Analyte**	**LOQ**	**Result**	**Q**
71-43-2	Benzene	1.0	< 1.0	U
108-88-3	Toluene	1.0	< 1.0	U
100-41-4	Ethylbenzene	1.0	< 1.0	U
179601-23-1	m,p-Xylene	1.0	< 1.0	U
95-47-6	o-Xylene	1.0	< 1.0	U

Reported in µg/kg (ppb)

Volatile Surrogate Recovery

d8-Toluene	98.0%
Bromofluorobenzene	95.2%
d4-1,2-Dichlorobenzene	102%

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C
Page 1 of 1

Sample ID: MW-18-12.5
SAMPLE

Lab Sample ID: BEE6J
LIMS ID: 16-11535
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT5/PAB
Date Analyzed: 08/03/16 20:18

Sample Amount: 5.41 g-dry-wt
Purge Volume: 5.0 mL
Moisture: 14.9%

CAS Number	**Analyte**	**LOQ**	**Result**	**Q**
71-43-2	Benzene	0.9	< 0.9	U
108-88-3	Toluene	0.9	< 0.9	U
100-41-4	Ethylbenzene	0.9	< 0.9	U
179601-23-1	m,p-Xylene	0.9	< 0.9	U
95-47-6	o-Xylene	0.9	< 0.9	U

Reported in µg/kg (ppb)

Volatile Surrogate Recovery

d8-Toluene	98.3%
Bromofluorobenzene	98.3%
d4-1,2-Dichlorobenzene	102%

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ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C
Page 1 of 1

Sample ID: MW-18-17
SAMPLE

Lab Sample ID: BEE6K
LIMS ID: 16-11536
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT5/PAB
Date Analyzed: 08/03/16 20:41

Sample Amount: 4.92 g-dry-wt
Purge Volume: 5.0 mL
Moisture: 11.6%

CAS Number	Analyte	LOQ	Result	Q
71-43-2	Benzene	1.0	< 1.0	U
108-88-3	Toluene	1.0	< 1.0	U
100-41-4	Ethylbenzene	1.0	< 1.0	U
179601-23-1	m,p-Xylene	1.0	< 1.0	U
95-47-6	o-Xylene	1.0	< 1.0	U

Reported in µg/kg (ppb)

Volatile Surrogate Recovery	
d8-Toluene	96.7%
Bromofluorobenzene	95.9%
d4-1,2-Dichlorobenzene	102%

FORM I

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C
Page 1 of 1

Sample ID: KJB-Dup
SAMPLE

Lab Sample ID: BEE6L
LIMS ID: 16-11537
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: 08/01/16
Date Received: 08/02/16

Instrument/Analyst: NT5/PAB
Date Analyzed: 08/03/16 21:04

Sample Amount: 4.48 g-dry-wt
Purge Volume: 5.0 mL
Moisture: 12.3%

CAS Number	Analyte	LOQ	Result	Q
71-43-2	Benzene	1.1	< 1.1	U
108-88-3	Toluene	1.1	< 1.1	U
100-41-4	Ethylbenzene	1.1	< 1.1	U
179601-23-1	m,p-Xylene	1.1	< 1.1	U
95-47-6	o-Xylene	1.1	< 1.1	U

Reported in µg/kg (ppb)

Volatile Surrogate Recovery	
d8-Toluene	97.4%
Bromofluorobenzene	96.1%
d4-1,2-Dichlorobenzene	101%

FORM I

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C
Page 1 of 1

Sample ID: MB-080316A
METHOD BLANK

Lab Sample ID: MB-080316A
LIMS ID: 16-11526
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: NA
Date Received: NA

Instrument/Analyst: NT5/PAB
Date Analyzed: 08/03/16 15:51

Sample Amount: 5.00 g-dry-wt
Purge Volume: 5.0 mL
Moisture: NA

CAS Number	**Analyte**	**LOQ**	**Result**	**Q**
71-43-2	Benzene	1.0	< 1.0	U
108-88-3	Toluene	1.0	< 1.0	U
100-41-4	Ethylbenzene	1.0	< 1.0	U
179601-23-1	m,p-Xylene	1.0	< 1.0	U
95-47-6	o-Xylene	1.0	< 1.0	U

Reported in µg/kg (ppb)

Volatile Surrogate Recovery

d8-Toluene	96.4%
Bromofluorobenzene	92.5%
d4-1,2-Dichlorobenzene	99.6%

FORM I

ORGANICS ANALYSIS DATA SHEET
Volatiles by P&T GC/MS-Method SW8260C
Page 1 of 1

Sample ID: LCS-080316A
LAB CONTROL SAMPLE

Lab Sample ID: LCS-080316A
LIMS ID: 16-11526
Matrix: Soil
Data Release Authorized:
Reported: 08/11/16

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00
Date Sampled: NA
Date Received: NA

Instrument/Analyst LCS: NT5/PAB
LCSD: NT5/PAB
Date Analyzed LCS: 08/03/16 14:48
LCSD: 08/03/16 15:28

Sample Amount LCS: 5.00 g-dry-wt
LCSD: 5.00 g-dry-wt
Purge Volume LCS: 5.0 mL
LCSD: 5.0 mL
Moisture: NA

Analyte	**LCS**	**Spike Added-LCS**	**LCS Recovery**	**LCSD**	**Spike Added-LCSD**	**LCSD Recovery**	**RPD**
Benzene	50.0	50.0	100%	50.9	50.0	102%	1.8%
Toluene	48.4	50.0	96.8%	49.3	50.0	98.6%	1.8%
Ethylbenzene	51.9	50.0	104%	53.6	50.0	107%	3.2%
m,p-Xylene	103	100	103%	107	100	107%	3.8%
o-Xylene	50.4	50.0	101%	52.4	50.0	105%	3.9%

Reported in µg/kg (ppb)

RPD calculated using sample concentrations per SW846.

Volatile Surrogate Recovery

	LCS	**LCSD**
d8-Toluene	97.3%	97.2%
Bromofluorobenzene	95.1%	95.5%
d4-1,2-Dichlorobenzene	99.3%	98.9%

FORM III

VOA SURROGATE RECOVERY SUMMARY

Matrix: Soil

QC Report No: BEE6-Kennedy Jenks
Project: Circle K
1696010.00

ARI ID	Client ID	Level	DCE	TOL	BFB	DCB	TOT OUT
MB-080316A	Method Blank	Low	NA	96.4%	92.5%	99.6%	0
LCS-080316A	Lab Control	Low	NA	97.3%	95.1%	99.3%	0
LCSD-080316A	Lab Control Dup	Low	NA	97.2%	95.5%	98.9%	0
BEE6A	KJB-14-7	Low	NA	97.6%	96.7%	101%	0
BEE6B	KJB-14-13	Low	NA	97.7%	90.6%	101%	0
BEE6C	KJB-14-18	Low	NA	97.3%	95.8%	101%	0
BEE6D	KJB-15-11	Low	NA	97.9%	96.6%	101%	0
BEE6E	KJB-15-19	Low	NA	96.4%	92.0%	102%	0
BEE6F	KJB-16-7.5	Low	NA	97.9%	96.6%	101%	0
BEE6G	KJB-16-16	Low	NA	96.5%	90.0%	105%	0
BEE6H	MW-17-8	Low	NA	98.1%	97.5%	102%	0
BEE6I	MW-17-19	Low	NA	98.0%	95.2%	102%	0
BEE6J	MW-18-12.5	Low	NA	98.3%	98.3%	102%	0
BEE6K	MW-18-17	Low	NA	96.7%	95.9%	102%	0
BEE6L	KJB-Dup	Low	NA	97.4%	96.1%	101%	0

	LCS/MB LIMITS		QC LIMITS	
SW8260C	Low	Med	Low	Med
(DCE) = d4-1,2-Dichloroethane	80-129	80-124	78-151	80-124
(TOL) = d8-Toluene	80-120	80-120	80-120	80-120
(BFB) = Bromofluorobenzene	80-120	80-120	75-124	80-120
(DCB) = d4-1,2-Dichlorobenzene	80-120	80-120	80-120	80-120

Log Number Range: 16-11526 to 16-11537

Appendix E

Laboratory Data Validation Documentation

DATA VALIDATION SUMMARY – 16D0063
APRIL 2016 SAMPLING EVENT
Ecology Circle K

Laboratory Reports included in Data Validation	Report Date	Sample IDs
ARI 16D0063 Includes: NWTPH-GX and VOCs (BTEX)	11 May 2016	Aqueous Samples: MW-6-042016, MW-10-042016, MW-9-042016, MW-8-042016, MW-4-042016, MW-7-042016, MW-15-042016, MW-14-042016, MW-11-042016, MW-13-042016 Field Duplicate: DUP1-042016 (MW-15-042016) Trip Blank: Trip Blanks

Criteria	(Yes or No)	Comment
Chain-of-Custody – Chain-of-custody protocol followed?	Yes	
Temperature Blank – Sample temperature criteria met?	Yes	Samples arrived at a temperature of 0.2 degrees Celsius (°C), which was slightly below the recommended temperature of 4°C ± 2°C.
Holding times – Samples analyzed within specified holding time?	Yes	
Laboratory method blank samples – Analytes present in method blank samples?	Yes	See Note 1 below.
Field/Equipment blank samples – Analytes present in field/equipment blank samples?	Not applicable	No field/equipment blank samples were submitted with this batch of samples.
Trip blank samples – Analytes present in trip blank samples?	Yes	See Note 2 below.
Matrix spikes/matrix spike duplicate samples – Control limits met?	Not applicable	
Surrogate percent recoveries – Control limits met?	No	See Note 3 below.
Laboratory control sample – Control limits met?	Yes	
Laboratory duplicate samples (if applicable) – Control limits met?	Not applicable	No laboratory duplicate samples were analyzed with this batch of samples.
Field duplicate samples (if submitted) – Relative percent differences within control limits?	Not applicable	Detected concentrations in the primary and field duplicate were less than 5x the method reporting limits.

NOTES

1. Toluene (0.05J µg/L) was detected in the method blank sample for batch BED0103. Detected concentrations of toluene less than 5x the method reporting limit in associated field samples (MW-6-042016) should be considered estimated concentrations with a possible high bias and qualified with a J+; no action was taken if detected concentrations of toluene were greater than 5x the method reporting limit. Ethylbenzene (0.04J µg/L), m,p-xylene (0.15J µg/L), and total xylenes (0.18J µg/L) were detected in the method blank sample for batch BED0107. Detected concentrations of ethylbenzene, m,p-xylene, and total xylenes less than the method reporting limit in associated field samples (MW-7-042016, MW-15-042016, MW-14-042016, MW-11-042016, and Trip Blanks) should be reported as less than the method reporting limit and qualified as non-detect "U". Toluene (0.10J µg/L), ethylbenzene (0.04J µg/L), m,p-xylene (0.18J µg/L),

DATA VALIDATION SUMMARY – 16D0063
APRIL 2016 SAMPLING EVENT
Ecology Circle K

o-xylene (0.05J µg/L), and total xylenes (0.24J µg/L) were detected in the method blank sample for batch BED0114. Detected concentrations of toluene, ethylbenzene, m,p-xylene, o-xylene, and total xylenes less than the method reporting limit in associated field samples (DUP1) should be reported as less than the method reporting limit and qualified as non-detect “U”.

2. The following compounds were detected in the trip blank sample: m,p-xylene (0.13J µg/L) and total xylenes (0.16J µg/L). Detected concentrations of m,p-xylene and total xylenes less than the method reporting limit in samples MW-6-042016, MW-7-042016, MW-15-042016, MW-14-042016, MW-11-042016, DUP1-042016, and Trip Blanks should be reported as less than the method reporting limit and qualified as non-detect “U”.
3. The percent recoveries for the surrogate, 1,2-dichloroethane-d4, were high following the analyses of samples MW-9-042016, MW-8-042016 and MW-4-042016. These samples were diluted and re-analyzed. The percent recoveries for all surrogates were within established QC limits for the dilutions. The results for both analyses have been submitted for these samples. The results from re-analyses with acceptable surrogate recoveries should be reported.

SUMMARY

Overall, the findings with respect to the quality assurance/quality control (QA/QC) data do not adversely affect the use of the analytical results.

DATA VALIDATION SUMMARY – 16I0389
SEPTEMBER 2016 SAMPLING EVENT
Ecology Circle K

Laboratory Reports included in Data Validation	Report Date	Sample IDs
ARI 16I0389 Includes: NWTPH-GX and VOCs (BTEX)	14 October 2016	Solid Samples: MW-19-10, MW-19-19, MW-20-10, MW-20-20, MW-21-10, MW-21-19.5 Trip Blank: Trip Blank

Criteria	(Yes or No)	Comment
Chain-of-Custody – Chain-of-custody protocol followed?	Yes	
Temperature Blank – Sample temperature criteria met?	Yes	Samples arrived at a temperature of 4.0 degrees Celsius (°C), which was within the recommended temperature of 4°C ± 2°C.
Holding times – Samples analyzed within specified holding time?	Yes	
Laboratory method blank samples – Analytes present in method blank samples?	No	
Field/Equipment blank samples – Analytes present in field/equipment blank samples?	Not applicable	No field/equipment blank samples were submitted with this batch of samples.
Trip blank samples – Analytes present in trip blank samples?	No	
Matrix spikes/matrix spike duplicate samples – Control limits met?	Not applicable	
Surrogate percent recoveries – Control limits met?	Yes	
Laboratory control sample – Control limits met?	Yes	
Laboratory duplicate samples (if applicable) – Control limits met?	Not applicable	No laboratory duplicate samples were analyzed with this batch of samples.
Field duplicate samples (if submitted) – Relative percent differences within control limits?	Not applicable	No field duplicate samples were analyzed with this batch of samples.

SUMMARY
Overall, the findings with respect to the quality assurance/quality control (QA/QC) data do not adversely affect the use of the analytical results.

DATA VALIDATION SUMMARY – 16L0126
DECEMBER 2016 SAMPLING EVENT
Ecology Circle K

Laboratory Reports included in Data Validation	Report Date	Sample IDs
ARI 16L0126 Includes: NWTPH-Gx, VOCs, metals	28 December 2016	Aqueous Samples: MW-2-161207, MW-4-161208, MW-6-161207, MW-7-161208, MW-8-161207, MW-9-161207, MW-10-161207, MW-11-161207, MW-13-161208, MW-14-161207, MW-15-161207, MW-16-161207-PRE, MW-16-161207-POST, MW-17-161207, MW-18-161207, MW-19-161208, MW-20-161208, MW-21-161208 Field Duplicate: DUP-1-161208 (MW-13) Trip Blank: Trip Blanks

Criteria	(Yes or No)	Comment
Chain-of-Custody – Chain-of-custody protocol followed?	Yes	
Temperature Blank – Sample temperature criteria met?	Yes	Samples arrived at a temperature of 0.0 and 0.8 degrees Celsius (°C), which was slightly less than the recommended temperature of 4°C ± 2°C, but acceptable.
Holding times – Samples analyzed within specified holding time?	No	Sulfide analyses were conducted outside the recommended 7 day hold time and flagged with an "H" qualifier by the lab.
Laboratory method blank samples – Analytes present in method blank samples?	Yes	Toluene was detected in method blank BEL0337; all associated field samples have been flagged by the lab with a "B" qualifier. Iron was detected in method blank BEL0303; the result for MW-17 (0.0306 mg/L) was qualified as estimated with a "J" due to method blank contamination.
Field/Equipment blank samples – Analytes present in field/equipment blank samples?	Not applicable	No field/equipment blank samples were submitted with this batch of samples.
Trip blank samples – Analytes present in trip blank samples?	No	
Matrix spikes/matrix spike duplicate samples – Control limits met?	Not applicable	
Surrogate percent recoveries – Control limits met?	No	Percent recoveries were outside the laboratory control limits in samples MW-19 and MW-20. Samples were re-analyzed by the laboratory.
Laboratory control sample – Control limits met?	Yes	
Laboratory duplicate samples (if applicable) – Control limits met?	Yes	
Field duplicate samples (if submitted) – Relative percent differences within control limits?	Yes	A field duplicate (DUP-1) was submitted with a primary sample from MW-13. RPDs for BTEX and HCID were acceptable.

DATA VALIDATION SUMMARY – 16L0126
DECEMBER 2016 SAMPLING EVENT
Ecology Circle K

SUMMARY

Overall, the findings with respect to the quality assurance/quality control (QA/QC) data do not adversely affect the use of the analytical results.

DATA VALIDATION SUMMARY – BBA2, BBA4, BBA5
MAY 2016 SAMPLING EVENT
Ecology Circle K

Laboratory Reports included in Data Validation	Report Date	Sample IDs
ARI BBA2, BBA4, BBA5 (combined) Includes: NWTPH-Dx, NWTPH-Gx, and VOCs (BTEX & Fuel Additives)	27 May 2016	Solid Samples: KJB-1-7.5, KJB-1-19, KJB-2-8, KJB-2-12, KJB-3-7.5, KJB-3-18.5, KJB-4-8.5, KJB-4-12, KJB-4-19, KJB-5-7, KJB-5-12, KJB-5-19.5, KJB-6-7, KJB-6-22, KJB-7-11, KJB-7-18.5, KJB-8-8, KJB-1-2.5, KJB-1-13, KJB-2-3, KJB-2-19, KJB-3-2, KJB-3-12.5, KJB-4-2.5, KJB-5-3.5, KJB-6-17.5, KJB-7-2, KJB-7-9.5, KJB-8-2.5, KJB-13-12, KJB-13-19, KJB-8-12, KJB-8-19, KJB-9-2, KJB-9-8.5, KJB-9-13, KJB-9-19, KJB-10-2, KJB-10-8, KJB-10-13, KJB-10-19.5, KJB-11-2, KJB-11-8, KJB-11-13, KJB-11-19, KJB-12-2, KJB-12-8, KJB-12-15, KJB-12-19, KJB-13-2, KJB-13-7 Aqueous Samples: KJB-1, KJB-2, KJB-3, KJB-5, KJB-6, KJB-7, KJB-9, KJB-10, KJB-11, KJB-12, KJB-13, KJB-4, KJB-8 Field Duplicate: 051916-Dup (duplicate of water sample KJB-11); 051916-SOIL (duplicate of KJB-13-19) Trip Blank: "TB"

Criteria	(Yes or No)	Comment
Chain-of-Custody – Chain-of-custody protocol followed?	Yes	
Temperature Blank – Sample temperature criteria met?	Yes	Samples arrived at a temperatures of 1.8, 3.6, and 4.2 degrees Celsius (°C), which were within the recommended temperature of 4°C ± 2°C.
Holding times – Samples analyzed within specified holding time?	Yes	
Laboratory method blank samples – Analytes present in method blank samples?	No	
Field/Equipment blank samples – Analytes present in field/equipment blank samples?	Not applicable	No field/equipment blank samples were submitted with this batch of samples.
Trip blank samples – Analytes present in trip blank samples?	No	
Matrix spikes/matrix spike duplicate samples – Control limits met?	Not applicable	
Surrogate percent recoveries – Control limits met?	No	See Note 1 below.
Laboratory control sample – Control limits met?	Yes	
Laboratory duplicate samples (if applicable) – Control limits met?	Not applicable	No laboratory duplicate samples were analyzed with this batch of samples.
Field duplicate samples (if submitted) – Relative percent differences within control limits?	Yes	

DATA VALIDATION SUMMARY – BBA2, BBA4, BBA5
MAY 2016 SAMPLING EVENT
Ecology Circle K

NOTES

1. Percent recovery of surrogate compound bromofluorobenzene was outside the laboratory control limit for sample KJB-4-8.5. Upon reanalysis at dilution, bromofluorobenzene was within the laboratory control limit. No further action was taken.
2. The percent difference for MTBE was not within control limits for the continuing calibration that bracketed the 5/25/16 VOCs analyses. As there were no detections of MTBE in the associated field samples, no action was taken.

SUMMARY

Overall, the findings with respect to the quality assurance/quality control (QA/QC) data do not adversely affect the use of the analytical results.

DATA VALIDATION SUMMARY – BEE6
AUGUST 2016 SAMPLING EVENT
Ecology Circle K

Laboratory Reports included in Data Validation	Report Date	Sample IDs
ARI BEE6 Includes: NWTPH-GX and VOCs (BTEX)	12 August 2016	Solid Samples: KJB-14-7, KJB-14-13, KJB-14-18, KJB-15-11, KJB-15-19, KJB-16-7.5, KJB-16-16, MW-17-8, MW-17-19, MW-18-12.5, MW-18-17, KJB-15-7.5, MW-17-11, MW-18-7 Aqueous Sample: KJB-15 Trip Blank: Trip Blank Field Duplicate: KJB-Dup (duplicate of KJB-18-17)

Criteria	(Yes or No)	Comment
Chain-of-Custody – Chain-of-custody protocol followed?	Yes	
Temperature Blank – Sample temperature criteria met?	Yes	Samples arrived at a temperature of 4.1 degrees Celsius (°C), which was within the recommended temperature of 4°C ± 2°C.
Holding times – Samples analyzed within specified holding time?	Yes	
Laboratory method blank samples – Analytes present in method blank samples?	No	
Field/Equipment blank samples – Analytes present in field/equipment blank samples?	Not applicable	No field/equipment blank samples were submitted with this batch of samples.
Trip blank samples – Analytes present in trip blank samples?	No	
Matrix spikes/matrix spike duplicate samples – Control limits met?	Not applicable	
Surrogate percent recoveries – Control limits met?	Yes	
Laboratory control sample – Control limits met?	Yes	
Laboratory duplicate samples (if applicable) – Control limits met?	Not applicable	No laboratory duplicate samples were analyzed with this batch of samples.
Field duplicate samples (if submitted) – Relative percent differences within control limits?	Not applicable	No analytes were detected at concentrations greater than 5x the method reporting limit in the primary or field duplicate sample.

SUMMARY

Overall, the findings with respect to the quality assurance/quality control (QA/QC) data do not adversely affect the use of the analytical results.

Appendix F

ETEC Field Notes

PMB 133, 3307 Evergreen Way, Ste 707
Washougal, WA 98671
(971) 222-3616 • (971) 222-3903 Fax
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FORMER CIRCLE K FIELD NOTES

Contact:	**Mr. Ty Schreiner**	From:	Greg Landers
Company:	Kennedy Jenks	Phone:	503-704-0491
Office:		Fax:	971-222-3903
Mobile:		Date:	
Pages:	5	Proposal:	1017-013

RE: **Field Notes Summary for Surfactant Enhanced Biological Injection/Extraction at Former Circle K, in Seattle, WA, Week of March 12, 2017**

DAY ONE (Sunday, March 12, 2017):

1. Greg Landers and Kevin Montgomery of ETEC arrived on site at 3:00 pm. Steve Misner of (Kennedy Jenks) was already at the site.
2. Steve held a tail gate safety meeting to discuss the possible hazards involved in the day's activities.
3. Water level were measured in RW-2, RW-4 and RW-5. No free product was measured at any of the wells. See the table below for levels.
4. ETEC staged their Trailer and one 1,250-gallon holding tank and a 500-gallon tank next to 24th avenue on the west side of the property. The equipment and tanks were barricaded using traffic barriers and caution tape.
5. Low voltage extraction pumps were placed in the above wells for extraction overnight. Extraction commenced at 4:00 pm. See table below for overnight extraction volumes.
6. The extraction pump control panel was set to pump for 5 minutes then off for 5 minutes to let the wells recharge. This program will run through the night.
7. A high level shut off float switch was mounted in the 1,200-gallon tank and connected to the extraction panel on ETEC's injection trailer.
8. ETEC was off offsite at 5:30 pm.

DAY TWO (Monday, March 13, 2017):

1. Greg Landers and Kevin Montgomery of ETEC arrived on site at 7:00 am. Alexander Lesher of (Kennedy Jenks) was already at the site. (He was onsite all night keeping an eye on the extraction)
2. Ground water extraction volumes were recorded. See table below
3. At 8:00 Steve held a tail gate safety meeting to discuss the possible hazards involved in the day's activities. The day's injection strategies were discussed and any possible problems associated with them.
4. ETEC personal then mounted injection compression fittings in RW-2, MW-21, MW-20 and RW-7. RW-1 is located right in the middle of the entrance off 24th avenue and it was decided not to block that entrance for the pilot project.
5. The injection header was connected to the above wells with garden hose.
6. Extracted ground water was transferred from the 1,200-gallon holding tank, through a 90-pound high pressure carbon vessel into two 165-gallon mix tanks. Five gallons of PetroSolv

was added to each tank then mixed with a stainless-steel sump pump. This solution was the injected into the above wells.

7. The above step was repeated until 65 gallons of PetroSolv had been injected. See the table below for injection volumes.
8. The extraction pump control panel was set to pump for 3 minutes then off for 3 minutes to let the wells recharge. This program will run through the night.
9. Potable water was used as make up water during the injection event.
10. At 12:00 pm all injection wells were aggressively surged.
11. ETEC disconnected and stored all injection hoses and fittings and was offsite at 5:00 pm.
12. Alexander remained at the site until the next morning.

Extraction Volumes for 3/13/17				
Date	**Time**	**RW-3**	**RW-4**	**RW-5**
3/13/17	8:00 am	269	185	174
3/13/17	4:00 pm	196	137	138

Extraction Total Overnight. 628 Gallons
Extraction Total for Day Two. 471 Gallons

Injection Volumes for 3/13/17					
Date	**Time**	**MW-21**	**RW-2**	**MW-20**	**RW-7**
3/13/17	4:00 pm	530	600	350	650

Injection Total for Day. 2,130 Gallons

VOLUMES FOR DAY 2:

Total Extracted Ground Water Volume 1,099 Gallons
Total Injected Treated Ground Water Volume 1,099 Gallons
Total Potable Water Volume Used 1,031 Gallons
Total PetroSolv Used 65 Gallons

DAY THREE (Tuesday, March 14, 2017):

1. Greg Landers and Kevin Montgomery of ETEC arrived on site at 7:00 am. Alexander Lesher of (Kennedy Jenks) had unplugged the extraction panel at 4:00 am.
2. Ground water extraction volumes were recorded. See table below
3. At 8:00 Steve held a tail gate safety meeting to discuss the possible hazards involved in the day's activities. The day's injection strategies were discussed and any possible problems associated with them.
4. ETEC personal then reconnected the injection fittings in RW-2, MW-21, MW-20 and RW-7. Injection into these wells commenced at 8:15 am.
5. Extracted ground water was transferred from the 1,200-gallon holding tank, through a 90-pound high pressure carbon vessel into two 165-gallon mix tanks. 2.5 gallons of PetroSolv was added to each tank then mixed with a stainless-steel sump pump. This solution was the injected into the above wells.
6. At 9:30 am 80 gallons of PetroSolv was delivered to the site by YRC. This was off loaded and stored next to the injection trailer.
7. The extraction pump control panel was set to pump for 2 minutes then off for 3 minutes to let the wells recharge. This program will run through the night.

8. **8.** The mix tanks were refilled and 5 gallons of PetroSolv was added to each mix tank then injected. Steps 5 and 7 were repeated until 70 gallons of PetroSolv had been injected.
9. **9.** At 12:30 pm all injection wells were surged aggressively.
10. **10.** At 1:00 pm injection into only RW-21 and RW-20 was performed to even the flow volume into each of the injection points.
11. **11.** At 2:00 pm an extraction pump was placed into MW-19 this was approved by Dale Myers (ecology). After 136 gallons of steady extraction the pump was shut off due to the injection well RW-7 being to close and probably short circuiting.
12. **12.** See the table below for injection/extraction volumes.
13. **13.** Potable water was used as make up water during the injection event.
14. **14.** ETEC disconnected and stored all injection hoses and fittings and was offsite at 6:30 pm.
15. **15.** Alexander remained at the site until the next morning to keep an eye on the extraction.

Extraction Volumes for 3/14/17					
Date	**Time**	**RW-3**	**RW-4**	**RW-5**	**MW-19**
3/14/17	6:00 am	212	158	149	
3/14/17	4:00 pm	314	236	269	136

Extraction Total Overnight. 519 Gallons
Extraction Total for Day. 859 Gallons

Injection Volumes for 3/14/17					
Date	**Time**	**MW-21**	**RW-2**	**MW-20**	**RW-7**
3/14/17	5:30 pm	610	570	710	500

Injection Total for Day Three. 2,390 Gallons

VOLUMES FOR DAY 3:

Total Extracted Ground Water Volume 1,378 Gallons
Total Injected Treated Ground Water Volume 1,378 Gallons
Total Potable Water Volume Used 1,012 Gallons
Total PetroSolv Used 70 Gallons

DAY FOUR (Wednesday, March 15, 2017):

1. **1.** Greg Landers and Kevin Montgomery of ETEC arrived on site at 6:00 am. Alexander Lesher of (Kennedy Jenks) was already at the site. He had manned the extraction system overnight.
2. **2.** Ground water extraction volumes were recorded. See table below.
3. **3.** At 9:00 Steve held a tail gate safety meeting to discuss the possible hazards involved in the day's activities.
4. **4.** At 9:30 ETEC personal placed a low voltage extraction pump in MW-19 this well was extracted from until 11:30 am. The pump was then moved to MW-13 and extraction from that well commenced at 11:45 am.
5. **5.** The vacuum truck showed up at 1:30 pm to remove and dispose of the extracted ground water in the holding tanks. Approximately 1,200 gallons of extracted ground water was removed from the tanks.

6. The time controller for RW-3, RW-4 and RW-5 was adjusted to run for 2 minutes and off for 3 minutes. The extraction pumps are extracting water for about one and a half minutes of the 2-minute run time.
7. MW-13 was moved to its own timer. This timer was set to be on for 2 minutes and off for 10 minutes. This setting allowed for more recharge time.
8. ETEC personal turned the site over to Alexander at 6:00 pm.

Extraction Volumes for 3/15/17						
Date	**Time**	**RW-3**	**RW-4**	**RW-5**	**MW-19**	**MW-13**
3/14/17	6:00 am	236	178	154		
3/14/17	11:30 am				118	
3/14/17	5:30 pm	192	116	115		38

Extraction Total Overnight. 568 Gallons
Extraction Total for Day. 461 Gallons

VOLUMES FOR DAY 4:
Total Extracted Ground Water Volume 1,029 Gallons

DAY FIVE (Thursday, March 16, 2017):

1. Greg Landers and Kevin Montgomery of ETEC arrived on site at 6:00 am. Samantha Karpa of (Kennedy Jenks) was already at the site.
2. Ground water extraction volumes were recorded. See table below
3. Steve held a tail gate safety meeting to discuss the possible hazards involved in the day's activities.
4. ETEC replaced extraction pumps in RW-4 and RW-5.
5. At 2:00 pm breakthrough was observed at RW-4.
6. At 3:00 pm the vacuum truck arrived to haul off approximately 1,100 gallons of extracted ground water.
7. Extraction flows were recorded at 3:30 pm. See table below.
8. ETEC was offsite at 6:00 pm.

Extraction Volumes for 3/16/17						
Date	**Time**	**RW-3**	**RW-4**	**RW-5**	**MW-19**	**MW-13**
3/16/17	6:00 am	204	122	109		
3/16/17	9:00 am					57
3/16/17	3:00 pm	120	59	56	199	

Extraction Total for Day Three Overnight. 492 Gallons
Extraction Total for Day. 491 Gallons

VOLUMES FOR DAY 5:

Total Extracted Ground Water Volume 983 Gallons

DAY SIX (Friday, March 17, 2017):

1. Greg Landers and Kevin Montgomery of ETEC arrived on site at 6:00 am. Steph of (Kennedy Jenks) had monitored the site overnight.
2. Ground water extraction volumes were recorded. See table below
3. Steve held a tail gate safety meeting to discuss the possible hazards involved in the day's activities.
4. The dwell timers for RW-4 and RW-5 were adjusted to 2 minutes on and 4 minutes off.
5. Due to the low extraction volume, overnight it was decided that Kevin would monitor the extraction overnight. Kevin went to the motel room at 8:30 am.
6. Extracted ground water was transferred from the 1,200-gallon holding tank to the 500-gallon tank. Water was also transferred through the 90-pound carbon vessel to fill the 165-gallon mix tanks. This transfer was conducted at 1:00 pm.
7. At 5:00 pm an extraction pump was placed in MW-19 and extraction from that well commenced.
8. At 5:30 pm flow readings for the day were recorded. See table below.
9. Greg was offsite at 6:30 pm, Kevin stayed to oversee the extraction

Extraction Volumes for 3/17/17				
Date	**Time**	**RW-3**	**RW-4**	**RW-5**
3/17/17	6:00 am	224	113	112
3/17/17	5:30 pm	162	77	80

Extraction Total for Overnight. 449 Gallons
Extraction Total for Day. 319 Gallons

VOLUMES FOR DAY 6:

Total Extracted Ground Water Volume 759 Gallons

DAY SEVEN (Saturday, March 18, 2017):

1. Greg Landers of ETEC arrived on site at 6:00 am. Kevin Montgomery had unplugged the extraction panel at 3:00 am.
2. Ground water extraction volumes were recorded. See table below
3. At 8:00 Steve held a tail gate safety meeting to discuss the possible hazards involved in the day's activities. The day's injection strategies were discussed and any possible problems associated with them.
4. The injection fitting and associated hoses and pumps were reconnected the in RW-2, RW-21, RW-20 and RW-7.
5. Fifty pounds of CBN (Custom Blend Nutrients) and one gallon of A2 (bacterial Consortium) was added to both full mix tanks then mixed with a stainless sump pump. This solution was then injected into the above injection wells.
6. The extracted ground water in the 1,200-gallon holding tank was then transferred through a 90-pound high pressure carbon vessel into both 165-gallon mix tanks. Fifty pounds of CBN and one gallon of A2 was added to each tank then mixed. This solution was the injected into

the above wells. This step was repeated until 650 pounds of CBN and 10 gallons of A2 had been injected.

7. Kevin arrived at site at 11:30 am to assist with the injection.
8. Samantha arrived at the site at 6:00 pm and remained at the site until the 1:00 am. The extraction was shut off at that time.
9. RW-5 showed breakthrough of surfactant at 6:30 pm.
10. ETEC disconnected and stored all injection hoses and fittings and was offsite at 6:30 pm.

Extraction Volumes for 3/18/17					
Date	**Time**	**RW-3**	**RW-4**	**RW-5**	**MW-19**
3/18/17	6:00 am	219	128	122	351
3/18/17	3:00 pm				234
3/18/17	6:00 pm	246	150	153	

Extraction Total Overnight. 820 Gallons
Extraction Total for Day. 783 Gallons

Injection Volumes for 3/18/17					
Date	**Time**	**MW-21**	**RW-2**	**MW-20**	**RW-7**
3/18/17	5:30 pm	610	670	620	

Injection Total for Day Seven. 1,900 Gallons

VOLUMES FOR DAY 7:

Total Extracted Ground Water Volume 1,603 Gallons
Total Injected Treated Ground Water Volume 1,603 Gallons
Total CBN Used 650 Pounds
Total A2 Used 10 Gallons

DAY EIGHT (Sunday, March 19, 2017):

1. Greg Landers of ETEC arrived on site at 6:00 am.
2. Ground water extraction volumes were recorded. See table below
3. Turned on extraction pumps EW-3, EW-4 and EW-5 at 7:00 am.
4. At 8:00 Steve held a tail gate safety meeting to discuss the possible hazards involved in the day’s activities. The day’s injection strategies were discussed and any possible problems associated with them.
5. The injection fitting and associated hoses and pumps were reconnected the in RW-2, RW-21, RW-20 and RW-7.
6. Fifty pounds of CBN (Custom Blend Nutrients) and one gallon of A2 (bacterial Consortium) was added to both full mix tanks then mixed with a stainless sump pump. This solution was then injected into the above injection wells.
7. Turned off Extraction from RW-3 and RW-4 at 9:00 am.
8. The extracted ground water in the 1,200-gallon holding tank was then transferred through a 90-pound high pressure carbon vessel into both 165-gallon mix tanks. Fifty pounds of CBN and one gallon of A2 was added to each tank then mixed. This solution was the injected into

the above wells. This step was repeated until 350 pounds of CBN and 5 gallons of A2 had been injected.

9. Turned off extraction from RW-5 at 1:00 pm. All extraction pumps and hoses were picked up and stowed in the injection/extraction trailer.
10. After the biological injection was completed, two hundred gallons of treated ground water was injected into all of the injection wells to flush any residual nutrients out of the injection hoses.
11. ETEC disconnected and loaded all injection hoses, fittings, and tanks. ETEC was offsite at 2:30 pm.

Extraction Volumes for 3/19/17					
Date	**Time**	**RW-3**	**RW-4**	**RW-5**	**MW-19**
3/19/17	9:00 am	185	121		
3/19/17	1:00 pm			137	

Extraction Total Overnight. 443 Gallons

Injection Volumes for 3/18/17					
Date	**Time**	**MW-21**	**RW-2**	**MW-20**	**RW-7**
3/19/17	1:30 pm	200	200	120	770

Injection Total for Day Three. 1,290 Gallons

VOLUMES FOR DAY 8:

Total Extracted Ground Water Volume 443 Gallons
Total Injected Treated Ground Water Volume 1,290 Gallons
Total CBN Used 350 Pounds
Total A2 Used 5 Gallons

PROJECT TOTALS

TOTAL EXTRACTED GROUND WATER	**7,294 Gallons**
TOTAL INJECTED GROUND WATER	**5,667 Gallons**
TOTAL INJECTED POTABLE WATER	**2,043 Gallons**
TOTAL PETROSOLV USED	**135 Gallons**
TOTAL CBN USED	**1,000 Pounds**
TOTAL A2 USED	**15 Gallons**