REMEDIATION WORK PLAN

FORMER RJ REFINERY
COUNTY ROAD 350 SOUTH
PRINCETON, INDIANA 47670

ATC PROJECT NO. 170IFA0010

JUNE 8, 2019

PREPARED FOR:

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
INDIANA BROWNFIELDS PROGRAM
100 NORTH SENATE AVENUE, ROOM 1275
INDIANPOLIS, INDIANA 46204
ATTENTION: MS. MICHELE OERTEL

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June 8, 2019

Ms. Michele Oertel
Indiana Department of Environmental Management
Indiana Brownfields Program
100 North Senate Avenue, Room 1275
Indianapolis, Indiana 46204

Re: **Remediation Work Plan**
Former RJ Refinery
Princeton, Indiana 47670
ATC Project No. 170IFA0010
BFD Site No. #4050006

Dear Ms. Oertel:

ATC Group Services, LLC (ATC) is pleased to provide the Indiana Brownfields Program (IBP) with the attached Remediation Work Plan (RWP) for the above referenced facility. This Remediation Work Plan has been prepared and formatted in accordance with the *Remediation Closure Guide* dated March 22, 2012.

This document provides details regarding the evaluation of various remedial technologies for the Site. The results of this evaluation indicate the most effective clean-up alternative for contaminants of concern is to implement In-Site Chemical Oxidation (ISCO) by injecting sodium persulfate catalyzed with a sodium hydroxide solution into the subsurface to enhance the natural degradation of the residual hydrocarbons present in the water-bearing zone. Vacuum extraction is also selected as an appropriate clean-up alternative in order to remove lightnon aqueous phase liquids (LNAPL) from the groundwater column beneath the Site.

We appreciate the opportunity to assist you with this project. If you have any questions concerning information contained in this RWP, please do not hesitate to call either of the undersigned below.

Sincerely,

ATC Group Services LLC

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1 Introduction

Based on a review of historical records, the Site operated as an oil refinery from circa 1950s to 1970s. Bulk storage and processing of several substances including but not limited to crude oil, naphtha, No.2 and No.5 fuel oil, gasoline, diesel, and kerosene occurred on the Site. The Site was owned and/or operated by Princeton Mining Company, R.J. Oil & Refining Company, Crystal-Princeton Refining Company, Northland Oil & Refining Company, and Indiana Refining Company since 1973.

Multiple investigations (Section 1.2) have been conducted at the Site including subsurface soil and groundwater sampling, groundwater elevation monitoring, and laser induced fluorescence (LIF) modeling. Based on the results of the prior investigations, it was concluded that prior uses associated with the refinery have impacted the soil and groundwater at the Site that will require remediation.

This document includes the components of the RWP outline provided in the general report formats prescribed in the Remediation Closure Guide (RCG).

1.1 Site Information

The Site is located north of County Road 350 South in Princeton, Gibson County, Indiana 47670. The Site is located approximately 0.2 miles west of Highway 41 and is part of the southwest quarter of Section 30, Township 2 South, Range 10 West. The Site is an irregular-shaped lot totaling approximately 36.07 acres and is currently unoccupied. The Vicinity Map is located in **Figure 1**.

The Princeton, Indiana Topographic Quadrangle Map (USGS, dated 1959, photorevised 1989) indicates the ground surface has an elevation of approximately 470 to 490 feet above mean sea level (MSL). The topography across the Site and surrounding area generally slopes to the west. According to information obtained from the Beacon-Gibson County GIS website, the Site is identified as parcel number 26-12-30-300-000.968-027. The Site is currently zoned Heavy Manufacturing (M-2).

During a Site walk on March 31, 2016, miscellaneous debris, metal piping, concrete structures, and trash were observed on several areas of the Site. Much of the Site consisted of overgrown vegetation and wooded areas. Several depressions, marsh areas, and ponds were also noted across the Site. The debris appears to be remnants from former structures demolished on the Site. The Site Plan is located in **Figure 2**.

1.2 Overview of Previous Investigations

<u>Phase I Environmental Site Assessment – April 25, 2016</u>
According to ATC's *Phase I Environmental Site Assessment* (ESA), multiple *recognized environmental conditions* (RECs) and ASTM non-scope conditions were identified at the Site. The following RECs or ASTM non-scope conditions were identified in the Phase I ESA:

- Historical use of the Site as an oil refinery. Prior owners of the Site include Princeton Mining Company, R.J. Oil & Refining Company, Crystal-Princeton Refining Company, Northland Oil & Refining Company, and Indiana Refining Company since 1973.
- ATC interviewed Mr. Kenneth McDaniel, Senior Environmental Manager with the Indiana Department of Environmental Management (IDEM), regarding the past clean-up activities on

the Site. Mr. McDaniel was the IDEM representative and Project Manager of the clean-up activities from 1989 to 1994. IDEM observed two apparent injection wells on the Site, which were reportedly used to dispose of waste generated by the refinery. Waste was drained into the wells which lead into the subsurface mine approximately 412 feet below the Site. Mr. McDaniel stated that low levels of polychlorinated biphenyls (PCBs) were encountered in many of the ASTs and crude oil on the Site. Mr. McDaniel stated that sumps and a septic system were used at the Site to discharge on-Site chemicals/wastes, which Mr. McDaniel felt eventually lead to the on-Site injection wells. According to Mr. McDaniel, IDEM performed on-Site solidification of oil and substances that could not be recycled and buried them on the north portion of the Site near former AST No. 39. No soil and groundwater sampling was conducted at the Site following clean-up activities

- Bulk storage of several substances including but not limited to crude oil, naphtha, No.2 and No.5 fuel oil, gasoline, diesel, and kerosene occurred on the Site. Multiple oil spills, the discharge of wastes into a subsurface mine, leaky ASTs and piping, the use of a septic system and sumps, illegal dumping, and burial of oil sludge were noted on the Site.
- ATC observed several piles of debris including metal piping, drums (rusted and empty), and concrete rubble on the central and southwest portions of the Site. Several mounds of soil were also observed on the Site. It is unknown if other materials / debris are present in the soil mounds.
- Dark brown stained water was observed in a pond on the north end of the Site.
- Past use as an oil refinery, reported spills, and disposal of wastes using injection wells on the Site are potential subsurface vapor migration sources.
- Suspect asbestos containing materials (ACMs) were identified on the Site in the form of asphalt coating, pipe compounds and orange insulation debris. Suspect ACMs were observed as debris on the Site in poor condition.

Multiple assessments have been completed at the property that have been documented by ATC in the following reports:

- *Phase II Limited Subsurface Investigation* (LSI), dated January 23, 2017,
- *Asbestos Survey Report*, dated January 25, 2017,
- *Phase II Further Site Investigation and Asbestos Abatement Report*, dated June 21, 2018,
- *Phase II Further Site Investigation*, dated September 21,2018,
- *Quarterly Monitoring Report,* dated September 27,2018,
- *Phase II Further Site Investigation,* dated January 16, 2019,
- *Quarterly Monitoring Report,* March 20, 2019,
- *Pilot Study,* April 8, 2019, and
- *Quarterly Monitoring Report*, dated April 24, 2019.

A total of 122 soil borings have been advanced at the Site to allow for soil and groundwater sample collection/evaluation. A total of 174 soil samples and 116 groundwater samples have been collected at the Site since 2016. There are currently 19 monitoring wells installed at the Site, and quarterly groundwater monitoring is currently ongoing.

Based on the historical laboratory analytical results, multiple contaminants of concern (CoCs) were detected in the soil and groundwater samples collected at the Site at concentrations

exceeding their respective RCG Screening Levels (SLs). Most notably, mercury, 1,2,4-trimethylbenzene (TMB), xylenes, and n-hexane were detected in the soil at concentrations exceeding their respective RCG excavation direct contact SLs. Benzene and naphthalene have been detected above the RCG commercial/industrial vapor exposure SL in the groundwater beneath the Site.

In order to further evaluate presence of LNAPL beneath the Site, a LIF assessment was conducted in July 2018. Based on the results of the LIF assessment, twenty-eight (28) out of the thirty-five (35) borings received LNAPL responses, which indicates a strong potential for the presence of LNAPL across the Site at depths ranging between 2 and 38 feet below ground surface (bgs). The highest LNAPL responses were detected generally between 100% and 400% at approximately 20 feet and 35 feet bgs. Multiple waveforms were identified with the LNAPL responses, which could indicate that multiple LNAPL types (i.e. gasoline, fuel oil, diesel, etc.) are present at the Site.

Based on historical gauging data, light non-aqueous phase liquids (LNAPL) has been detected above the groundwater up to approximately 10 feet in thickness. LNAPL thicknesses have been measured in monitoring wells MW-1, MW-2R, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-16, MW-17, and MW-18.

On March 29-30, 2018, approximately one (1) cubic yard of regulated asbestos containing materials (RACM) was removed from the Site by a licensed abatement contractor and disposed of at Advanced Disposal Blackfoot Landfill in Winslow, Indiana. Since the RACM appears to have been removed from the Site, asbestos removal is not addressed in this RWP.

A pilot study was performed at the Site to determine the effectiveness of a remediation approach. Seven (7) injection points IP-1 to IP-7 were installed at the Site in the vicinity of monitoring well MW-8. On March 12-13, 2019, groundwater remediation activities were performed on the Site, which was focused at the seven (7) injections point locations and monitoring well MW-8. Remediation activities included enhanced fluid recovery of approximately 650 gallons of impacted groundwater using a vacuum extraction truck. Approximately 4,690 gallons of 15% sodium persulfate catalyzed with sodium hydroxide were injected into the seven (7) injection points utilizing a mobile injection trailer simultaneously with the vacuum extraction.

2 Geologic Data

2.1 Geologic and Hydrogeologic Information

The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey classifies the soil at the property as primarily Udorthents (cut and fill). The table summarizes below the soils present at the property.

Summary of Soil Classification				
Soil Identification	**Landform Type**	**Slope Properties**	**Drainage Class**	**Permeability**
Alford silt loam	Loess hills	Moderate sloping	Well-drained	Moderately high to high
Ragsdale silt loam	Lake plain depressions	Nearly level	Poorly-drained	Moderately high to high
Reesville silt loam	Lake plains	Nearly level	Somewhat poorly-drained	Moderately high to high
Udorthents	Cut and filled	Not provided	Not provided	Not provided
Uniontown silt loam	Lake terraces	Nearly level to moderately sloping	Moderately well to well-drained	Moderately high

Wisconsinan to Holocene-age alluvium and silt generally forms the unconsolidated material below the property. The unconsolidated material is expected to have a thickness of approximately 50 to 100 feet. The soil samples collected during prior investigations indicate that the shallow stratigraphy of the Site consists of concrete, topsoil, and gravel, underlain generally by mixtures of clay (CL), clayey silt (ML), and sand (SW) within the upper 50 feet. Soil vapor screening results recorded during the soil sampling activities were reported from 0.0 parts per million (ppm) to 4,600 ppm. Soil boring logs generated from prior investigations are attached in **Appendix A**.

Pennsylvanian-age Patoka and Shelburn formations consisting of shale and sandstone form the bedrock below the property. The surface of the bedrock has an elevation of approximately 400 to 450 feet above MSL. Regionally, the bedrock surface dips to the southwest in the study area. None of the soil borings advanced at the Site have been extended to bedrock. The deepest boring completed on-Site extends to a depth of 50 feet bgs.

Brown Ditch appears to drain the study area. The ditch is located approximately 450 feet northwest of the Site and generally flows from east to west. Regional groundwater flow direction is generally influenced by major hydrogeologic features such as a river or lake. Surface and/or bedrock topography may also influence regional groundwater flow direction. Based on prior investigations, groundwater flow is to the east-southeast beneath the eastern portion of the Site, and to the west beneath the western portion of the Site. The depth to groundwater measurements observed during the April 2019 gauging event ranged between 1.80 to 38.22 feet below the top of the monitoring well casings. The approximate hydraulic gradient under the eastern portion of the Site is 0.05 feet / foot (MW-14 to MW-16), and 0.08 feet / foot (MW-7 to MW-6) under the western portion of the Site. A potentiometric surface map with data from the April 2019 gauging event is presented on **Figure 3**.

3 Site Conditions

3.1 Determination of Present and Future Land Use

The property is an approximately 36.07-acre lot and is currently unoccupied. Much of the property consists of overgrown vegetation and wooded areas. Several depressions, marsh areas, and ponds were noted across the property. Future usage is expected to be commercial/industrial in nature. The properties to the north and portions east are agricultural. Residential land is present to the south, west, and portions east. A trucking business is also located south of the property. The Site location and adjacent areas are illustrated on **Figure 2.**

3.2 Assessment of Potentially Susceptible Areas

The National Wetlands Database maintained by the United States Fish and Wildlife Service (USFWS) was reviewed to determine if the Site was within, or in close proximity to, registered wetlands. Based on the review, wetlands were identified on the Site in the form of freshwater ponds, freshwater emergent wetlands, and a freshwater riverine. Freshwater emergent and forested wetlands, and a freshwater riverine were also located approximately 400 feet to the northwest of the Site.

The glacial sand and gravel aquifer located beneath the Site is hydraulically connected to the Brown Ditch-Skelton Creek Watershed. The McCleansboro Group is the bedrock aquifer beneath the Site. The bedrock beneath the Site includes fractures and erosional features that could provide a preferential pathway for the migration of contaminated groundwater into bedrock aquifers. The bedrock aquifer beneath the Site consists of mostly shale and sandstone of the McCleansboro Group, which is hydraulically connected to the Wabash River.

A review of the Water Well Database, maintained by the Indiana Department of Natural Resources (IDNR), identified thirteen water wells (18070 to 18074, 204808, 204815, 204818, 204823, 204865, 204868, 204870, and 204873) within one-half mile of the Site. Water well 204823 was identified on the Site. Based on communication with IDEM, this well has been abandoned. Water well 204808 is shown south of the Site. Based on communication with the landowner, water well 204808 is no longer active, and could not be identified in the field for abandonment. Municipal water supply to the Site and surrounding properties is currently provided by Gibson Water, Inc. utility.

Parks, recreational areas, or hospitals are not located in the immediate vicinity of the Site.

3.3 Ecological Screening Assessment

Potentially affected species of flora and fauna
The Site and surrounding area supports numerous species of flora and fauna, including small mammals, reptiles and birds. The Site has been vacant since the 1970s and will likely be redeveloped with potential buildings and paved surfaces that will minimize its use by the local flora and fauna. The depth to groundwater limits the potential exposure of CoCs to flora and fauna beyond the Site boundaries.

Potentially affected species of flora and fauna on the Endangered Species List
The USFWS website was searched for the federally listed threatened, endangered, proposed, and candidate species in Gibson County, Indiana. The Indiana Bat, Northern Long-Eared Bat, Least Tern, Fat Pocketbook, Fanshell, and Bald Eagle (recovered) were listed for Gibson County.

Given the presence of dense vegetation, wooded areas, and wetland areas, critical habitat of such species could be present on the Site. All state and federal regulations regarding potential endangered species should be followed prior to future development of the Site. Based on the soil analytical results and depth to groundwater, exposure to on-Site contamination appears minimal for on-Site species.

Potential or observed effects of contamination on vegetation or wildlife populations
Based on Site observations, there appears to be isolated areas across the Site around former AST saddles, pipelines, etc. where stressed vegetation and black staining are visible. It is unknown how the stressed vegetation and surface staining has affected vegetation or wildlife at the Site.

3.4 Potential Exposure Pathways

An evaluation of the three default exposure pathways: soil exposure, groundwater exposure, and vapor exposure is discussed in the following paragraphs.

3.4.1 Soil Exposure

Soil exposure pathways may include:

- direct contact with skin (dermal absorption route);
- inhalation of CoCs on soil particulates and dust (ingestion and inhalation routes);
- volatilization from soil into the air (inhalation route);
- soil consumption (ingestion and dermal absorption routes); and
- CoC migration from soil to groundwater.

Since future use is expected to be commercial/industrial, CoC concentrations are not expected to an exposure concern in soil at depths of less than 2 feet, with the exception of adsorbed mercury detected in in the soil at B-16 (0-2). Although volatile CoCs are present in the soil and volatilization from soil to air is possible, the absence of occupied on-site buildings limit the potential exposure through inhalation and direct contact. CoC migration from soil to groundwater (groundwater ingestion) is a potential soil exposure pathway.

3.4.2 Groundwater Exposure

Groundwater exposure pathways may include:

- Volatilization from water to air (inhalation route);
- Direct contact with skin (dermal absorption route); and
- Water consumption (ingestion route).

Based on available data collected from the monitoring wells, groundwater has been impacted with CoCs at concentrations in exceedance of IDEM RCGs. The depth to groundwater beneath the Site is approximately 1.8 to 38 feet bgs and volatilization from water to air is possible. However, the absence of on-Site buildings limit the potential exposure through inhalation and direct contact.

Based on the IDNR Water Well Database, water well 204423 is located on the Site and water well 204808 is located on the south adjacent property. As noted in Section 3.2, water well 204423 has been abandoned and well 204808 is currently not in use. ATC attempted to abandon well

204808, but was unable to locate it due to being buried and inactive. The absence of potable wells at the Site indicates a low potential for ingestion of impacted groundwater.

3.4.3 Construction Worker Occupational

Direct contact to CoCs by construction worker occupational exposure may occur during excavation activities. Possible scenarios for this activity on or near the Site would include soil excavation, building construction, or utility line installation/repair. Exposure to the pockets of impacted soils at the Site is possible by this pathway. Use of the appropriate personal protective equipment and practicing standard health and safety procedures could reduce the potential for this type of exposure. The HASP for this project should be followed during all Site work, and is provided as **Appendix D**.

3.5 Contaminants of Concern

Based on the soil analytical results from previous investigations, mercury (B-16 (0-2)), 1,2,4-TMB (B-1 (23-24) and SB-12 (6-8')), xylenes (SB-12 (6-8') and MW-8 (12'14')), and n-hexane (B-1 (23-24) and SB-12 (6-8')) were detected in the soil at concentrations above their respective RCG excavation SLs. Multiple CoCs including arsenic, 1,2,4-TMB, 1,3,5-TMB, benzene, ethylbenzene, isopropylbenzene, methylene chloride, PCE, toluene, n-propylbenzene, 1-methylnaphthalene, 2-methylnaphthalene, 2,4-dinitrotoluene, naphthalene, and PCBs (Arochlor 1248) were detected in one or more soil samples at concentrations exceeding the RCG residential direct contact and/or MTG SLs, respectively. A summary of the historical soil analytical data is provided on **Tables 1** through **6**, and depicted on **Figure 4**.

Based on the groundwater results from previous investigations, benzene and/or naphthalene have been historically detected at concentrations exceeding the RCG commercial/industrial vapor exposure SL in one or more groundwater samples collected from B-1, B-3, B-15, B-21, B-25, MW-1, MW-2, MW-2R, MW-6, MW-8 to MW-13, and MW-15 to MW-19. Benzene was also detected above the RCG residential vapor exposure SL in one or more groundwater samples collected from B-30, B-36, and MW-14. Naphthalene was also detected at concentrations exceeding the RCG residential vapor exposure SL in one or more groundwater samples collected from B-1, B-3, MW-1, MW-2R, MW-8, MW-9, MW-11, MW-12, MW-13, MW-15, MW-16, and MW-18.

Multiple CoCs including arsenic, lead, isopropylbenzene, n-butylbenzene, benzene, 1,2-dichloroethane, cis-1,2-dichloroethene, ethylene dibromide, n-hexane, toluene, xylenes (total), ethylbenzene, n-propylbenzene, 1,2,4-TMB, 1,3,5-TMB, benzo(a)anthracene, benzo(a)pyrene, dibenz(a,h)anthracene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, and PCBs (Arochlor 1260) were detected in one or more groundwater samples that exceeded their respective RCG TAP residential SLs. A summary of the historical groundwater analytical data is provided on **Tables 7** through **10**, and depicted on **Figure 5**.

The targeted contamination zones appear to be concentrated on the south-central portion of the Site and off-Site properties to the east/southeast. Once remediation activities are complete and CoC concentrations are at acceptable levels, an environmental restrictive covenant (ERC) may be necessary to further protect human health and the environment.

4 Remediation Plan

The remediation plan outlines available remedial strategies and evaluates the effectiveness of each in remediating the COCs detected in the subsurface soil and groundwater within the immediate vicinity of the Former RJ Refinery Site.

4.1 Cleanup Standards and Objectives

The cleanup criteria selected for the COCs identified in the subsurface soils and groundwater are those listed in IDEM's Remediation Closure Guide (RCG) dated March 22, 2012, updated March 2019. The RCG provides various SLs based on the proposed land use and potential exposure. Although the Site is expected to be redeveloped as commercial/industrial land, nearby residential development should also be considered as part of the clean-up goals at the Site. The clean-up objective will include the remediation of impacted groundwater with CoC concentrations exceeding the RCG commercial/industrial vapor exposure SLs beneath the Site, and CoC concentrations exceeding the RCG residential vapor exposure SL adjacent to the Site. The remedial action will also address the presence of LNAPL under the Site to reduce to stable/acceptable levels. These remedial actions are designed to prevent unacceptable levels of human health risk from exposure to COCs in soil, groundwater and indoor air quality. The clean-up goals for groundwater at the Site are presented below:

Contaminant of Concern	Sample Locations	Groundwater Clean-up Objectives	
		RCG Residential Vapor Exposure Screening Level	RCG Commercial/ Industrial Vapor Exposure Screening Level
Benzene	B-1, B-3, B-15, B-21, B-25, B-30, B-36, MW-1, MW-2R, MW-6, MW-8 to MW-13, MW-15 to MW-19	28 ug/L	120 ug/L
Naphthalene	B-1, B-3, MW-1, MW-2R, MW-18	110 ug/L	460 ug/L

ug/L = micrograms per liter

Multiple CoC concentrations were also detected in groundwater samples above their respective RCG tap residential SLs; however, since the region's potable water is supplied through the municipality, ingestion and direct contact exposure does not appear to be of concern. Furthermore, an ERC may be necessary to further protect human health and the environment.

4.2 Remediation Alternatives

This section examines the technological effectiveness of each potential technology in relation to the Site-specific characteristics discussed above. ATC has considered the following criteria in evaluating the remedial options at the Site:

- Technical feasibility;
- Prevention of further migration of the dissolved hydrocarbon constituents;
- Speed of remediation; and
- Cost-effectiveness.

Treatment technologies that prevent human exposure to impacted groundwater and soil have also been evaluated.

4.3 Soil Remediation Alternatives

Options available for soil remediation consisted of no action, soil excavation with subsequent off-Site disposal, and implementation of in-situ technologies through the use of a remediation system.

4.3.1 Soil Remediation –Excavation

According to the IDEM, approximately 132,500 square feet would need to be excavated 20 to 25 feet bgs to address the upper NAPL layer. Assuming 25% of the excavated material would require landfill disposal, a total of approximately 34,351 tons (based on the conversion factor of 1.4 tons per cubic yard) of soil would require landfill disposal or ex-situ treatment to achieve cleanup goals. NAPL and dissolved-phase contaminated groundwater would require on-Site treatment (including applicable permits) or off-Site disposal. Estimated costs to complete the soil excavation totaled approximately $4,000,000.

The IDEM evaluated limiting excavation to address only the most heavily contaminated areas. However, even the most limited removal actions still exceeded $2,000,000 and this remedial option was determined cost prohibitive and not a viable remedial technology.

4.4 Groundwater Remediation Alternatives

Options available for groundwater remediation consisted of pump and treat technologies, enhanced fluid recovery, and various in-situ technologies including the use of a remediation system, enhanced soil mixing, ISCO, and monitored natural attenuation.

4.4.1 Pump and Treat Technology

Conventional groundwater pumping and treatment technology has proven to be effective in removing and containing dissolved hydrocarbons in groundwater. This is accomplished by establishing a groundwater capture zone, typically requiring a series of recovery wells or trenches. In addition to removing and containing the dissolved hydrocarbons, groundwater pump and treatment systems also remediate hydrocarbons in the saturated soil and groundwater via extraction. Through groundwater pumping, groundwater flow is induced in the direction of the recovery wells or trenches. As groundwater flows toward the wells, hydrocarbons adsorbed to the saturated soil particles will desorb into the captured groundwater, which is then pumped to the surface for treatment. This remedial technique typically operates for a longer period of time than other remedial options because the hydrocarbons must be drawn through the subsurface to recovery wells.

In some instances, the effectiveness of conventional groundwater pumping and treatment can be limited as the rate of desorption may be relatively slow. In such instances, a prolonged remediation time may be necessary to achieve the groundwater closure objectives. Based on the large area of contamination and thickness of the NAPL plume(s), the number of recovery wells required (determined by pilot testing) could be significant and extracted liquids would need to be pre-treated prior to disposal. This remedial option seems cost prohibitive and is not a viable remedial technology.

4.4.2 Enhanced Fluid Recovery

Enhanced fluid recovery (EFR) events are commonly used to periodically recover groundwater containing LNAPL and dissolved phase hydrocarbons. A mobile vacuum tank truck (vac truck) is typically utilized to perform EFR events. A vac-truck provides a mobile high vacuum source that can be attached to one or several wells at a given time. Thus, EFR events allow the flexibility to concentrate removal efforts at those locations which warrant it. Utilizing EFR events at a Site with localized elevated dissolved COC concentrations can be a cost effective alternative to the implementation of a permanent water recovery and treatment system. However, the remedial timeframe is extended due to only periodic operation. Based on the elevated CoC concentrations over a large area, this remedial approach does not appear to be a technically feasible option for this Site.

4.4.3 Groundwater Remediation – In-Situ Technologies

In-situ groundwater treatment consists of various technologies where air, bacteria, chemicals, or nutrients are injected into the groundwater. Injecting nutrients, chemicals, or bacteria typically enhance the biological degradation of the contaminants dissolved in the groundwater. Air sparging is another in-situ technology capable of treating groundwater. Unlike chemical or bacteria injection, potential clogging of injection points and pore spaces is less likely to occur with an air sparge system.

4.4.3.1 Air Sparging

Air sparging is a groundwater remediation technique that involves injecting air under pressure into the saturation zone. The injected air, which then travels upward through groundwater, strips volatile hydrocarbons from the groundwater and, through the addition of oxygen present in the injected air, also enhances the natural aerobic biodegradation. The volatilized hydrocarbons move with the injected air to the unsaturated zone, where a network of SVE points typically captures them. As with the SVE application previously discussed, recovered hydrocarbon vapors are then treated, if necessary, and discharged to the atmosphere.

The combined air sparging and SVE technique is limited to constituents which can readily be volatilized or biodegraded, such as BTEX, and to highly permeable, granular soils with few heterogeneities. Additionally, the system design may also be limited by the presence of potential subsurface vapor conduits, such as utility trenches, which can result in the transport of hydrocarbon vapors into unintended areas.

The primary advantage of air sparging and SVE is that it consists of in-situ treatment of the groundwater, thereby eliminating the need for an aboveground groundwater treatment system and water discharge or disposal. SVE also has the advantage of providing for the remediation of unsaturated soil containing adsorbed hydrocarbons. The disadvantages to air sparging and SVE are the subsurface limitations on its application and the lack of hydraulic control; however, curtains of air sparge wells can be installed to create treatment zones which groundwater flows through.

The cohesive soils associated with the vadose zone would appear to limit the amount of hydrocarbon vapors collected through SVE technologies. Since the elevated CoC concentrations detected in the groundwater at the Site may represent the presence of non-aqueous phase liquids (NAPL), the implementation of an air sparging system could potentially spread NAPL beneath the Site causing a greater zone of impact. Based on a review of the remedial alternative evaluation criteria, air sparging is not recommended based on the subsurface geology and elevated CoC concentrations present in the groundwater beneath the Site.

4.4.3.2 In-Situ Enhanced Soil Mixing

In-Situ Enhanced Soil Mixing (ISESM) is generally an effective method to address contaminated soil. Augers ranging in diameter from three (3) to twelve (12) feet would be used to mix soils up to approximately 40 feet bgs. Enhancements such as injection of heated air in combination with vapor extraction, injection of oxidants, or injection of grout (e.g., bentonite clay or cement) may be a viable alternative to retard off-Site migration by immobilizing shallow NAPL within the southern (downgradient) portion of the Site. However, the estimated cost to perform ISESM would be in excess of $1,500,000 and this remedy was determined cost prohibitive and not a viable remedial technology.

4.4.3.3 In-Situ Chemical Oxidation

The IDEM consulted an outside subcontractor to provide a cost estimate to address the Site using In-Situ Chemical Oxidation (ISCO). Due to the high levels of NAPL and oxidant demand, the recommended remedial strategy combined ISCO and vacuum extraction (vacuum truck). The proposed treatment area includes 122 injection/extraction wells advanced to 30 feet bgs in the south-central to southeast portion of the Site.

Approximately 670 gallons of 15% sodium persulfate catalyzed with sodium hydroxide would be injected into each of the 122 injection locations. Vacuum extraction would be utilized prior to, during, and following injection activities to facilitate the effectiveness of the treatment chemistry. All extracted fluids would be stored in mobile frac tanks prior to off-Site disposal.

The work would take approximately 10 days to complete and the estimated cost of $785,000 is within the available budget. The ISCO is considered a viable remedial option.

4.4.3.4 Monitored Natural Attenuation

Natural attenuation processes commonly occur in the subsurface where hydrocarbons are present. After the source area is remediated, natural attenuation processes may be effective in degrading residual hydrocarbons. Based on the current concentrations of dissolved hydrocarbons and NAPL at the Site, natural attenuation alone does not appear to be the best remedial option.

4.4.4 Containment Slurry Wall

Containment slurry walls typically include a groundwater pumping system to collect contaminated groundwater and reduce migration around or through the slurry wall. Given the long-term hydraulic monitoring required, the technology is not considered a viable remedial option.

4.5 Environmental Restrictive Covenant

In order to protect human health and the environment, an environmental restrictive covenant (ERC) is recommended to be placed on the Site. The ERC may consider the following provisions and restrictions:

- The Owner shall not use or allow the use of groundwater at the Site for any purpose without IDEM's approval.
- The Owner shall not use the Site for residential purposes, including, but not limited to, daily care facilities (i.e. schools, child care centers, nursing homes, etc.).
- Excavation restrictions without IDEM's approval may be necessary.

4.6 Cost Analysis

A consideration to cost effectiveness was given to the applicable remedial options. A summary of the estimated costs associated with remediation alternatives is provided in **Appendix B.**

5 Selected Remedy

Based on the evaluation of remedial alternatives, the selected remedy for the Site will include the ISCO option. Remediation activities will include the extraction of impacted groundwater and NAPL from installed injection points using a vacuum extraction truck. Existing monitoring wells may also be used for additional extraction. A mobile injection trailer will be utilized to administer the injection of 15% sodium persulfate catalyzed with sodium hydroxide into 122 injection points. Approximately 670 gallons of injection solution (mixed on-Site) will be pumped into each injection point using air-tight piping and hoses. Injection operations is expected to be combined with vacuum extraction during remediation activities. All extracted fluids would be stored in mobile frac tanks prior to off-Site disposal.

Following remediation activities, an environmental restrictive covenant (ERC) may be prepared and recorded for the Site and nearby properties to act as an institutional control against human exposure to residual hydrocarbons.

5.1 Closure Report and Data Management

Once remediation activities have been implemented at the Site and cleanup goals have been achieved, a Remediation Completion Report will be prepared and submitted to the IDEM.

All data generated during the remediation activities will be managed and presented to the IDEM in communications or reports. All electronic submittals will follow the IDEM's Electronic Data Submittal Guidelines.

5.2 Project Schedule

The schedule represents an eighteen (18) week time frame only. The schedule is based on no delays being caused by EPA or IDEM's approval process or from the selected vendors and subcontractors, other than the time frame provided in the schedule. The projected schedule has been provided in **Appendix C**.

6 References

ATC Group Services LLC, *Asbestos Survey Report*, dated January 25, 2017.

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USDA NRCS Web Soil Survey: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm.

United States Geological Survey (USGS), *Princeton, Indiana Topographic Quadrangle Map*, 7.5 Minute Series, dated 1959, photorevised 1989.

Tables

Table 1
Summary of Analytical Soil Results - VOCs/Metals - October 2016
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Sample Depth (ft)	Date Sampled	Detected Metals (ppm)							Detected VOCs (ppm)														
			Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	2-Butanone (MEK)	Acetone	Benzene	Ethylbenzene	Isopropylbenzene	Methylene Chloride	Tetrachloroethene	Toluene	n-Hexane	n-Propylbenzene	p-Isopropyltoluene	sec-Butylbenzene	tert-Butylbenzene
IDEM Screening Soil Exposure Direct Contact Residential 2016			9.5	21,000	99	NE*	400	3.1	550	81	180	28,000	85,000	17	81	270	490	110	820	140	260	NE*	150	180
IDEM Screening Soil Exposure Direct Contact Commercial/Industrial 2016			30	100,000	980	NE*	800	3.1	5,800	220	180	28,000	100,000	51	250	270	3,200	170	820	140	260	NE*	150	180
IDEM Screening Soil Exposure Direct Contact Excavation 2016			920	100,000	1,900	NE*	1,000	3.1	9,800	220	180	28,000	100,000	1,800	480	270	3,300	170	820	140	260	NE*	150	180
IDEM Screening Groundwater Soil MTG Residential 2016			5.9	1,700	7.5	100,000	270	2.1	5.3	0.44	3.4	23	57	0.051	16	15	0.025	0.045	14	210	25	NE*	120	31
B-1	0-2	10/25/2016	7.8	121	<0.59	18.2	9.9	<0.24	<1.2	<0.0044	<0.0044	<0.0220	<0.0878	<0.0044	<0.0044	<0.0044	<0.0176	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044
B-1	23-24	10/25/2016	**14.5**	36.9	<3.0	13.0	265	<0.27	<5.9	323	97.7	<5.48	<21.9	2.46	**106**	13.8	<4.38	<1.10	11.6	511	58.8	3.21	7.59	<1.10
B-2	0-2	10/25/2016	**11.1**	115	<0.55	21.5	8.5	<0.23	<1.1	<0.0047	<0.0047	<0.0233	<0.0933	<0.0047	<0.0047	<0.0047	<0.0187	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047
B-2	8-10	10/25/2016	8.5	48.8	<0.54	16.8	10.1	<0.24	<1.1	<0.475	<0.475	<2.37	<9.49	<0.475	<0.475	<0.475	<1.90	<0.475	<0.475	<0.475	<0.475	<0.475	<0.475	<0.475
B-3	0-2	10/25/2016	**12.3**	91.3	<0.51	19.6	12.7	<0.24	<1.0	<0.0055	<0.0055	<0.0277	<0.111	<0.0055	<0.0055	<0.0055	<0.0222	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055
B-3	24-25	10/25/2016	8.2	29.8	<0.53	10.4	8.7	<0.24	<1.1	16.3	4.75	<1.17	<4.69	0.127	7.40	0.761	<0.938	<0.235	0.393	19.5	3.37	<0.235	0.405	<0.235
BLIND DUPLICATE 1			9.1	85.6	<0.59	15.8	10.3	<0.23	<1.2	<0.488	<0.488	<2.44	<9.76	<0.488	<0.488	4.98	<1.95	<0.488	<0.488	<0.488	6.57	<0.488	3.29	<0.488
B-4	0-2	10/25/2016	**11.0**	70.9	<0.54	17.4	12.7	<0.23	<1.1	<0.0053	<0.0053	<0.0263	<0.105	<0.0053	<0.0053	<0.0053	<0.0210	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053
B-4	28-30	10/25/2016	4.2	27.8	<0.56	12.8	9.2	<0.23	<1.1	<0.0046	<0.0046	<0.0231	<0.0922	<0.0046	<0.0046	<0.0046	<0.0184	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046
B-5	0-2	10/25/2016	**12.3**	95.3	<0.50	34.1	15.9	<0.23	<1.0	<0.0056	<0.0056	<0.0281	<0.112	<0.0056	<0.0056	<0.0056	<0.0225	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056
B-5	8-10	10/25/2016	4.3	48.6	<0.58	13.1	7.3	<0.25	<1.2	<0.0048	<0.0048	<0.0242	<0.0970	<0.0048	<0.0048	0.0894	<0.0194	<0.0048	<0.0048	<0.0048	0.578	<0.0048	0.153	<0.0048
B-6	0-2	10/25/2016	**25.7**	82.8	<0.56	23.9	10.9	<0.25	<1.1	<0.0048	<0.0048	<0.0242	<0.0970	<0.0048	<0.0048	<0.0048	<0.0194	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048
B-6	32-34	10/25/2016	4.0	31.7	<0.49	11.6	8.0	<0.23	<0.97	<0.0047	<0.0047	<0.0235	<0.0941	<0.0047	<0.0047	<0.0047	<0.0188	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047
B-7	0-2	10/26/2016	**24.4**	113	<0.53	42.8	64.7	<0.24	<1.1	<0.0046	<0.0046	<0.0231	<0.0925	<0.0046	<0.0046	<0.0046	<0.0185	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046
B-7	26-28	10/26/2016	7.1	49.9	<0.57	17.4	12.5	<0.23	<1.1	<0.0043	<0.0043	<0.0217	<0.0867	<0.0043	<0.0043	<0.0043	<0.0173	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043	<0.0043
B-8	0-2	10/25/2016	**11.4**	74.9	<0.60	19.4	18.3	<0.28	<1.2	<0.561	<0.561	<2.81	<11.2	0.697	2.96	9.78	<2.25	<0.561	<0.561	<0.561	40.7	<0.561	5.80	<0.561
B-8	4-6	10/25/2016	9.1	102	<0.61	16.6	16.0	<0.24	<1.2	<0.510	<0.510	<2.55	<10.2	1.09	<0.510	8.41	<2.04	<0.510	<0.510	0.890	28.3	<0.510	4.45	<0.510
B-9	0-2	10/25/2016	**9.9**	63.9	<0.54	22.8	10.9	<0.24	<1.1	<0.510	<0.510	<2.55	<10.2	<0.510	<0.510	1.89	<2.04	<0.510	<0.510	<0.510	6.53	<0.510	1.45	<0.510
B-9	6-8	10/25/2016	6.7	51.3	<0.58	13.6	8.8	<0.26	<1.2	<0.509	<0.509	<2.54	<10.2	0.969	<0.509	3.24	<2.03	<0.509	<0.509	<0.509	10.7	<0.509	2.21	<0.509
B-10	0-2	10/25/2016	**15.2**	74.9	<0.59	24.4	14.5	<0.26	<1.2	<0.0060	<0.0060	<0.0300	<0.120	<0.0060	<0.0060	<0.0060	<0.0240	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
B-10	8-10	10/25/2016	3.2	67.4	<0.55	12.3	5.8	<0.24	<1.1	**86.6**	25.9	<1.04	<4.18	0.287	33.8	4.68	<0.836	<0.209	<0.209	37.2	20.8	0.623	2.08	<0.209
B-11	0-2	10/28/2016	**12.9**	73.2	<0.59	18.4	14.0	<0.24	<1.2	<0.0048	<0.0048	<0.0240	<0.0962	<0.0048	<0.0048	<0.0048	<0.0192	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048
B-11	8-10	10/28/2016	4.6	38.8	<0.50	13.0	6.5	<0.22	<1.0	<0.482	<0.482	<2.41	<9.65	<0.482	<0.482	0.857	<1.93	<0.482	<0.482	1.10	1.04	0.615	0.506	<0.482
B-12	0-2	10/27/2016	**10.4**	73.8	<0.51	18.3	31.1	<0.20	<1.0	<0.0052	<0.0052	<0.0260	<0.104	<0.0052	<0.0052	<0.0052	<0.0208	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052
B-12	4-6	10/27/2016	9.1	74.8	<0.57	14.3	9.9	<0.24	<1.1	<0.499	<0.499	<2.50	<9.99	<0.499	<0.499	0.896	<2.00	<0.499	<0.499	<0.499	1.37	<0.499	1.95	<0.499
B-13	0-2	11/1/2016	**20.8**	74.6	<0.50	18.2	20.6	<0.24	<1.0	<0.0047	<0.0047	<0.0236	<0.0946	<0.0047	<0.0047	<0.0047	<0.0189	<0.0047	0.0054	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047
B-13	4-6	11/1/2016	9.5	171	<0.54	20.1	9.8	<0.26	<1.1	<1.32	<1.32	<6.58	<26.3	2.44	<1.32	3.45	<5.27	<1.32	<1.32	6.65	6.39	1.64	2.19	<1.32
B-14	0-2	10/28/2016	6.0	60.5	<0.54	12.3	9.6	<0.21	<1.1	<0.0050	<0.0050	<0.0252	<0.101	<0.0050	<0.0050	<0.0050	<0.0202	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-14	6-8	10/28/2016	8.8	60.1	<0.58	13.2	8.2	<0.25	<1.2	<1.34	<1.34	<6.72	<26.9	<1.34	<1.34	2.82	<5.38	<1.34	<1.34	<1.34	7.74	<1.34	1.68	<1.34
B-15	0-2	10/31/2016	8.5	75.8	<0.58	14.1	18.6	<0.23	<1.2	0.171	0.0412	0.0448	0.197	0.0761	0.0185	0.0262	<0.0221	<0.0055	<0.0055	<0.0055	0.0718	0.0252	0.0145	<0.0055
B-15	6-8	10/31/2016	7.6	86.8	<0.54	17.7	9.5	<0.25	<1.1	<0.507	<0.507	<2.54	<10.1	7.74	1.40	3.51	<2.03	<0.507	<0.507	2.46	11.0	2.02	1.94	<0.507
B-16	0-2	10/28/2016	**10.3**	86.1	<0.50	12.1	40.6	5.7	<1.0	<0.0054	<0.0054	<0.0271	<0.108	<0.0054	<0.0054	<0.0054	0.0250	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054
B-16	14-16	10/28/2016	5.7	65.6	<0.60	20.5	13.2	<0.25	<1.2	<1.23	<1.23	<6.15	<24.6	0.468	<1.23	<1.23	5.59	<1.23	<1.23	<1.23	<1.23	<1.23	<1.23	<1.23
B-17	0-2	10/31/2016	5.5	57.5	<0.46	9.6	11.5	<0.22	<0.93	<0.0048	<0.0048	<0.0241	<0.0966	<0.0048	<0.0048	<0.0048	<0.0193	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048
B-17	8-10	10/31/2016	5.5	41.5	<0.52	10.0	5.7	<0.23	<1.0	<0.0048	<0.0048	<0.0240	<0.0959	<0.0048	<0.0048	<0.0048	<0.0192	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048
B-18	0-2	10/31/2016	**10.7**	125	<0.50	18.7	14.0	<0.24	<0.99	<0.0048	<0.0048	<0.0239	<0.0954	<0.0048	<0.0048	<0.0048	<0.0191	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048

Table 1
Summary of Analytical Soil Results - VOCs/Metals - October 2016
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Sample Depth (ft)	Date Sampled	Detected Metals (ppm)							Detected VOCs (ppm)														
			Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	2-Butanone (MEK)	Acetone	Benzene	Ethylbenzene	Isopropylbenzene	Methylene Chloride	Tetrachloroethene	Toluene	n-Hexane	n-Propylbenzene	p-Isopropyltoluene	sec-Butylbenzene	tert-Butylbenzene
IDEM Screening Soil Exposure Direct Contact Residential 2016			9.5	21,000	99	NE*	400	3.1	550	81	180	28,000	85,000	17	81	270	490	110	820	140	260	NE*	150	180
IDEM Screening Soil Exposure Direct Contact Commercial/Industrial 2016			30	100,000	980	NE*	800	3.1	5,800	220	180	28,000	100,000	51	250	270	3,200	170	820	140	260	NE*	150	180
IDEM Screening Soil Exposure Direct Contact Excavation 2016			920	100,000	1,900	NE*	1,000	3.1	9,800	220	180	28,000	100,000	1,800	480	270	3,300	170	820	140	260	NE*	150	180
IDEM Screening Groundwater Soil MTG Residential 2016			5.9	1,700	7.5	100,000	270	2.1	5.3	0.44	3.4	23	57	0.051	16	15	0.025	0.045	14	210	25	NE*	120	31
B-18	6-8	10/31/2016	**17.1**	147	<0.57	20.1	9.4	<0.24	<1.1	<0.506	<0.506	<2.53	<10.1	1.47	0.844	4.91	<2.02	<0.506	<0.506	14.6	12.4	1.28	2.57	<0.506
BLIND DUPLICATE 4			6.7	107	<0.58	16.3	7.3	<0.25	<1.2	<0.509	<0.509	<2.54	<10.2	1.07	<0.509	2.01	<2.04	<0.509	<0.509	7.62	5.47	<0.509	1.10	<0.509
B-19	0-2	10/27/2016	7.0	63.0	<0.55	14.9	26.8	<0.25	<1.1	0.0385	0.0090	0.0564	<0.109	0.0268	0.0726	0.0336	<0.0218	<0.0054	<0.0054	0.0939	0.0785	0.0202	0.0370	<0.0054
B-19	6-8	10/27/2016	6.9	83.2	<0.51	14.3	8.5	<0.23	<1.0	<0.489	<0.489	<2.45	<9.79	<0.489	<0.489	<0.489	<1.96	<0.489	<0.489	<0.489	<0.489	<0.489	<0.489	<0.489
BLIND DUPLICATE 3			7.7	96.3	<0.62	15.2	8.9	<0.26	<1.2	<0.508	<0.508	<2.54	<10.2	<0.508	<0.508	0.645	<2.03	<0.508	<0.508	<0.508	1.25	<0.508	0.683	<0.508
B-20	0-2	10/28/2016	9.0	162	<0.55	8.5	19.1	<0.25	<1.1	<0.0052	<0.0052	<0.0258	<0.103	<0.0052	<0.0052	<0.0052	<0.0207	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052
B-20	14-16	10/28/2016	5.0	57.4	<0.54	15.9	9.0	<0.23	<1.1	12.4	<2.31	<11.5	<46.1	<2.31	3.72	2.82	<9.22	<2.31	<2.31	<2.31	4.09	<2.31	<2.31	<2.31
B-21	0-2	10/27/2016	4.6	159	<0.56	9.7	11.5	<0.22	<1.1	<0.237	<0.237	<1.19	<4.74	<0.237	0.239	1.22	<0.949	<0.237	<0.237	<0.237	4.30	<0.237	0.762	<0.237
B-21	24-26	10/27/2016	3.7	21.8	<0.49	7.5	7.2	<0.24	<0.99	41.9	12.2	<5.52	<22.1	**27.4**	24.6	2.38	<4.41	<1.10	84.6	59.7	8.59	<1.10	<1.10	<1.10
B-22	0-2	10/27/2016	7.4	86.3	<0.51	14.7	23.5	<0.22	<1.0	<0.0059	<0.0059	<0.0293	<0.117	<0.0059	<0.0059	<0.0059	<0.0234	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059
B-22	6-8	10/27/2016	8.5	73.3	<0.57	15.0	8.8	<0.24	<1.1	<0.503	<0.503	<2.51	<10.1	<0.503	<0.503	5.14	<2.01	<0.503	<0.503	<0.503	17.7	<0.503	2.94	<0.503
B-23	0-2	10/31/2016	**10.0**	93.8	<0.52	10.4	13.1	<0.22	<1.0	0.0328	0.0071	<0.0276	<0.110	<0.0055	<0.0055	<0.0055	<0.0221	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055
B-23	6-8	10/31/2016	9.1	73.9	<0.60	13.9	11.6	<0.26	<1.2	74.3	23.9	<2.03	<8.14	15.8	26.1	3.14	<1.63	<0.407	<0.407	6.24	14.9	1.50	1.91	<0.407
B-24	0-2	10/28/2016	8.7	91.0	<0.52	14.9	34.6	<0.23	<1.0	<0.0051	<0.0051	<0.0254	<0.102	<0.0051	<0.0051	<0.0051	<0.0203	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051
B-24	20-22	10/28/2016	2.0	24.2	<0.60	7.4	6.6	<0.23	<1.2	21.7	6.22	<2.81	<11.2	<0.562	0.758	1.52	<2.25	<0.562	<0.562	27.1	2.96	2.88	2.55	<0.562
B-25	0-2	10/31/2016	6.8	63.4	<0.45	10.7	16.0	0.66	<0.91	<0.0039	<0.0039	<0.0197	<0.0786	0.0123	<0.0039	0.0541	<0.0157	<0.0039	<0.0039	<0.0039	0.0720	<0.0039	0.0529	<0.0039
B-25	2-4	10/31/2016	9.3	68.1	<0.50	13.5	16.0	<0.25	<1.0	32.8	8.98	<2.48	<9.92	0.213	6.64	18.7	<1.98	<0.496	<0.496	1.17	34.9	5.67	12.2	<0.496
BLIND DUPLICATE 5			**10.6**	70.4	<0.53	14.5	16.5	<0.25	<1.1	2.86	0.738	<2.34	<9.37	<0.468	0.783	8.16	<1.87	<0.468	<0.468	<0.468	18.1	0.811	5.80	<0.468
B-26	0-2	10/31/2016	**11.1**	74.4	<0.56	16.9	12.4	<0.23	<1.1	<0.0053	<0.0053	<0.0267	<0.107	<0.0053	<0.0053	<0.0053	<0.0214	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053
B-26	6-8	10/31/2016	4.3	56.9	<0.50	15.0	7.9	<0.25	<0.99	6.78	1.35	<2.38	<9.50	<0.475	1.45	<0.475	<1.90	<0.475	<0.475	1.95	1.42	<0.475	<0.475	<0.475
B-27	0-2	10/31/2016	**22.9**	65.6	<0.51	12.3	30.0	<0.21	<1.0	<0.152	<0.152	<0.761	<3.04	<0.152	<0.152	<0.152	<0.609	<0.152	<0.152	<0.152	<0.152	<0.152	<0.152	<0.152
B-27	6-8	10/31/2016	3.9	56.1	<0.52	13.3	8.2	<0.25	<1.0	<0.456	<0.456	<2.28	<9.13	<0.456	<0.456	<0.456	<1.83	<0.456	<0.456	<0.456	<0.456	<0.456	<0.456	<0.456
B-28	0-2	10/26/2016	4.3	98.1	<0.51	12.3	8.8	<0.23	<1.0	<0.0047	<0.0047	<0.0234	<0.0937	<0.0047	<0.0047	<0.0047	<0.0187	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047
B-28	8-10	10/26/2016	3.3	52.4	<0.50	12.0	6.7	<0.22	<1.0	<0.0041	<0.0041	<0.0204	<0.0816	<0.0041	<0.0041	<0.0041	<0.0163	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041
B-29	0-2	10/26/2016	**13.7**	113	<0.58	25.0	11.7	<0.23	<1.2	<0.0048	<0.0048	<0.0241	<0.0966	<0.0048	<0.0048	<0.0048	<0.0193	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048
B-29	6-8	10/26/2016	7.5	52.9	<0.56	14.6	8.4	<0.22	<1.1	<0.0038	<0.0038	<0.0192	<0.0770	<0.0038	<0.0038	<0.0038	<0.0154	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038
B-30	0-2	10/26/2016	6.7	86.5	<0.56	13.7	12.8	<0.23	<1.1	0.0158	0.0051	<0.0224	<0.0896	<0.0045	0.0088	<0.0045	<0.0179	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045
B-30	12-14	10/26/2016	3.6	44.9	<0.50	12.2	9.0	<0.25	<1.0	37.3	9.46	<1.07	<4.29	2.46	16.6	1.84	<0.858	<0.215	<0.215	26.0	7.82	0.290	0.912	<0.215
B-31	0-2	10/26/2016	**9.8**	78.9	<0.50	15.5	11.1	<0.23	<1.0	<0.0055	<0.0055	<0.0277	<0.111	<0.0055	<0.0055	<0.0055	<0.0222	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055
B-31	4-6	10/26/2016	6.4	52.8	<0.53	10.9	7.1	<0.25	<1.1	<0.0048	<0.0048	<0.0242	<0.0969	<0.0048	<0.0048	<0.0048	<0.0194	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048
B-32	0-2	10/26/2016	**13.0**	102	<0.51	18.3	13.2	<0.22	<1.0	<0.0054	<0.0054	<0.0272	<0.109	<0.0054	<0.0054	<0.0054	<0.0217	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054
B-32	4-6	10/26/2016	7.8	51.2	<0.55	15.3	8.1	<0.26	<1.1	<0.125	<0.125	<0.625	<2.50	<0.125	<0.125	<0.125	0.640	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
B-33	0-2	10/25/2016	**12.7**	59.9	<0.51	19.3	13.9	<0.25	<1.0	<0.0048	<0.0048	<0.0240	<0.0961	<0.0048	<0.0048	<0.0048	<0.0192	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048
B-33	4-6	10/25/2016	6.7	56.2	<0.55	10.9	8.6	<0.26	<1.1	<0.523	<0.523	<2.61	<10.5	<0.523	0.574	3.34	<2.09	<0.523	<0.523	<0.523	4.75	0.527	3.62	<0.523
B-34	0-2	10/25/2016	**14.3**	103	<0.57	20.4	25.0	<0.22	<1.1	<0.0057	<0.0057	<0.0286	<0.114	<0.0057	<0.0057	<0.0057	<0.0229	<0.0057	<0.0057	<0.0057	<0.0057	<0.0057	<0.0057	<0.0057
B-34	8-10	10/25/2016	1.9	50.7	<0.54	16.2	9.8	<0.25	<1.1	27.6	7.83	<0.0228	<0.0912	6.48	13.3	1.68	<0.0182	<0.0046	<0.0046	12.4	5.37	0.194	0.239	<0.0046
B-35	0-2	10/25/2016	**10.6**	68.2	<0.52	16.9	10.4	<0.23	<1.0	<0.0052	<0.0053	<0.0266	<0.106	<0.0053	<0.0053	<0.0053	<0.0213	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053
B-35	6-8	10/25/2016	4.0	48.3	<0.56	13.8	6.2	<0.23	<1.1	77.9	25.2	<1.18	<4.71	0.174	20.7	4.00	<0.942	<0.235	<0.235	<0.235	15.9	1.28	2.50	<0.235
B-36	0-2	11/1/2016	5.5	62.1	<0.49	10.8	10.6	<0.21	<0.98	<0.0050	<0.0050	<0.0250	<0.100	<0.0050	<0.0050	<0.0050	<0.0200	<0.0050	0.0062	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

Table 1
Summary of Analytical Soil Results - VOCs/Metals - October 2016
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Sample Depth (ft)	Date Sampled	Detected Metals (ppm)							Detected VOCs (ppm)														
			Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	2-Butanone (MEK)	Acetone	Benzene	Ethylbenzene	Isopropylbenzene	Methylene Chloride	Tetrachloroethene	Toluene	n-Hexane	n-Propylbenzene	p-Isopropyltoluene	sec-Butylbenzene	tert-Butylbenzene
IDEM Screening Soil Exposure Direct Contact Residential 2016			9.5	21,000	99	NE*	400	3.1	550	81	180	28,000	85,000	17	81	270	490	110	820	140	260	NE*	150	180
IDEM Screening Soil Exposure Direct Contact Commercial/Industrial 2016			30	100,000	980	NE*	800	3.1	5,800	220	180	28,000	100,000	51	250	270	3,200	170	820	140	260	NE*	150	180
IDEM Screening Soil Exposure Direct Contact Excavation 2016			920	100,000	1,900	NE*	1,000	3.1	9,800	220	180	28,000	100,000	1,800	480	270	3,300	170	820	140	260	NE*	150	180
IDEM Screening Groundwater Soil MTG Residential 2016			5.9	1,700	7.5	100,000	270	2.1	5.3	0.44	3.4	23	57	0.051	16	15	0.025	0.045	14	210	25	NE*	120	31
B-36	10-12	11/1/2016	4.1	68.4	<0.53	19.4	9.5	<0.25	<1.1	6.86	2.13	<2.30	<9.21	0.828	3.25	<0.461	<1.84	<0.461	<0.461	4.04	1.53	<0.461	<0.461	<0.461
B-37	0-2	11/1/2016	**12.7**	37.7	<0.53	18.8	15.2	<0.23	<1.1	<0.0072	<0.0072	<0.0360	<0.144	<0.0072	<0.0072	<0.0072	<0.0288	<0.0072	<0.0072	<0.0072	<0.0072	<0.0072	<0.0072	<0.0072
B-37	18-20	11/1/2016	2.8	10.5	<0.55	5.4	4.7	<0.23	<1.1	<0.0048	<0.0048	<0.0242	<0.0969	<0.0048	<0.0048	<0.0048	<0.0194	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048
B-38	0-2	11/1/2016	**11.6**	93.3	<0.58	22.0	11.6	<0.26	<1.2	<0.0046	<0.0046	<0.0228	<0.0913	<0.0046	<0.0046	<0.0046	<0.0183	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046
B-38	8-10	11/1/2016	8.4	83.3	<0.57	21.9	13.5	<0.24	<1.1	<0.0046	<0.0046	<0.0229	<0.0917	<0.0046	<0.0046	<0.0046	<0.0183	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046
B-39	0-2	11/1/2016	7.0	84.1	<0.55	10.7	29.0	<0.22	<1.1	<0.0052	<0.0052	<0.0260	<0.104	<0.0052	<0.0052	<0.0052	<0.0208	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052
BLIND DUPLICATE 6			**10.6**	63.9	<0.50	16.6	11.1	<0.23	<1.0	<0.0052	<0.0052	<0.0261	<0.104	<0.0052	<0.0052	<0.0052	<0.0209	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052
B-39	18-19	11/1/2016	5.1	39.0	<0.52	9.6	8.0	<0.25	<1.0	<0.241	<0.241	<1.20	<4.82	<0.241	<0.241	<0.241	<0.963	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241	<0.241
B-40	0-2	11/1/2016	9.1	83.3	<0.55	12.7	17.0	<0.22	<1.1	<0.0048	<0.0048	<0.0239	<0.0956	<0.0048	<0.0048	<0.0048	<0.0191	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048
B-40	8-10	11/1/2016	6.1	128	<0.60	13.1	10.9	<0.26	<1.2	<0.0049	<0.0049	<0.0247	0.115	<0.0049	<0.0049	<0.0049	<0.0197	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049	<0.0049
B-41	0-2	10/31/2016	**11.3**	63.6	<0.57	18.7	12.0	<0.25	<1.1	<0.0051	<0.0051	<0.0256	<0.102	<0.0051	<0.0051	<0.0051	<0.0204	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051
B-41	8-10	10/31/2016	3.6	66.1	<0.53	26.8	6.6	<0.23	<1.1	<0.0046	<0.0046	<0.0228	<0.0910	<0.0046	<0.0046	<0.0046	<0.0182	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046
B-42	0-2	10/26/2016	6.4	62.2	<0.59	16.9	14.2	<0.24	<1.2	<0.0050	<0.0050	<0.0249	<0.0998	<0.0050	<0.0050	<0.0050	<0.0200	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-42	8-10	10/26/2016	5.9	55.8	<0.54	17.4	7.6	<0.23	<1.1	<0.0045	<0.0045	<0.0225	<0.0899	<0.0045	<0.0045	<0.0045	<0.0180	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045
B-43	0-2	11/1/2016	4.8	70.9	<0.62	8.0	12.6	<0.26	<1.2	<0.0048	<0.0048	<0.0242	<0.0968	<0.0048	<0.0048	<0.0048	<0.0194	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048
B-43	8-10	11/1/2016	7.8	103	<0.56	13.3	10.0	<0.25	<1.1	<0.0047	<0.0047	<0.0234	<0.0936	<0.0047	<0.0047	<0.0047	<0.0187	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047
B-44	0-2	11/1/2016	**10.2**	78.5	<0.56	16.7	19.2	<0.24	<1.1	<0.0050	<0.0050	<0.0249	<0.0996	<0.0050	<0.0050	<0.0050	<0.0199	<0.0050	0.0082	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-44	33-35	11/1/2016	3.7	32.0	<0.55	13.1	9.0	<0.24	<1.1	<0.0038	<0.0038	<0.0191	<0.0765	<0.0038	<0.0038	<0.0038	<0.0153	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038	<0.0038
B-45	0-2	10/31/2016	8.0	50.3	<0.52	11.7	13.6	<0.23	<1.0	<0.0044	<0.0044	<0.0221	<0.0882	<0.0044	<0.0044	<0.0044	<0.0176	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044
B-45	24-26	10/31/2016	8.3	146	<0.54	14.1	9.9	<0.24	<1.1	<0.0042	<0.0042	<0.0210	<0.0839	<0.0042	<0.0042	<0.0042	<0.0168	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042	<0.0042
B-46	0-2	10/27/2016	**10.5**	69.7	<0.49	17.1	12.6	<0.23	<0.98	<0.0052	<0.0052	<0.0259	<0.103	<0.0052	<0.0052	<0.0052	<0.0207	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052
B-46	8-10	10/27/2016	3.0	62.8	<0.50	13.2	6.0	<0.22	<1.0	<0.0048	<0.0048	<0.0239	<0.0957	<0.0048	<0.0048	<0.0048	<0.0191	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048
B-47	0-2	10/27/2016	**11.9**	75.4	<0.51	20.2	12.3	<0.22	<1.0	<0.0051	<0.0051	<0.0253	<0.101	<0.0051	<0.0051	<0.0051	<0.0203	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051
B-47	24-26	10/27/2016	2.8	26.6	<0.57	12.1	9.9	<0.24	3.7	<0.0041	<0.0041	<0.0203	<0.0812	<0.0041	<0.0041	<0.0041	<0.0162	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041
B-48	0-2	10/27/2016	7.1	69.5	<0.55	14.3	9.2	<0.24	<1.1	<0.0044	<0.0044	<0.0219	<0.0875	<0.0044	<0.0044	<0.0044	<0.0175	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044
B-48	5-6	10/27/2016	4.8	71.7	<0.54	14.2	23.4	<0.27	<1.1	<0.0057	<0.0057	0.0487	0.283	<0.0057	<0.0057	<0.0057	<0.0228	<0.0057	<0.0057	<0.0057	<0.0057	<0.0057	<0.0057	<0.0057
B-49	0-2	10/27/2016	8.0	73.8	<0.56	14.6	10.8	<0.23	<1.1	<0.0051	<0.0051	<0.0254	<0.102	<0.0051	<0.0051	<0.0051	<0.0203	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051
B-49	12-14	10/27/2016	7.6	48.1	<0.57	13.3	8.1	<0.26	<1.1	<0.0039	<0.0039	<0.0195	<0.0779	<0.0039	<0.0039	<0.0039	<0.0156	<0.0039	<0.0039	<0.0039	<0.0039	<0.0039	<0.0039	<0.0039
B-50	0-2	10/27/2016	**9.9**	85.9	<0.56	17.8	11.6	<0.23	<1.1	<0.0046	<0.0046	<0.0232	<0.0927	<0.0046	<0.0046	<0.0046	<0.0185	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046
B-50	12-14	10/27/2016	8.9	171	<0.97	26.7	26.3	<0.43	2.9	17.3	5.82	<0.0530	<0.212	0.0740	2.24	0.623	<0.0424	0.0595	0.970	1.81	2.21	0.519	0.482	<0.0106
B-51	0-2	10/26/2016	4.0	51.8	<0.50	10.7	11.3	<0.21	<1.0	<0.0053	<0.0053	<0.0263	<0.105	<0.0053	<0.0053	<0.0053	<0.0210	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053
B-51	4-6	10/26/2016	4.8	52.5	<0.52	11.5	8.1	<0.23	<1.0	<0.151	<0.151	<0.753	<3.01	<0.151	<0.151	<0.151	<0.602	<0.151	<0.151	<0.151	<0.151	<0.151	<0.151	<0.151
B-52	0-2	10/26/2016	9.0	53.8	<0.50	10.3	9.4	<0.23	<0.99	<0.0048	<0.0048	<0.0239	<0.0958	<0.0048	<0.0048	<0.0048	<0.0192	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048
B-52	4-6	10/26/2016	4.8	66.2	<0.51	19.8	7.0	<0.25	<1.0	<0.0041	<0.0041	<0.0205	<0.0820	<0.0041	<0.0041	<0.0041	<0.0164	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	0.0456	0.0091
BLIND DUPLICATE 2			5.3	60.9	<0.54	13.6	6.6	<0.24	<1.1	<0.0045	<0.0045	<0.0225	<0.0902	<0.0045	<0.0045	<0.0045	<0.0180	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	0.0410	0.0069
B-53	0-2	10/26/2016	8.8	75.9	<0.52	14.6	9.7	<0.23	<1.0	<0.0044	<0.0044	<0.0219	<0.0875	<0.0044	<0.0044	<0.0044	<0.0175	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044
B-53	8-10	10/26/2016	5.6	41.5	<0.53	11.4	5.0	<0.24	<1.1	<0.0047	<0.0047	<0.0236	<0.0945	<0.0047	<0.0047	<0.0047	<0.0189	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047
B-54	0-2	10/27/2016	**11.7**	67.0	0.56	180	111	0.52	1.3	<0.0045	<0.0045	<0.0225	<0.0898	<0.0045	<0.0045	<0.0045	<0.0180	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045
B-54	2-4	10/27/2016	7.3	152	<0.76	24.1	16.0	<0.31	2.1	6.90	1.91	<0.0417	<0.167	0.0190	0.639	0.341	0.0760	0.0274	0.199	0.0302	0.903	0.438	0.309	<0.0083

Table 1
Summary of Analytical Soil Results - VOCs/Metals - October 2016
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Sample Depth (ft)	Date Sampled	Detected Metals (ppm)							Detected VOCs (ppm)														
			Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	2-Butanone (MEK)	Acetone	Benzene	Ethylbenzene	Isopropylbenzene	Methylene Chloride	Tetrachloroethene	Toluene	n-Hexane	n-Propylbenzene	p-Isopropyltoluene	sec-Butylbenzene	tert-Butylbenzene
IDEM Screening Soil Exposure Direct Contact Residential 2016			**9.5**	**21,000**	**99**	**NE***	**400**	**3.1**	**550**	**81**	**180**	**28,000**	**85,000**	**17**	**81**	**270**	**490**	**110**	**820**	**140**	**260**	**NE***	**150**	**180**
IDEM Screening Soil Exposure Direct Contact Commercial/Industrial 2016			**30**	**100,000**	**980**	**NE***	**800**	**3.1**	**5,800**	**220**	**180**	**28,000**	**100,000**	**51**	**250**	**270**	**3,200**	**170**	**820**	**140**	**260**	**NE***	**150**	**180**
IDEM Screening Soil Exposure Direct Contact Excavation 2016			**920**	**100,000**	**1,900**	**NE***	**1,000**	**3.1**	**9,800**	**220**	**180**	**28,000**	**100,000**	**1,800**	**480**	**270**	**3,300**	**170**	**820**	**140**	**260**	**NE***	**150**	**180**
IDEM Screening Groundwater Soil MTG Residential 2016			**5.9**	**1,700**	**7.5**	**100,000**	**270**	**2.1**	**5.3**	**0.44**	**3.4**	**23**	**57**	**0.051**	**16**	**15**	**0.025**	**0.045**	**14**	**210**	**25**	**NE***	**120**	**31**
B-55	0-2	10/27/2016	**11.2**	124	<0.58	21.0	10.3	<0.26	<1.2	<0.0050	<0.0050	<0.0248	<0.0994	<0.0050	<0.0050	<0.0050	<0.0199	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-55	16-18	10/27/2016	**7.8**	52.0	<0.53	17.0	8.4	<0.25	<1.1	<0.0044	<0.0044	<0.0221	<0.0885	<0.0044	<0.0044	<0.0044	<0.0177	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044	<0.0044
TRIP BLANK 1		10/25/2016	NA*	NA*	NA*	NA*	NA*	NA*	NA*	<0.0050	<0.0050	<0.0250	<0.100	<0.0050	<0.0050	<0.0050	<0.0200	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
TRIP BLANK 2		10/25/2016	NA*	NA*	NA*	NA*	NA*	NA*	NA*	<0.0050	<0.0050	<0.0250	<0.100	<0.0050	<0.0050	<0.0050	<0.0200	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
TRIP BLANK 3		10/26/2016	NA*	NA*	NA*	NA*	NA*	NA*	NA*	<0.0050	<0.0050	<0.0250	<0.100	<0.0050	<0.0050	<0.0050	<0.0200	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
TRIP BLANK 4		10/27/2016	NA*	NA*	NA*	NA*	NA*	NA*	NA*	<0.0050	<0.0050	<0.0250	<0.100	<0.0050	<0.0050	<0.0050	<0.0200	<0.0050	0.0118	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
TRIP BLANK 5		10/31/2016	NA*	NA*	NA*	NA*	NA*	NA*	NA*	<0.0050	<0.0050	<0.0250	<0.100	<0.0050	<0.0050	<0.0050	<0.0200	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
TRIP BLANK 6		11/1/2016	NA*	NA*	NA*	NA*	NA*	NA*	NA*	<0.0050	<0.0050	<0.0250	<0.100	<0.0050	<0.0050	<0.0050	<0.0200	<0.0050	0.0131	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

Notes:
- NE = not established / NA* = not analyzed
- Soil samples were analyzed for volatile organic compounds (VOCs) via SW 846 Method 8260 and RCRA Metals using SW 846 Method 6010B and 7470.
- Analytes not listed in the table were not detected above their respective laboratory reporting levels.
- Analytical results presented in milligrams per kilogram (mg/kg) or parts per million (ppm).

BOLD	= Concentrations above their respective RCG Residential Migration to Groundwater Screening Levels (updated in March 2018).
BOLD	= Concentrations above their respective RCG Residential Direct Contact Screening Levels (updated in March 2018).
BOLD	= Concentrations above their respective RCG Commercial Direct Contact Screening Levels (updated in March 2018).
BOLD	= Concentrations above their respective RCG Excavation Direct Contact Screening Levels (updated in March 2018).

Table 2
Summary of Analytical Soil Results - SVOCs - October 2016
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Sample Depth (ft)	Date Sampled	Detcted SVOCs (ppm)									
			1-Methylnaphthalene	2,4-Dimethylphenol	2,4-Dinitrotoluene	2-Methylnaphthalene	2-Methylphenol (o-Cresol)	3&4-Methylphenol (m&p Cresol)	Fluorene	Naphthalene	Phenanthrene	Phenol
IDEM Screening Soil Exposure Direct Contact Residential 2016			250	1,800	24	340	4,500	NE*	3,400	53	NE*	27,000
IDEM Screening Soil Exposure Direct Contact Commercial/Industrial 2016			390	16,000	74	3,000	41,000	NE*	30,000	170	NE*	100,000
IDEM Screening Soil Exposure Direct Contact Excavation 2016			390	34,000	3,400	6,800	87,000	NE*	68,000	3,100	NE*	100,000
IDEM Screening Groundwater Soil MTG Residential 2016			1.2	8.5	0.065	3.7	15	NE*	110	0.11	NE*	67
B-1	0-2	10/25/2016	<0.410	<0.410	<0.410	<0.410	<0.410	<0.410	<0.410	<0.410	<0.410	<0.410
B-1	23-24	10/25/2016	3.85	<0.443	0.571	5.56	<0.443	<0.443	<0.443	6.32	<0.443	<0.443
B-2	0-2	10/25/2016	<0.376	<0.376	<0.376	<0.376	<0.376	<0.376	<0.376	<0.376	<0.376	<0.376
B-2	8-10	10/25/2016	<0.395	<0.395	<0.395	<0.395	<0.395	<0.395	<0.395	<0.395	<0.395	<0.395
B-3	0-2	10/25/2016	<0.385	<0.385	<0.385	<0.385	<0.385	<0.385	<0.385	<0.385	<0.385	<0.385
B-3	24-25	10/25/2016	0.632	<0.390	<0.390	1.19	<0.390	<0.390	<0.390	1.17	<0.390	<0.390
BLIND DUPLICATE 1			2.61	<0.393	<0.393	3.66	<0.393	<0.393	<0.393	1.51	<0.393	<0.393
B-4	0-2	10/25/2016	<0.386	<0.386	<0.386	<0.386	<0.386	<0.386	<0.386	<0.386	<0.386	<0.386
B-4	28-30	10/25/2016	<0.397	<0.397	<0.397	<0.397	<0.397	<0.397	<0.397	<0.397	<0.397	<0.397
B-5	0-2	10/25/2016	<0.378	<0.378	<0.378	<0.378	<0.378	<0.378	<0.378	<0.378	<0.378	<0.378
B-5	8-10	10/25/2016	<0.416	<0.416	<0.416	<0.416	<0.416	<0.416	<0.416	<0.416	<0.416	<0.416
B-6	0-2	10/25/2016	<0.395	<0.395	<0.395	<0.395	<0.395	<0.395	<0.395	<0.395	<0.395	<0.395
B-6	32-34	10/25/2016	<0.384	<0.384	<0.384	<0.384	<0.384	<0.384	<0.384	<0.384	<0.384	<0.384
B-7	0-2	10/26/2016	<3.81	<3.81	<3.81	<3.81	<3.81	<3.81	<3.81	<3.81	<3.81	<3.81
B-7	26-28	10/26/2016	<0.398	<0.398	<0.398	<0.398	<0.398	<0.398	<0.398	<0.398	<0.398	<0.398
B-8	0-2	10/25/2016	0.872	<0.433	<0.433	1.48	<0.433	<0.433	<0.433	<0.433	<0.433	<0.433
B-8	4-6	10/25/2016	5.98	<0.410	<0.410	9.39	<0.410	<0.410	0.457	<0.410	0.944	<0.410
B-9	0-2	10/25/2016	3.69	<0.416	<0.416	5.39	<0.416	<0.416	<0.416	<0.416	0.564	<0.416
B-9	6-8	10/25/2016	3.06	<0.401	<0.401	4.79	<0.401	<0.401	<0.401	<0.401	0.403	<0.401
B-10	0-2	10/25/2016	<0.422	<0.422	<0.422	<0.422	<0.422	<0.422	<0.422	<0.422	<0.422	<0.422
B-10	8-10	10/25/2016	<0.387	<0.387	<0.387	0.642	<0.387	<0.387	<0.387	0.875	<0.387	<0.387
B-11	0-2	10/28/2016	<0.403	<0.403	<0.403	<0.403	<0.403	<0.403	<0.403	<0.403	<0.403	<0.403
B-11	8-10	10/28/2016	<0.384	<0.384	<0.384	<0.384	<0.384	<0.384	<0.384	<0.384	<0.384	<0.384
B-12	0-2	10/27/2016	<0.352	<0.352	<0.352	<0.352	<0.352	<0.352	<0.352	<0.352	<0.352	<0.352
B-12	4-6	10/27/2016	2.53	<0.410	<0.410	<0.410	<0.410	<0.410	<0.410	<0.410	<0.410	<0.410
B-13	0-2	11/1/2016	<0.364	<0.364	<0.364	<0.364	<0.364	<0.364	<0.364	<0.364	<0.364	<0.364
B-13	4-6	11/1/2016	1.43	<0.409	<0.409	<0.409	<0.409	<0.409	<0.409	<0.409	<0.409	<0.409
B-14	0-2	10/28/2016	<0.354	<0.354	<0.354	<0.354	<0.354	<0.354	<0.354	<0.354	<0.354	<0.354
B-14	6-8	10/28/2016	0.737	<0.407	<0.407	0.878	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407
B-15	0-2	10/31/2016	1.46	<0.380	<0.380	0.854	<0.380	<0.380	<0.380	<0.380	<0.380	<0.380
B-15	6-8	10/31/2016	48.3	<4.06	<4.06	55.7	<4.06	<4.06	<4.06	<4.06	<4.06	<4.06
B-16	0-2	10/28/2016	<0.371	<0.371	<0.371	<0.371	<0.371	<0.371	<0.371	<0.371	<0.371	<0.371
B-16	14-16	10/28/2016	<0.413	6.78	<0.413	<0.413	6.29	4.83	<0.413	<0.413	<0.413	4.27
B-17	0-2	10/31/2016	<0.354	<0.354	<0.354	<0.354	<0.354	<0.354	<0.354	<0.354	<0.354	<0.354
B-17	8-10	10/31/2016	<0.360	<0.360	<0.360	<0.360	<0.360	<0.360	<0.360	<0.360	<0.360	<0.360
B-18	0-2	10/31/2016	<0.392	<0.392	<0.392	<0.392	<0.392	<0.392	<0.392	<0.392	<0.392	<0.392
B-18	6-8	10/31/2016	0.903	<0.413	<0.413	1.53	<0.413	<0.413	<0.413	<0.413	<0.413	<0.413
BLIND DUPLICATE 4			1.24	<0.413	<0.413	2.21	<0.413	<0.413	<0.413	<0.413	<0.413	<0.413
B-19	0-2	10/27/2016	<0.390	<0.390	<0.390	<0.390	<0.390	<0.390	<0.390	<0.390	<0.390	<0.390
B-19	6-8	10/27/2016	1.13	<0.397	<0.397	1.15	<0.397	<0.397	<0.397	<0.397	<0.397	<0.397
BLIND DUPLICATE 3			3.55	<0.405	<0.405	4.42	<0.405	<0.405	<0.405	<0.405	0.548	<0.405
B-20	0-2	10/28/2016	<0.380	<0.380	<0.380	<0.380	<0.380	<0.380	<0.380	<0.380	<0.380	<0.380
B-20	14-16	10/28/2016	1.10	0.564	<0.391	1.47	0.430	<0.391	<0.391	0.641	<0.391	1.40
B-21	0-2	10/27/2016	<0.379	<0.379	<0.379	<0.379	<0.379	<0.379	<0.379	<0.379	<0.379	<0.379
B-21	24-26	10/27/2016	7.42	<0.380	<0.380	13.2	<0.380	<0.380	<0.380	14.7	<0.380	<0.380
B-22	0-2	10/27/2016	<0.354	<0.354	<0.354	<0.354	<0.354	<0.354	<0.354	<0.354	<0.354	<0.354
B-22	6-8	10/27/2016	3.00	<0.407	<0.407	4.58	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407
B-23	0-2	10/31/2016	<0.368	<0.368	<0.368	<0.368	<0.368	<0.368	<0.368	<0.368	<0.368	<0.368

Table 2
Summary of Analytical Soil Results - SVOCs - October 2016
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Sample Depth (ft)	Date Sampled	Detcted SVOCs (ppm)									
			1-Methylnaphthalene	2,4-Dimethylphenol	2,4-Dinitrotoluene	2-Methylnaphthalene	2-Methylphenol (o-Cresol)	3&4-Methylphenol (m&p Cresol)	Fluorene	Naphthalene	Phenanthrene	Phenol
IDEM Screening Soil Exposure Direct Contact Residential 2016			250	1,800	24	340	4,500	NE*	3,400	53	NE*	27,000
IDEM Screening Soil Exposure Direct Contact Commercial/Industrial 2016			390	16,000	74	3,000	41,000	NE*	30,000	170	NE*	100,000
IDEM Screening Soil Exposure Direct Contact Excavation 2016			390	34,000	3,400	6,800	87,000	NE*	68,000	3,100	NE*	100,000
IDEM Screening Groundwater Soil MTG Residential 2016			1.2	8.5	0.065	3.7	15	NE*	110	0.11	NE*	67
B-23	6-8	10/31/2016	9.27	<0.421	<0.421	13.2	<0.421	<0.421	<0.421	8.50	<0.421	<0.421
B-24	0-2	10/28/2016	<0.385	<0.385	<0.385	<0.385	<0.385	<0.385	<0.385	<0.385	<0.385	<0.385
B-24	20-22	10/28/2016	1.66	<0.393	<0.393	1.96	<0.393	<0.393	<0.393	0.558	<0.393	<0.393
B-25	0-2	10/31/2016	<0.338	<0.338	<0.338	<0.338	<0.338	<0.338	<0.338	<0.338	<0.338	<0.338
B-25	2-4	10/31/2016	1.17	<0.391	<0.391	1.50	<0.391	<0.391	<0.391	<0.391	<0.391	<0.391
BLIND DUPLICATE 5			1.62	<0.386	<0.386	1.82	<0.386	<0.386	<0.386	<0.386	<0.386	<0.386
B-26	0-2	10/31/2016	<0.377	<0.377	<0.377	<0.377	<0.377	<0.377	<0.377	<0.377	<0.377	<0.377
B-26	6-8	10/31/2016	<0.386	<0.386	<0.386	<0.386	<0.386	<0.386	<0.386	<0.386	<0.386	<0.386
B-27	0-2	10/31/2016	<0.351	<0.351	<0.351	<0.351	<0.351	<0.351	<0.351	<0.351	<0.351	<0.351
B-27	6-8	10/31/2016	<0.402	<0.402	<0.402	<0.402	<0.402	<0.402	<0.402	<0.402	<0.402	<0.402
B-28	0-2	10/26/2016	<0.358	<0.358	<0.358	<0.358	<0.358	<0.358	<0.358	<0.358	<0.358	<0.358
B-28	8-10	10/26/2016	<0.386	<0.386	<0.386	<0.386	<0.386	<0.386	<0.386	<0.386	<0.386	<0.386
B-29	0-2	10/26/2016	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00
B-29	6-8	10/26/2016	<0.388	<0.388	<0.388	<0.388	<0.388	<0.388	<0.388	<0.388	<0.388	<0.388
B-30	0-2	10/26/2016	<0.374	<0.374	<0.374	<0.374	<0.374	<0.374	<0.374	<0.374	<0.374	<0.374
B-30	12-14	10/26/2016	0.684	<0.387	<0.387	1.20	<0.387	<0.387	<0.387	1.34	<0.387	<0.387
B-31	0-2	10/26/2016	<3.61	<3.61	<3.61	<3.61	<3.61	<3.61	<3.61	<3.61	<3.61	<3.61
B-31	4-6	10/26/2016	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399
B-32	0-2	10/26/2016	<0.394	<0.394	<0.394	<0.394	<0.394	<0.394	<0.394	<0.394	<0.394	<0.394
B-32	4-6	10/26/2016	<0.408	<0.408	<0.408	<0.408	<0.408	<0.408	<0.408	<0.408	<0.408	<0.408
B-33	0-2	10/25/2016	<0.380	<0.380	<0.380	<0.380	<0.380	<0.380	<0.380	<0.380	<0.380	<0.380
B-33	4-6	10/25/2016	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399
B-34	0-2	10/25/2016	<0.379	<0.379	<0.379	<0.379	<0.379	<0.379	<0.379	<0.379	<0.379	<0.379
B-34	8-10	10/25/2016	<0.397	<0.397	<0.397	0.439	<0.397	<0.397	<0.397	0.473	<0.397	<0.397
B-35	0-2	10/25/2016	<0.375	<0.375	<0.375	<0.375	<0.375	<0.375	<0.375	<0.375	<0.375	<0.375
B-35	6-8	10/25/2016	1.10	<0.393	<0.393	2.29	<0.393	<0.393	<0.393	1.86	<0.393	<0.393
B-36	0-2	11/1/2016	<0.349	<0.349	<0.349	<0.349	<0.349	<0.349	<0.349	<0.349	<0.349	<0.349
B-36	10-12	11/1/2016	1.99	<0.398	<0.398	4.16	<0.398	<0.398	<0.398	3.86	<0.398	<0.398
B-37	0-2	11/1/2016	<0.383	<0.383	<0.383	<0.383	<0.383	<0.383	<0.383	<0.383	<0.383	<0.383
B-37	18-20	11/1/2016	<0.365	<0.365	<0.365	<0.365	<0.365	<0.365	<0.365	<0.365	<0.365	<0.365
B-38	0-2	11/1/2016	<0.405	<0.405	<0.405	<0.405	<0.405	<0.405	<0.405	<0.405	<0.405	<0.405
B-38	8-10	11/1/2016	<0.389	<0.389	<0.389	<0.389	<0.389	<0.389	<0.389	<0.389	<0.389	<0.389
B-39	0-2	11/1/2016	<0.374	<0.374	<0.374	<0.374	<0.374	<0.374	<0.374	<0.374	<0.374	<0.374
BLIND DUPLICATE 6			<0.372	<0.372	<0.372	<0.372	<0.372	<0.372	<0.372	<0.372	<0.372	<0.372
B-39	18-19	11/1/2016	<0.397	<0.397	<0.397	<0.397	<0.397	<0.397	<0.397	<0.397	<0.397	<0.397
B-40	0-2	11/1/2016	<0.363	<0.363	<0.363	<0.363	<0.363	<0.363	<0.363	<0.363	<0.363	<0.363
B-40	8-10	11/1/2016	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407	<0.407
B-41	0-2	10/31/2016	<0.402	<0.402	<0.402	<0.402	<0.402	<0.402	<0.402	<0.402	<0.402	<0.402
B-41	8-10	10/31/2016	<0.396	<0.396	<0.396	<0.396	<0.396	<0.396	<0.396	<0.396	<0.396	<0.396
B-42	0-2	10/26/2016	<0.402	<0.402	<0.402	<0.402	<0.402	<0.402	<0.402	<0.402	<0.402	<0.402
B-42	8-10	10/26/2016	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399
B-43	0-2	11/1/2016	<0.413	<0.413	<0.413	<0.413	<0.413	<0.413	<0.413	<0.413	<0.413	<0.413
B-43	8-10	11/1/2016	<0.415	<0.415	<0.415	<0.415	<0.415	<0.415	<0.415	<0.415	<0.415	<0.415
B-44	0-2	11/1/2016	<0.397	<0.397	<0.397	<0.397	<0.397	<0.397	<0.397	<0.397	<0.397	<0.397
B-44	33-35	11/1/2016	<0.372	<0.372	<0.372	<0.372	<0.372	<0.372	<0.372	<0.372	<0.372	<0.372
B-45	0-2	10/31/2016	<0.367	<0.367	<0.367	<0.367	<0.367	<0.367	<0.367	<0.367	<0.367	<0.367
B-45	24-26	10/31/2016	<0.391	<0.391	<0.391	<0.391	<0.391	<0.391	<0.391	<0.391	<0.391	<0.391
B-46	0-2	10/27/2016	<0.374	<0.374	<0.374	<0.374	<0.374	<0.374	<0.374	<0.374	<0.374	<0.374

Table 2
Summary of Analytical Soil Results - SVOCs - October 2016
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Sample Depth (ft)	Date Sampled	Detcted SVOCs (ppm)									
			1-Methylnaphthalene	2,4-Dimethylphenol	2,4-Dinitrotoluene	2-Methylnaphthalene	2-Methylphenol (o-Cresol)	3&4-Methylphenol (m&p Cresol)	Fluorene	Naphthalene	Phenanthrene	Phenol
IDEM Screening Soil Exposure Direct Contact Residential 2016			**250**	**1,800**	**24**	**340**	**4,500**	**NE***	**3,400**	**53**	**NE***	**27,000**
IDEM Screening Soil Exposure Direct Contact Commercial/Industrial 2016			**390**	**16,000**	**74**	**3,000**	**41,000**	**NE***	**30,000**	**170**	**NE***	**100,000**
IDEM Screening Soil Exposure Direct Contact Excavation 2016			**390**	**34,000**	**3,400**	**6,800**	**87,000**	**NE***	**68,000**	**3,100**	**NE***	**100,000**
IDEM Screening Groundwater Soil MTG Residential 2016			**1.2**	**8.5**	**0.065**	**3.7**	**15**	**NE***	**110**	**0.11**	**NE***	**67**
B-46	8-10	10/27/2016	<0.389	<0.389	<0.389	<0.389	<0.389	<0.389	<0.389	<0.389	<0.389	<0.389
B-47	0-2	10/27/2016	<0.358	<0.358	<0.358	<0.358	<0.358	<0.358	<0.358	<0.358	<0.358	<0.358
B-47	24-26	10/27/2016	<0.388	<0.388	<0.388	<0.388	<0.388	<0.388	<0.388	<0.388	<0.388	<0.388
B-48	0-2	10/27/2016	<0.368	<0.368	<0.368	<0.368	<0.368	<0.368	<0.368	<0.368	<0.368	<0.368
B-48	5-6	10/27/2016	<0.421	<0.421	<0.421	<0.421	<0.421	<0.421	<0.421	<0.421	<0.421	<0.421
B-49	0-2	10/27/2016	<3.75	<3.75	<3.75	<3.75	<3.75	<3.75	<3.75	<3.75	<3.75	<3.75
B-49	12-14	10/27/2016	<0.398	<0.398	<0.398	<0.398	<0.398	<0.398	<0.398	<0.398	<0.398	<0.398
B-50	0-2	10/27/2016	<0.369	<0.369	<0.369	<0.369	<0.369	<0.369	<0.369	<0.369	<0.369	<0.369
B-50	12-14	10/27/2016	6.48	<0.672	<0.672	6.88	<0.672	<0.672	<0.672	2.78	1.16	<0.672
B-51	0-2	10/26/2016	<0.372	<0.372	<0.372	<0.372	<0.372	<0.372	<0.372	<0.372	<0.372	<0.372
B-51	4-6	10/26/2016	1.63	<0.396	<0.396	0.750	<0.396	<0.396	<0.396	<0.396	0.442	<0.396
B-52	0-2	10/26/2016	<0.364	<0.364	<0.364	<0.364	<0.364	<0.364	<0.364	<0.364	<0.364	<0.364
B-52	4-6	10/26/2016	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399	<0.399
BLIND DUPLICATE 2			<0.389	<0.389	<0.389	<0.389	<0.389	<0.389	<0.389	<0.389	<0.389	<0.389
B-53	0-2	10/26/2016	<3.63	<3.63	<3.63	<3.63	<3.63	<3.63	<3.63	<3.63	<3.63	<3.63
B-53	8-10	10/26/2016	<0.403	<0.403	<0.403	<0.403	<0.403	<0.403	<0.403	<0.403	<0.403	<0.403
B-54	0-2	10/27/2016	<0.375	<0.375	<0.375	<0.375	<0.375	<0.375	<0.375	<0.375	<0.375	<0.375
B-54	2-4	10/27/2016	14.2	<2.66	<2.66	12.0	<2.66	<2.66	<2.66	3.62	2.70	<2.66
B-55	0-2	10/27/2016	<0.413	<0.413	<0.413	<0.413	<0.413	<0.413	<0.413	<0.413	<0.413	<0.413
B-55	16-18	10/27/2016	<0.395	<0.395	<0.395	<0.395	<0.395	<0.395	<0.395	<0.395	<0.395	<0.395

Notes:
- NE = not established / NA* = not analyzed
- Soil samples were analyzed for semi volatile organic compounds (SVOCs) via SW 846 Method 8270 SIM and PCBs using SW 846 Method 8082.
- Analytes not listed in the table were not detected above their respective laboratory reporting levels.
- Analytical results presented in milligrams per kilogram (mg/kg) or parts per million (ppm).

BOLD	= Concentrations above their respective RCG Residential MTG Screening Levels (updated in March 2016).
BOLD	= Concentrations above their respective RCG Residential Direct Contact Screening Levels (updated in March 2016).
BOLD	= Concnetrations above their respective RCG Commercial Direct Contact Screening Levels (updated in March 2016).
BOLD	= Concentrations above their respective RCG Excavation Direct Contact Screening Levels (updated in March 2016).

Table 2
Summary of Analytical Soil Results - VOCs/PCBs - April 2018
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Date Collected	Detected VOCs (ppm)															PCB-1248 (ppm)
		1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	2-Butanone (MEK)	Acetone	Benzene	Ethylbenzene	Isopropylbenzene (Cumene	Toluene	Trichlorofluoromethane	Xylene (Total)	n-Butylbenzene	n-Hexane	n-Propylbenzene	p-Isopropyltoluene	sec-Butylbenzene	
IDEM Screening Groundwater Soil MTG Residential 2018		1.6	1.7	23	57	0.051	16	15	14	66	200	64	210	25	NE	120	0.24
IDEM Screening Soil Exposure Direct Contact Residential 2018		220	180	28,000	85,000	17	81	270	820	1,200	260	110	140	260	NE	150	3.2
IDEM Screening Soil Exposure Direct Contact Commercial/Industrial 2018		220	180	28,000	100,000	51	250	270	820	1,200	260	110	140	260	NE	150	9.5
IDEM Screening Soil Exposure Direct Contact Excavation 2018		220	180	28,000	100,000	1,800	480	270	820	1,200	260	110	140	260	NE	150	560
SB-01 (0-2')	4/19/2018	<0.0046	<0.0046	<0.023	<0.092	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0092	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.12
SB-01 (14-16')	4/19/2018	<0.24	<0.24	<1.2	<4.8	<0.24	<0.24	<0.24	<0.24	<0.24	<0.48	<0.24	<0.24	<0.24	<0.24	<0.24	<0.12
Blind Duplicate		<0.29	<0.29	<1.4	<5.8	<0.29	<0.29	<0.29	<0.29	<0.29	<0.58	<0.29	<0.29	<0.29	<0.29	<0.29	<0.13
SB-02 (0-2')	4/19/2018	<0.0053	<0.0053	<0.026	<0.11	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.011	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.12
SB-02 (6-8')	4/19/2018	1.7	<0.53	<2.6	<10.5	1.7	10.4	1.5	<0.53	<0.53	5.2	2.7	0.78	2.4	1.6	0.55	<0.13
SB-03 (0-2')	4/19/2018	<0.0059	<0.0059	<0.029	<0.12	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.012	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.12
SB-03 (12-14')	4/19/2018	<0.23	<0.23	<1.1	<4.6	<0.23	<0.23	<0.23	<0.23	<0.23	<0.46	<0.23	<0.23	<0.23	<0.23	<0.23	<0.12
SB-04 (0-2')	4/18/2018	0.013	<0.0093	<0.047	<0.19	<0.0093	0.012	<0.0093	<0.0093	<0.0093	0.053	<0.0093	0.014	<0.0093	<0.0093	<0.0093	<0.12
SB-04 (10-12')	4/18/2018	21.8	5.5	<1.2	<4.8	3.3	10.0	1.3	<0.24	<0.24	11.9	2.9	<0.24	5.4	0.28	0.69	<0.12
SB-05 (0-2')	4/18/2018	<0.0046	<0.0046	<0.023	<0.092	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0092	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.11
SB-05 (12-14')	4/18/2018	86.9	21.1	<1.1	17.1	<0.22	33.3	4.9	<0.22	<0.22	37.3	11.0	3.8	19.8	0.84	2.1	<0.12
SB-06 (0-2')	4/18/2018	<0.0055	<0.0055	<0.027	<0.11	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.011	<0.0055	<0.0055	<0.0055	<0.0055	<0.0055	<0.12
SB-06 (18-20')	4/18/2018	0.083	0.019	<0.025	<0.10	<0.0050	0.11	<0.0050	0.055	<0.0050	0.32	<0.0050	<0.0050	0.011	<0.0050	<0.0050	<0.13
SB-07 (0-2')	4/18/2018	<0.0060	<0.0060	<0.030	<0.12	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.012	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.12
SB-07 (12-14')	4/18/2018	99.8	8.1	<1.3	<5.2	<0.26	2.1	4.7	<0.26	<0.26	0.69	8.7	<0.26	22.4	0.68	3.0	<0.12
SB-08 (0-2')	4/19/2018	0.011	<0.0046	<0.023	<0.091	0.0090	0.0093	<0.0046	0.012	<0.0046	0.039	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.11
SB-08 (16-18')	4/19/2018	72.5	21.6	<1.3	<5.4	1.8	34.1	4.4	1.9	<0.27	111	9.9	85.7	15.5	1.7	2.4	<0.12
SB-09 (0-2')	4/19/2018	0.43	<0.29	<1.4	<5.7	0.31	0.40	0.70	<0.29	<0.29	<0.57	0.63	<0.29	1.6	<0.29	0.45	<0.12
SB-09 (22-24')	4/19/2018	63.6	17.7	<2.7	<10.7	11.4	28.8	4.3	0.54	<0.54	83.9	9.1	60.8	13.7	2.4	2.5	<0.12
SB-10 (0-2')	4/20/2018	0.012	<0.0056	<0.028	0.17	<0.0056	0.0061	<0.0056	0.034	<0.0056	0.040	<0.0056	0.019	<0.0056	<0.0056	<0.0056	<0.12
SB-10 (6-8')	4/20/2018	4.3	<0.55	<2.7	<11.0	<0.55	1.5	0.84	<0.55	<0.55	<1.1	0.80	<0.55	2.0	<0.55	0.71	<0.13
SB-11 (0-2')	4/20/2018	0.012	<0.0062	<0.031	<0.12	0.0092	0.0086	<0.0062	0.015	<0.0062	0.022	<0.0062	0.021	<0.0062	<0.0062	<0.0062	<0.12
SB-11 (4-6')	4/20/2018	<0.59	<0.59	<2.9	<11.7	<0.59	<0.59	0.90	<0.59	<0.59	<1.2	1.1	<0.59	2.7	<0.59	0.62	<0.13
SB-12 (0-2')	4/19/2018	<0.0065	<0.0065	<0.033	<0.13	0.013	<0.0065	<0.0065	<0.0065	<0.0065	<0.013	<0.0065	<0.0065	<0.0065	<0.0065	<0.0065	<0.12
SB-12 (6-8')	4/19/2018	288	82.8	<2.5	<10.1	31.3	154	13.8	1.9	<0.51	493	33.6	212	62.3	2.0	7.3	<0.13
MW-01 (0-2')	4/27/2018	<0.0050	<0.0050	<0.025	<0.10	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.12
MW-01 (14-16')	4/27/2018	<0.0031	<0.0031	0.030	<0.062	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<0.0062	<0.0031	<0.0031	<0.0031	<0.0031	<0.0031	<0.12
MW-02 (0-2')	4/27/2018	<0.0058	<0.0058	<0.029	<0.12	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.012	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.13
MW-02 (6-8')	4/27/2018	<0.0056	<0.0056	<0.028	<0.11	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.011	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.13
MW-03 (0-2')	4/26/2018	<0.0056	<0.0056	<0.028	<0.11	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.011	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.13
MW-03 (8-10')	4/26/2018	20.7	4.7	<2.0	<8.0	<0.40	2.7	1.1	<0.40	<0.40	4.6	2.8	<0.40	5.1	<0.40	0.68	<0.12
MW-04 (0-2')	4/26/2018	<0.0050	<0.0050	<0.025	<0.10	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.13
MW-04 (8-10')	4/26/2018	<0.0045	<0.0045	<0.022	<0.090	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.0090	<0.0045	<0.0045	<0.0045	<0.0045	<0.0045	<0.12
MW-05 (0-2')	4/26/2018	<0.0063	<0.0063	<0.031	<0.13	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.013	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.15
MW-05 (10-12')	4/26/2018	<0.0046	<0.0046	<0.023	<0.092	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0092	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.12
Blind Duplicate 3		<0.0046	<0.0046	<0.023	<0.092	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.0092	<0.0046	<0.0046	<0.0046	<0.0046	<0.0046	<0.12
MW-06 (0-2')	5/1/2018	<0.0050	<0.0050	<0.025	<0.10	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	1.9
MW-06 (4-6')	5/1/2018	61.9	20.0	<2.6	<10.2	2.8	23.6	3.2	2.3	<0.51	153	7.4	15.2	11.0	1.2	2.0	<0.13
MW-07 (0-2')	4/24/2018	<0.0053	<0.0053	<0.026	<0.11	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.011	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.12
MW-07 (4-6')	4/24/2018	<0.55	<0.55	<2.7	<11.0	<0.55	<0.55	10.6	<0.55	<0.55	<1.1	8.1	<0.55	26.2	<0.55	7.3	<0.13

Table 2
Summary of Analytical Soil Results - VOCs/PCBs - April 2018
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Date Collected	Detected VOCs (ppm)															PCB-1248 (ppm)
		1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	2-Butanone (MEK)	Acetone	Benzene	Ethylbenzene	Isopropylbenzene (Cumene	Toluene	Trichlorofluoromethane	Xylene (Total)	n-Butylbenzene	n-Hexane	n-Propylbenzene	p-Isopropyltoluene	sec-Butylbenzene	
IDEM Screening Groundwater Soil MTG Residential 2018		**1.6**	**1.7**	**23**	**57**	**0.051**	**16**	**15**	**14**	**66**	**200**	**64**	**210**	**25**	**NE**	**120**	**0.24**
IDEM Screening Soil Exposure Direct Contact Residential 2018		**220**	**180**	**28,000**	**85,000**	**17**	**81**	**270**	**820**	**1,200**	**260**	**110**	**140**	**260**	**NE**	**150**	**3.2**
IDEM Screening Soil Exposure Direct Contact Commercial/Industrial 2018		**220**	**180**	**28,000**	**100,000**	**51**	**250**	**270**	**820**	**1,200**	**260**	**110**	**140**	**260**	**NE**	**150**	**9.5**
IDEM Screening Soil Exposure Direct Contact Excavation 2018		**220**	**180**	**28,000**	**100,000**	**1,800**	**480**	**270**	**820**	**1,200**	**260**	**110**	**140**	**260**	**NE**	**150**	**560**
MW-08 (0-2')	4/25/2018	<0.0067	<0.0067	<0.034	<0.13	<0.0067	<0.0067	<0.0067	<0.0067	<0.0067	<0.013	<0.0067	<0.0067	<0.0067	<0.0067	<0.0067	<0.14
MW-08 (12-14')	4/25/2018	**189**	**57.1**	<2.4	<9.4	**33.6**	**83.2**	9.5	0.66	<0.47	**419**	18.0	54.6	**35.0**	3.0	5.0	<0.12
Blind Duplicate 2		**135**	**40.0**	<2.1	<8.5	**24.8**	**58.2**	7.0	0.49	<0.42	**302**	13.4	35.9	24.7	2.2	3.8	<0.12
MW-09 (0-2')	4/24/2018	<0.0062	<0.0062	<0.031	<0.12	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.012	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.12
MW-09 (8-10')	4/24/2018	**137**	**40.4**	<2.3	<9.0	**1.8**	**58.5**	6.5	<0.45	<0.45	**223**	14.7	19.4	**29.4**	0.79	3.3	<0.12
MW-10 (0-2')	4/25/2018	0.0086	<0.0051	<0.026	<0.10	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	0.011	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.11
MW-10 (6-8')	4/25/2018	<0.50	<0.50	<2.5	<10.0	**2.1**	<0.50	2.0	<0.50	<0.50	<1.0	3.9	0.81	6.7	0.80	1.2	<0.13
MW-11 (0-2')	4/23/2018	<0.0048	<0.0048	<0.024	<0.095	0.0080	<0.0048	0.080	<0.0048	<0.0048	<0.0095	0.088	<0.0048	0.34	<0.0048	0.055	<0.12
MW-11 (12-14')	4/23/2018	**41.0**	**10.9**	<1.9	<7.6	**6.6**	**19.6**	2.0	<0.38	<0.38	56.0	4.8	44.7	8.4	0.42	1.0	<0.12
MW-12 (0-2')	4/23/2018	0.040	0.012	<0.030	<0.12	<0.0060	0.019	<0.0060	0.022	0.0085	0.10	<0.0060	0.0075	0.0077	<0.0060	<0.0060	<0.13
MW-12 (24-26')	4/23/2018	**21.7**	**6.9**	<1.9	<7.6	<0.38	7.6	1.1	<0.38	<0.38	23.7	3.4	35.4	5.0	<0.38	0.67	<0.12
MW-13 (0-2')	4/25/2018	<0.0041	<0.0041	<0.020	<0.081	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.0081	<0.0041	<0.0041	<0.0041	<0.0041	<0.0041	<0.12
MW-13 (8-10')	4/25/2018	**30.5**	**8.3**	<1.1	<4.5	**0.65**	**21.9**	1.6	<0.23	<0.23	74.8	1.7	0.74	5.9	<0.23	0.48	<0.13
MW-14 (0-2')	4/30/2018	<0.0051	<0.0051	<0.025	<0.10	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.010	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.13
MW-14 (6-8')	4/30/2018	<0.46	<0.46	<2.3	<9.1	<0.46	<0.46	0.80	<0.46	<0.46	<0.91	2.1	<0.46	3.2	<0.46	0.72	<0.12
MW-15 (0-2')	5/1/2018	<0.0052	<0.0052	<0.026	<0.10	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.010	<0.0052	<0.0052	<0.0052	<0.0052	<0.0052	<0.13
MW-15 (8-10')	5/1/2018	**7.7**	**2.1**	<1.2	<4.6	**2.3**	3.8	0.35	<0.23	<0.23	15.1	0.85	4.3	1.6	<0.23	<0.23	<0.12
MW-16 (0-2')	4/30/2018	<0.0053	<0.0053	<0.026	<0.11	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.011	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.13
MW-16 (28-30')	4/30/2018	0.056	0.015	<0.021	<0.085	**0.34**	0.082	<0.0042	0.014	<0.0042	0.32	<0.0042	0.066	0.012	<0.0042	<0.0042	<0.12
Trip Blank	4/19/2018	<0.0050	<0.0050	<0.025	<0.10	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	NA
Trip Blank	4/20/2018	<0.0050	<0.0050	<0.025	<0.10	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	NA
Trip Blank	4/24/2018	<0.0050	<0.0050	<0.025	<0.10	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	NA
Trip Blank	4/26/2018	<0.0050	<0.0050	<0.025	<0.10	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	NA
Trip Blank	4/27/2018	<0.0050	<0.0050	<0.025	<0.10	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	NA
Trip Blank	4/30/2018	<0.0050	<0.0050	<0.025	<0.10	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	NA
Trip Blank	5/1/2018	<0.0050	<0.0050	<0.025	<0.10	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	NA

Notes:
- NE = not established / NA* = not analyzed
- Soil samples were analyzed for volatile organic compounds (VOCs) via SW 846 Method 8260 polychlorinated biphenyls (PCBs) using SW-846 Method 8082.
- Analytes not listed in the table were not detected above their respective laboratory reporting levels.
- Soil analytical results presented in milligrams per kilogram (mg/kg) or parts per million (ppm).
- Trip blanks presented in millgrams per liter (mg/L) or ppm.

BOLD	= Concentrations above their respective RCG Residential Migration to Groundwater Screening Levels (updated in March 2018).
BOLD	= Concentrations above their respective RCG Residential Direct Contact Screening Levels (updated in March 2018).
BOLD	= Concentrations above their respective RCG Commercial Direct Contact Screening Levels (updated in March 2018).
BOLD	= Concentrations above their respective RCG Excavation Direct Contact Screening Levels (updated in March 2018).

Table 4
Summary of Analytical Soil Results - PAHs - April 2018
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Date Collected	Detected PAHs (ppm)																	
		1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene
IDEM Screening Groundwater Soil MTG Residential 2018		1.2	3.7	110	NE	1,200	2.1	4.7	60	NE	590	1,800	19	1,800	110	200	0.11	NE	260
IDEM Screening Soil Exposure Direct Contact Residential 2018		250	340	5,000	NE	25,000	15	1.5	15	NE	150	1,500	1.5	3,400	3,400	15	53	NE	2,500
IDEM Screening Soil Exposure Direct Contact Commercial/Industrial 2018		390	3,000	45,000	NE	100,000	210	21	210	NE	2,100	21,000	21	30,000	30,000	210	170	NE	23,000
IDEM Screening Soil Exposure Direct Contact Excavation 2018		390	6,800	100,000	NE	100,000	12,000	500	12,000	NE	100,000	100,000	1,200	68,000	68,000	12,000	3,100	NE	51,000
SB-01 (0-2')	4/19/2018	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061
SB-01 (14-16')	4/19/2018	0.0068	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	0.0064	0.0212	<0.0059	<0.0059	<0.0059	<0.0059
Blind Duplicate		0.0103	0.0072	0.0231	<0.0064	0.0461	0.0205	0.0079	0.0095	<0.0064	0.0095	0.0272	<0.0064	0.117	0.0344	<0.0064	0.0100	0.141	0.0825
SB-02 (0-2')	4/19/2018	0.116	0.166	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	0.118	0.0260	<0.0060
SB-02 (6-8')	4/19/2018	12.1	14.1	0.356	0.118	<0.0062	0.0064	<0.0062	<0.0062	<0.0062	<0.0062	0.0181	<0.0062	0.0191	0.242	<0.0062	3.86	0.251	0.0420
SB-03 (0-2')	4/19/2018	0.0092	0.0111	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	0.0128	0.0073	<0.0062
SB-03 (12-14')	4/19/2018	0.0181	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	0.0064	<0.0060	<0.0060	<0.0060	0.0118	<0.0060
SB-04 (0-2')	4/18/2018	0.587	0.684	<0.0304	<0.0304	<0.0304	<0.0304	<0.0304	<0.0304	<0.0304	<0.0304	0.126	<0.0304	0.0438	0.0969	<0.0304	0.344	0.395	0.0322
SB-04 (10-12')	4/18/2018	0.255	0.452	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	0.353	0.0079	<0.0058
SB-05 (0-2')	4/18/2018	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056
SB-05 (12-14')	4/18/2018	0.689	1.22	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	0.0063	<0.0059	1.14	0.0120	<0.0059
SB-06 (0-2')	4/18/2018	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062
SB-06 (18-20')	4/18/2018	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	0.0082	<0.0063	<0.0063
SB-07 (0-2')	4/18/2018	<0.0057	<0.0057	<0.0057	<0.0057	<0.0057	<0.0057	0.0080	0.0087	0.0083	0.0068	0.0079	<0.0057	0.0068	<0.0057	0.0059	<0.0057	<0.0057	0.0071
SB-07 (12-14')	4/18/2018	0.189	0.269	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	0.137	<0.0058	<0.0058
SB-08 (0-2')	4/19/2018	0.0098	0.0097	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056
SB-08 (16-18')	4/19/2018	2.23	3.25	0.0378	0.0327	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	0.0097	<0.0063	0.0127	0.0887	<0.0063	2.88	0.180	0.0115
SB-09 (0-2')	4/19/2018	0.0770	0.0894	<0.0059	0.0784	0.0536	0.110	0.152	0.144	0.176	0.147	0.156	0.0692	0.133	<0.0059	0.122	0.0357	0.0567	0.162
SB-09 (22-24')	4/19/2018	2.12	2.61	0.0496	0.0339	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	0.0101	<0.0059	0.0134	0.0904	<0.0059	0.844	0.162	0.0094
SB-10 (0-2')	4/20/2018	<0.0613	<0.0613	<0.0613	<0.0613	<0.0613	<0.0613	<0.0613	<0.0613	<0.0613	<0.0613	0.329	<0.0613	<0.0613	<0.0613	<0.0613	<0.0613	<0.0613	<0.0613
SB-10 (6-8')	4/20/2018	0.162	0.0305	0.0090	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	0.0225	<0.0063	<0.0063	0.0350	<0.0063	<0.0063	0.127	<0.0063
SB-11 (0-2')	4/20/2018	<0.298	<0.298	<0.298	<0.298	<0.298	<0.298	<0.298	<0.298	<0.298	<0.298	<0.298	<0.298	<0.298	<0.298	<0.298	0.348	<0.298	<0.298
SB-11 (4-6')	4/20/2018	3.49	4.25	0.0560	0.0678	<0.0323	<0.0323	<0.0323	<0.0323	<0.0323	<0.0323	0.121	<0.0323	<0.0323	0.186	<0.0323	<0.0323	0.450	<0.0323
SB-12 (0-2')	4/19/2018	0.0661	0.0684	<0.0306	0.0390	<0.0306	0.0630	0.0724	0.0674	0.0646	0.0837	0.0891	<0.0306	0.0755	<0.0306	0.0533	0.0309	<0.0306	0.0681
SB-12 (6-8')	4/19/2018	0.0793	0.0764	<0.0315	<0.0315	<0.0315	<0.0315	<0.0315	<0.0315	<0.0315	<0.0315	<0.0315	<0.0315	<0.0315	<0.0315	<0.0315	<0.0315	<0.0315	<0.0315
MW-01 (0-2')	4/27/2018	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059
MW-01 (14-16')	4/27/2018	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061
MW-02 (0-2')	4/27/2018	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	0.0187	0.0216	0.0221	0.0153	0.0228	0.0290	<0.0063	0.0416	<0.0063	0.0125	<0.0063	0.0187	0.0429
MW-02 (6-8')	4/27/2018	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066	<0.0066
MW-03 (0-2')	4/26/2018	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063
MW-03 (8-10')	4/26/2018	1.16	2.08	0.0093	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	0.0107	<0.0059	1.66	0.0188	<0.0059
MW-04 (0-2')	4/26/2018	0.258	0.450	0.0069	0.0295	0.0501	0.0928	0.109	0.0938	0.0753	0.114	0.124	0.0285	0.209	0.0209	0.0663	1.67	0.277	0.190
MW-04 (8-10')	4/26/2018	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
MW-05 (0-2')	4/26/2018	<0.0074	<0.0074	<0.0074	<0.0074	<0.0074	0.0368	0.0435	0.0445	0.0327	0.0397	0.0496	0.0121	0.0792	<0.0074	0.0294	<0.0074	0.0239	0.0686
MW-05 (10-12')	4/26/2018	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Blind Duplicate 3		<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
MW-06 (0-2')	5/1/2018	0.0349	0.0556	<0.0074	<0.0074	<0.0074	<0.0074	<0.0074	<0.0074	<0.0074	<0.0074	<0.0074	<0.0074	<0.0074	<0.0074	<0.0074	0.0366	0.0092	<0.0074
MW-06 (4-6')	5/1/2018	2.27	4.39	0.0176	0.0116	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	0.0072	0.0228	<0.0063	3.48	0.0380	0.0148
MW-07 (0-2')	4/24/2018	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	0.0070	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	0.0065	<0.0062

Table 4
Summary of Analytical Soil Results - PAHs - April 2018
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Date Collected	Detected PAHs (ppm)																	
		1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene
IDEM Screening Groundwater Soil MTG Residential 2018		**1.2**	**3.7**	**110**	**NE**	**1,200**	**2.1**	**4.7**	**60**	**NE**	**590**	**1,800**	**19**	**1,800**	**110**	**200**	**0.11**	**NE**	**260**
IDEM Screening Soil Exposure Direct Contact Residential 2018		**250**	**340**	**5,000**	**NE**	**25,000**	**15**	**1.5**	**15**	**NE**	**150**	**1,500**	**1.5**	**3,400**	**3,400**	**15**	**53**	**NE**	**2,500**
IDEM Screening Soil Exposure Direct Contact Commercial/Industrial 2018		**390**	**3,000**	**45,000**	**NE**	**100,000**	**210**	**21**	**210**	**NE**	**2,100**	**21,000**	**21**	**30,000**	**30,000**	**210**	**170**	**NE**	**23,000**
IDEM Screening Soil Exposure Direct Contact Excavation 2018		**390**	**6,800**	**100,000**	**NE**	**100,000**	**12,000**	**500**	**12,000**	**NE**	**100,000**	**100,000**	**1,200**	**68,000**	**68,000**	**12,000**	**3,100**	**NE**	**51,000**
MW-07 (4-6')	4/24/2018	**3.99**	**5.27**	0.0429	0.0421	<0.0067	<0.0067	<0.0067	<0.0067	<0.0067	<0.0067	0.0347	<0.0067	<0.0067	0.164	<0.0067	**0.420**	0.298	0.0282
MW-08 (0-2')	4/25/2018	0.0366	0.0615	<0.0346	<0.0346	<0.0346	<0.0346	<0.0346	<0.0346	<0.0346	<0.0346	<0.0346	<0.0346	<0.0346	<0.0346	<0.0346	0.0362	<0.0346	<0.0346
MW-08 (12-14')	4/25/2018	**9.03**	**14.9**	0.128	0.0548	0.0420	0.0090	<0.0061	<0.0061	<0.0061	<0.0061	0.0164	<0.0061	0.0255	0.150	<0.0061	**11.8**	0.224	0.0460
Blind Duplicate 2		**7.74**	**13.1**	0.107	0.0411	0.0420	0.0088	<0.0060	<0.0060	<0.0060	<0.0060	0.0186	<0.0060	0.0270	0.137	<0.0060	**10.5**	0.217	0.0472
MW-09 (0-2')	4/24/2018	0.0314	0.0438	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	0.0162	<0.0061	<0.0061
MW-09 (8-10')	4/24/2018	0.624	1.18	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	**1.26**	0.0079	<0.0059
MW-10 (0-2')	4/25/2018	0.0420	0.0561	<0.0055	<0.0055	0.0139	0.0209	0.0378	0.0177	0.104	0.0216	0.0447	0.0101	0.0275	<0.0055	0.0296	0.0450	0.0597	0.0905
MW-10 (6-8')	4/25/2018	**12.3**	**15.3**	0.223	0.0871	0.146	0.0134	0.0072	<0.0064	<0.0064	<0.0064	0.0387	<0.0064	0.0312	0.333	<0.0064	<0.0064	0.769	0.122
MW-11 (0-2')	4/23/2018	0.0913	0.0242	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063
MW-11 (12-14')	4/23/2018	0.905	1.59	0.0064	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	0.0164	<0.0059	**1.64**	0.0282	<0.0059
MW-12 (0-2')	4/23/2018	0.0412	0.0647	<0.0065	<0.0065	<0.0065	<0.0065	<0.0065	<0.0065	<0.0065	<0.0065	<0.0065	<0.0065	<0.0065	<0.0065	<0.0065	0.0599	0.0076	<0.0065
MW-12 (24-26')	4/23/2018	0.583	1.03	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	0.0069	<0.0059	**0.825**	0.0168	<0.0059
MW-13 (0-2')	4/25/2018	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061
MW-13 (8-10')	4/25/2018	**2.42**	**4.03**	0.0201	0.0166	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	0.0088	0.0559	<0.0064	**4.17**	0.113	0.0151
MW-14 (0-2')	4/30/2018	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064	<0.0064
MW-14 (6-8')	4/30/2018	0.532	0.266	0.0062	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	0.0134	<0.0058	**0.222**	0.0292	<0.0058
MW-15 (0-2')	5/1/2018	0.0793	0.114	<0.0327	<0.0327	<0.0327	<0.0327	<0.0327	<0.0327	<0.0327	<0.0327	<0.0327	<0.0327	<0.0327	<0.0327	<0.0327	**0.190**	0.0357	<0.0327
MW-15 (8-10')	5/1/2018	0.209	0.395	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	**0.385**	<0.0059	<0.0059
MW-16 (0-2')	4/30/2018	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063
MW-16 (28-30')	4/30/2018	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058	<0.0058

Notes:
- NE = not established / NA* = not analyzed
- Soil samples were analyzed for polynuclear aromatic hydrocarbons (PAHs) using SW 846 Method 8270.
- Analytes not listed in the table were not detected above their respective laboratory reporting levels.
- Analytical results presented in milligrams per kilogram (mg/kg) or parts per million (ppm).

BOLD	= Concentrations above their respective RCG Residential Migration to Groundwater Screening Levels (updated in March 2018).
BOLD	= Concentrations above their respective RCG Residential Direct Contact Screening Levels (updated in March 2018).
BOLD	= Concentrations above their respective RCG Commercial Direct Contact Screening Levels (updated in March 2018).
BOLD	= Concentrations above their respective RCG Excavation Direct Contact Screening Levels (updated in March 2018).

Table 5
Summary of Analytical Soil Results - VOCs/PCBs November 2018
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Date Collected	Detected VOCs (ppm)												
		1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Benzene	Ethylbenzene	Isopropylbenzene	Toluene	Trichloroethene	Xylene (Total)	n-Butylbenzene	n-Hexane	n-Propylbenzene	p-Isopropyltoluene	sec-Butylbenzene
IDEM Screening Groundwater Soil MTG Residential 2018		**1.6**	**1.7**	**0.051**	**16**	**15**	**14**	**66**	**200**	**64**	**210**	**25**	**NE**	**120**
IDEM Screening Soil Exposure Direct Contact Residential 2018		**220**	**180**	**17**	**81**	**270**	**820**	**1,200**	**260**	**110**	**140**	**260**	**NE**	**150**
IDEM Screening Soil Exposure Direct Contact Commercial/Industrial 2018		**220**	**180**	**51**	**250**	**270**	**820**	**1,200**	**260**	**110**	**140**	**260**	**NE**	**150**
IDEM Screening Soil Exposure Direct Contact Excavation 2018		**220**	**180**	**1,800**	**480**	**270**	**820**	**1,200**	**260**	**110**	**140**	**260**	**NE**	**150**
MW-2R (0-2')	11/13/2018	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051	<0.01	<0.0051	<0.0051	<0.0051	<0.0051	<0.0051
MW-2R (36-38')	11/13/2018	**95.5**	**28.6**	**4**	**30.3**	5.4	**32**	0.5	194	11.5	51	16.3	1.8	2.9
Blind Duplicate		<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.011	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054
MW-17 (2-4')	11/12/2018	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.011	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053
MW-17 (38-40')	11/12/2018	**16**	**4.5**	<0.4	3.2	0.68	1.9	<0.4	17.4	2.4	1.3	3.3	<0.4	0.52
MW-18 (0-2')	11/13/2018	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056	<0.011	<0.0056	<0.0056	<0.0056	<0.0056	<0.0056
MW-18 (36-38')	11/13/2018	**87.2**	**25.6**	**8**	**39**	4.9	**82.6**	<0.26	197	9.5	88	13.9	1.4	2.6
MW-19 (0-2')	11/13/2018	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063	<0.013	<0.0063	<0.0063	<0.0063	<0.0063	<0.0063
MW-19 (34-36')	11/13/2018	0.0056	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.011	<0.0054	0.011	<0.0054	<0.0054	<0.0054
Trip Blank	11/13/2018	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.01	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

Notes:
- NE = not established / NA* = not analyzed
- Soil samples were analyzed for volatile organic compounds (VOCs) via SW 846 Method 8260 polychlorinated biphenyls (PCBs) using SW-846 Method 8082.
- Analytes not listed in the table were not detected above their respective laboratory reporting levels.
- Soil analytical results presented in milligrams per kilogram (mg/kg) or parts per million (ppm).
- Trip blanks presented in millgrams per liter (mg/L) or ppm.

BOLD	= Concentrations above their respective RCG Residential Migration to Groundwater Screening Levels (updated in March 2018).
BOLD	= Concentrations above their respective RCG Residential Direct Contact Screening Levels (updated in March 2018).
BOLD	= Concentrations above their respective RCG Commercial Direct Contact Screening Levels (updated in March 2018).
BOLD	= Concentrations above their respective RCG Excavation Direct Contact Screening Levels (updated in March 2018).

Table 6
Summary of Analytical Soil Results - PAHs - April 2018
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Date Collected	Detected PAHs (ppm)																	
		1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene
IDEM Screening Groundwater Soil MTG Residential 2018		**1.2**	**3.7**	**110**	**NE**	**1,200**	**2.1**	**4.7**	**60**	**NE**	**590**	**1,800**	**19**	**1,800**	**110**	**200**	**0.11**	**NE**	**260**
IDEM Screening Soil Exposure Direct Contact Residential 2018		**250**	**340**	**5,000**	**NE**	**25,000**	**15**	**1.5**	**15**	**NE**	**150**	**1,500**	**1.5**	**3,400**	**3,400**	**15**	**53**	**NE**	**2,500**
IDEM Screening Soil Exposure Direct Contact Commercial/Industrial 2018		**390**	**3,000**	**45,000**	**NE**	**100,000**	**210**	**21**	**210**	**NE**	**2,100**	**21,000**	**21**	**30,000**	**30,000**	**210**	**170**	**NE**	**23,000**
IDEM Screening Soil Exposure Direct Contact Excavation 2018		**390**	**6,800**	**100,000**	**NE**	**100,000**	**12,000**	**500**	**12,000**	**NE**	**100,000**	**100,000**	**1,200**	**68,000**	**68,000**	**12,000**	**3,100**	**NE**	**51,000**
MW-2R (0-2')	11/13/2018	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061	<0.0061
MW-2R (36-38')	11/13/2018	**7.2**	**12.7**	0.038	0.04	0.033	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	0.016	<0.0059	0.015	0.078	<0.0059	**12**	0.17	0.022
Blind Duplicate	11/13/2018	<0.0062	<0.0062	<0.0062	<0.0062	<0.0062	0.0079	0.0095	0.01	0.0074	0.011	0.01	<0.0062	0.015	<0.0062	0.007	<0.0062	0.0063	0.012
MW-17 (2-4')	11/12/2018	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0060
MW-17 (38-40')	11/12/2018	**1.8**	3	0.014	0.011	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	<0.0059	0.039	<0.0059	**2.7**	0.048	<0.0059
MW-18 (0-2')	11/13/2018	0.025	0.045	<0.0064	0.0073	<0.0064	0.025	0.029	0.032	0.021	0.034	0.032	0.0085	0.046	<0.0064	0.021	0.046	0.019	0.042
MW-18 (36-38')	11/13/2018	0.63	1.1	0.0062	0.0054	0.0065	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	<0.0054	0.01	<0.0054	**0.58**	0.028	<0.0054
MW-19 (0-2')	11/13/2018	0.018	0.046	<0.0059	0.01	0.0069	0.013	0.023	0.033	0.024	0.02	0.023	0.0098	0.025	<0.0059	0.018	0.019	0.013	0.03
MW-19 (34-36')	11/13/2018	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053	<0.0053

Notes:
- NE = not established / NA* = not analyzed
- Soil samples were analyzed for polynuclear aromatic hydrocarbons (PAHs) using SW 846 Method 8270.
- Analytes not listed in the table were not detected above their respective laboratory reporting levels.
- Analytical results presented in milligrams per kilogram (mg/kg) or parts per million (ppm).

BOLD	= Concentrations above their respective RCG Residential Migration to Groundwater Screening Levels (updated in March 2018).
BOLD	= Concentrations above their respective RCG Residential Direct Contact Screening Levels (updated in March 2018).
BOLD	= Concentrations above their respective RCG Commercial Direct Contact Screening Levels (updated in March 2018).
BOLD	= Concentrations above their respective RCG Excavation Direct Contact Screening Levels (updated in March 2018).

Table 7
Summary of Groundwater Analytical Results - VOCs/Metals - November 2016
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Date Sampled	Detected Metals (ppm)					Detected VOCs (ppm)													
		Arsenic	Barium	Cadmium	Chromium	Lead	1,1,2-Trichloroethane	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Benzene	Chlorobenzene	Ethylbenzene	Isopropylbenzene (Cumene)	Toluene	Xylene (Total)	cis-1,2-Dichloroethene	n-Butylbenzene	n-Hexane	n-Propylbenzene	p-Isopropyltoluene	sec-Butylbenzene
IDEM Screening Groundwater Tap Residential 2016		**0.01**	**2**	**0.005**	**0.1**	**0.015**	**0.005**	**0.015**	**0.12**	**0.005**	**0.1**	**0.7**	**0.45**	**1**	**10**	**0.07**	**1**	**1.5**	**0.66**	**NE***	**2**
IDEM Screening Vapor Exposure Groundwater Residential 2016		**NE***	**NE***	**NE***	**NE***	**NE***	**0.011**	**NE***	**NE***	**0.028**	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***
IDEM Screening Vapor Exposure Groundwater Commercial/Industrial 2016		**NE***	**NE***	**NE***	**NE***	**NE***	**0.046**	**NE***	**NE***	**0.12**	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***
B-1	11/7/2016	**0.0328**	0.114	<0.0020	0.0343	**0.0824**	<0.100	**1.97**	**0.459**	**9.93**	<0.100	**2.33**	<0.100	**18.4**	**13.2**	<0.100	<0.100	0.577	0.307	<0.100	<0.100
Blind Duplicate 1		**0.0298**	0.100	<0.0020	0.0243	**0.0696**	<0.100	**2.00**	**0.473**	**12.4**	<0.100	**2.37**	<0.100	**22.4**	**13.5**	<0.100	<0.100	0.533	0.304	<0.100	<0.100
B-3	11/7/2016	<0.0100	0.0737	<0.0020	<0.0100	<0.0100	<0.0050	**0.603**	**0.249**	**0.305**	0.0051	**1.06**	0.0478	0.298	3.02	<0.0050	<0.0050	0.277	0.158	<0.0050	0.0066
B-4	11/7/2016	<0.0100	0.0388	<0.0020	<0.0100	<0.0100	<0.0050	0.0144	<0.0050	<0.0050	<0.0050	0.0084	<0.0050	0.0082	0.0404	<0.0050	<0.0050	0.0083	<0.0050	<0.0050	<0.0050
B-6	11/9/2016	<0.0100	0.174	<0.0020	0.0137	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-7	11/8/2016	<0.0100	0.0726	<0.0020	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-15	11/11/2016	<0.0100	0.133	<0.0020	<0.0100	<0.0100	<0.0050	**0.0421**	0.0181	**0.126**	<0.0050	0.0688	0.0095	<0.0050	0.0670	<0.0050	0.0111	0.0283	0.0222	<0.0050	<0.0050
B-16	11/14/2016	<0.0100	0.186	<0.0020	<0.0100	<0.0100	<0.0050	0.0128	<0.0050	**0.0220**	<0.0050	0.0102	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	0.0078	<0.0050	<0.0050	<0.0050
B-18	11/14/2016	<0.0100	0.123	<0.0020	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	**0.0181**	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	0.0171	<0.0050	<0.0050	<0.0050
B-19	11/8/2016	<0.0100	0.592	<0.0020	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-20	11/14/2016	<0.0100	0.138	<0.0020	<0.0100	<0.0100	<0.0050	0.0123	<0.0050	**0.0051**	<0.0050	0.0071	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-21	11/8/2016	<0.0100	0.0328	<0.0020	<0.0100	**0.0173**	<0.0500	**1.68**	**0.386**	**32.9**	<0.0500	**1.53**	0.0629	**21.4**	9.06	**0.871**	0.0765	0.199	0.243	<0.0500	<0.0500
B-24	11/11/2016	**0.0124**	0.164	<0.0020	<0.0100	<0.0100	**0.0065**	**0.173**	0.0456	**0.0135**	<0.0050	0.0262	0.0206	<0.0050	0.0662	<0.0050	0.0215	0.164	0.0309	0.0135	0.0113
B-25	11/14/2016	**0.0370**	0.732	<0.0020	0.0695	**0.0528**	<0.0050	**0.713**	**0.129**	**1.09**	<0.0050	0.660	0.0666	0.126	2.47	<0.0050	0.0318	0.219	0.112	0.0188	0.0155
B-29	11/9/2016	<0.0100	0.0931	<0.0020	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-30	11/8/2016	<0.0100	0.0874	<0.0020	<0.0100	<0.0100	<0.0050	**0.157**	0.0446	**0.0463**	<0.0050	0.117	0.0094	<0.0050	0.529	<0.0050	0.0116	0.0869	0.0291	<0.0050	<0.0050
B-36	11/14/2016	<0.0100	0.216	<0.0020	<0.0100	<0.0100	<0.0050	**0.0637**	0.0239	**0.0366**	<0.0050	0.107	0.0086	<0.0050	0.398	<0.0050	<0.0050	0.0762	0.0167	<0.0050	<0.0050
B-37	11/11/2016	<0.0100	0.0612	<0.0020	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-39	11/11/2016	<0.0100	0.0474	<0.0020	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-40	11/10/2016	**0.0123**	0.283	0.0021	0.0111	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-43	11/10/2016	<0.0100	0.132	<0.0020	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-44	11/10/2016	<0.0100	0.0800	<0.0020	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-45	11/11/2016	<0.0100	0.289	<0.0020	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-47	11/9/2016	<0.0100	0.0636	<0.0020	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-49	11/9/2016	<0.0100	0.0565	<0.0020	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-50	11/9/2016	<0.0100	0.140	<0.0020	<0.0100	<0.0100	<0.0050	0.0062	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-51	11/9/2016	<0.0100	0.139	<0.0020	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Blind Duplicate 2		<0.0100	0.144	<0.0020	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
B-55	11/9/2016	**0.0150**	0.283	<0.0020	0.0670	**0.0217**	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
L-1	11/10/2016	<0.0100	0.082	<0.0020	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
L-2	11/10/2016	<0.0100	0.0529	<0.0020	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
L-3	11/10/2016	<0.0100	0.0848	<0.0020	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
L-4	11/11/2016	<0.0100	0.0410	<0.0020	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
S-1	11/11/2016	<0.0100	0.0780	<0.0020	<0.0100	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Trip Blank1	11/8/2016	NA*	NA*	NA*	NA*	NA*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Trip Blank2	11/9/2016	NA*	NA*	NA*	NA*	NA*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Trip Blank3	11/10/2016	NA*	NA*	NA*	NA*	NA*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Trip Blank4	11/14/2016	NA*	NA*	NA*	NA*	NA*	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0100	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

Notes:
-NE = Not Established/ NA*= Not Analyzed
- Groundwater samples were analyzed for volatile organic compounds (VOCs) via SW 846 Method 8260 and RCRA Metals via SW 846 Methods 6010B and 7470.
- Analytes not listed in the table were not detected above their respective laboratory detection levels.
- Analytical results presented in milligrams per liter (mg/L) or parts per million (ppm).

BOLD	= Concentrations above their respective Remediation Closure Guide (RCG) Residential Tap (Direct Contact) Screening Levels (updated in March 2016).
BOLD	= Concentrations above their respective Remediation Closure Guide (RCG) Residential Vapor Exposure Screening Levels (updated in March 2016).
BOLD	= Concentrations above their respective Remediation Closure Guide (RCG) Commercial Vapor Exposure Screening Levels (updated in March 2016).

Table 8
Summary of Groundwater Analytical Results - SVOCs - November 2016
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Date Sampled	Detected SVOCs (ppm)														
		1-Methylnaphthalene	2,4-Dimethylphenol	2-Methylnaphthalene	2-Methylphenol (o-Cresol)	3&4-Methylphenol (m&p Cresol)	Benzo(a)anthracene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Dibenz(a,h)anthracene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Phenol
IDEM Screening Groundwater Tap Residential 2016		**0.011**	**0.36**	**0.036**	**0.93**	**NE***	**0.00012**	**0.00034**	**NE***	**0.0034**	**0.000034**	**0.29**	**0.00034**	**0.0017**	**NE***	**5.8**
IDEM Screening Vapor Exposure Groundwater Residential 2016		**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**0.11**	**NE***	**NE***
IDEM Screening Vapor Exposure Groundwater Commercial/Industrial 2016		**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**NE***	**0.46**	**NE***	**NE***
B-1	11/7/2016	**0.0374**	<0.0100	**0.0519**	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	**0.181**	<0.0010	<0.0100
Blind Duplicate 1		**0.0255**	<0.0100	**0.0389**	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	**0.124**	<0.0010	<0.0100
B-3	11/7/2016	**0.0260**	<0.0100	**0.0382**	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	**0.126**	<0.0010	<0.0100
B-4	11/7/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	0.0012	<0.0010	<0.0100
B-6	11/9/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
B-7	11/8/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	0.0013	<0.0010	<0.0100
B-15	11/11/2016	**0.0389**	<0.0100	**0.0380**	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0012	<0.00010	**0.0317**	0.0015	<0.0100
B-16	11/14/2016	<0.0010	0.168	<0.0010	0.134	0.130	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	0.0695
B-18	11/14/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
B-19	11/8/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
B-20	11/14/2016	0.0016	0.0182	0.0015	0.0127	<0.0100	<0.00010	<0.00010	0.00011	<0.00010	**0.00012**	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
B-21	11/8/2016	**0.0246**	<0.0100	0.0349	<0.0100	0.0149	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.0050	<0.00050	**0.0779**	<0.0050	0.0145
B-24	11/11/2016	**0.0309**	<0.0100	0.0263	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0013	<0.00010	**0.0216**	0.0014	<0.0100
B-25	11/14/2016	**0.0717**	<0.0100	**0.0821**	<0.0100	<0.0100	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0100	<0.0010	**0.103**	<0.0100	0.0341
B-29	11/9/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
B-30	11/8/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	**0.0028**	<0.0010	<0.0100
B-36	11/14/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
B-37	11/11/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
B-39	11/11/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
B-40	11/10/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
B-43	11/10/2016	<0.0025	<0.0250	<0.0025	<0.0250	<0.0250	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025	<0.0025	<0.00025	<0.0025	<0.0025	<0.0250
B-44	11/10/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
B-45	11/11/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
B-47	11/9/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
B-49	11/9/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	0.00011	0.00020	0.00012	0.00011	<0.00010	<0.0010	0.00013	<0.0010	<0.0010	<0.0100
B-50	11/9/2016	0.0011	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
B-51	11/9/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
Blind Duplicate 2		<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
B-55	11/9/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
L-1	11/10/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
L-2	11/10/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
L-3	11/10/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
L-4	11/11/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100
S-1	11/11/2016	<0.0010	<0.0100	<0.0010	<0.0100	<0.0100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.0010	<0.00010	<0.0010	<0.0010	<0.0100

Notes:
-NE = Not Established/ NA*= Not Analyzed
- Groundwater samples were analyzed for semi volatile organic compounds (SVOCs) using SW 846 Method 8270SIM.
- Analytes not listed in the table were not detected above their respective laboratory detection levels.
- Analytical results presented in milligrams per liter (mg/L) or parts per million (ppm).

BOLD	= Concentrations above their respective Remediation Closure Guide (RCG) Residential Tap (Direct Contact) Screening Levels (updated in March 2016).
BOLD	= Concentrations above their respective Remediation Closure Guide (RCG) Residential Vapor Exposure Screening Levels (updated in March 2016).
BOLD	= Concentrations above their respective Remediation Closure Guide (RCG) Commercial Vapor Exposure Screening Levels (updated in March 2016).

Table 9
Summary of Analytical Groundwater Results - VOCs/PCBs - May 2018 to April 2019
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Date Sampled	PCB - Arochlor 1260 (ppb)	Detected VOCs (ppb)														
			1,2,4-Trimethylbenzene	1,2-Dibromoethane (EDB)	1,2-Dichloroethane	1,3,5-Trimethylbenzene	Benzene	Ethylbenzene	Isopropylbenzene (Cumene)	Toluene	Xylene (Total)	cis-1,2-Dichloroethene	n-Butylbenzene	n-Hexane	n-Propylbenzene	p-Isopropyltoluene	sec-Butylbenzene
IDEM Screening Groundwater Tap Residential 2019		0.078	56	0.05	5	60	5	700	450	1,000	10,000	70	1,000	1,500	660	NE	2,000
IDEM Screening Vapor Exposure Groundwater Residential 2019		NE	NE	NE	50	NE	28	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
IDEM Screening Vapor Exposure Groundwater Commercial/Industrial 2019		NE	NE	NE	210	NE	120	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
MW-1	05/10/2018	<0.10	2,600	<250	<250	690	14,300	2,900	<250	19,000	14,700	<250	<250	340	440	<250	<250
	8/15/2018	<0.10	2,300	<250	<250	600	11,900	2,400	<250	14,000	11,600	<250	<250	600	400	<250	<250
	11/29/2018	<0.10	16,400	<500	<500	4,200	14,300	4,100	620	22,100	25,200	<500	1,900	590	2,700	<500	<250
	2/13/2019	<0.10	28,100	<500	<500	7,500	12,800	15,500	1,600	29,300	84,400	<500	2,800	1,900	6,000	<500	740
	4/4/2019	<0.10	1,430	<500	<500	<500	8,850	2,070	<500	15,600	10,100	<500	<500	628	<500	<500	<500
MW-2	05/09/2018	<0.10	250	<5.0	<5.0	64	1,200	250	26	270	570	<5.0	7.9	160	63	<5.0	<5.0
	8/14/2018	*Not sampled due to insufficient water volume*															
MW-2R	11/27/2018	<0.10	1,400	5.3	<5.0	280	7,300	1,900	86	4,900	11,000	<5.0	25	510	190	5.3	8.7
	2/12/2019	<0.10	1,800	<5.0	<5.0	400	8,200	2,100	92	5,500	11,300	<5.0	35	660	270	6.2	11
	4/3/2019	<0.10	1,260	<50.0	<50.0	294	4,700	1,680	73.0	2,920	6,950	<50.0	<50.0	442	178	<50.0	<50.0
MW-3	05/09/2018	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	8/14/2018	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	11/27/2018	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	2/12/2019	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	4/3/2019	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW-4	05/09/2018	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	8/14/2018	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	11/27/2018	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	2/12/2019	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	4/3/2019	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW-5	05/09/2018	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	8/14/2018	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	11/27/2018	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	2/12/2019	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	4/3/2019	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW-6	05/09/2018	<0.10	<5.0	<5.0	<5.0	<5.0	6.6	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	8/14/2018	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	11/27/2018	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	2/12/2019	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	4/4/2019	<0.10	11.6	<5.0	<5.0	<5.0	175	9.6	<5.0	<5.0	46.8	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW-7	05/09/2018	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	8/14/2018	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	11/28/2018	<0.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	2/12/2019	<0.10	<5.0	<5.0	<5.0	<5.0	5.3	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	4/4/2019	<0.10	<5.0	<5.0	<5.0	5.9	8.4	<5.0	114	<5.0	<10.0	<5.0	20.6	<5.0	209	<5.0	15.4

Table 9
Summary of Analytical Groundwater Results - VOCs/PCBs - May 2018 to April 2019
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Date Sampled	PCB - Arochlor 1260 (ppb)	Detected VOCs (ppb)														
			1,2,4-Trimethylbenzene	1,2-Dibromoethane (EDB)	1,2-Dichloroethane	1,3,5-Trimethylbenzene	Benzene	Ethylbenzene	Isopropylbenzene (Cumene)	Toluene	Xylene (Total)	cis-1,2-Dichloroethene	n-Butylbenzene	n-Hexane	n-Propylbenzene	p-Isopropyltoluene	sec-Butylbenzene
IDEM Screening Groundwater Tap Residential 2019		0.078	56	0.05	5	60	5	700	450	1,000	10,000	70	1,000	1,500	660	NE	2,000
IDEM Screening Vapor Exposure Groundwater Residential 2019		NE	NE	NE	50	NE	28	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
IDEM Screening Vapor Exposure Groundwater Commercial/Industrial 2019		NE	NE	NE	210	NE	120	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
MW-8	05/10/2018	<0.10	3,400	<250	<250	900	25,400	3,400	<250	24,000	17,700	910	<250	0.68	0.62	<250	<250
	8/15/2018	<0.10	1,900	<250	<250	520	32,200	2,700	<250	23,900	12,900	<250	<250	1,200	380	<250	<250
	11/29/2018	<0.10	8,700	<500	<500	2,400	26,000	7,000	550	32,200	36,400	1,300	710	2,400	1,900	<500	<500
	2/14/2019	<0.10	6,700	<50.0	<50.0	2,000	14,100	5,000	360	12,400	26,700	870	530	1,400	1,300	85	150
	4/5/2019	<0.10	1,510	<250	<250	372	25,300	2,430	<250	17,400	12,300	951	<250	351	<250	<250	<250
MW-9	05/10/2018	<0.10	1,200	<5.0	<5.0	290	15,200	1,700	100	6,100	7,700	<5.0	50.0	290	260	7.4	15
	8/15/2018	<0.10	1,500	<50.0	<50.0	420	19,300	2,500	120	8,100	9,700	<50.0	59	570	310	<50.0	<50.0
	11/29/2018	<0.10	4,200	<500	<500	1,100	22,100	4,600	<500	14,100	21,300	<500	<500	<500	790	<500	<500
	2/14/2019	<0.10	3,700	<250	<250	860	26,300	4,400	3,300	17,100	21,100	<0.25	8,100	890	14,200	830	1,700
	4/5/2019	<0.10	1,540	<500	<500	<500	20,300	2,540	<500	10,200	12,000	<500	<500	<500	<500	<500	<500
MW-10	05/10/2018	<0.10	63	<5.0	<5.0	21	410	74	14	<5.0	77	<5.0	7.7	22	25	<5.0	<5.0
(Blind Duplicate)	5/10/2018	<0.10	74	<5.0	<5.0	25	400	87	16	6.6	91	<5.0	8.6	20	27	5.1	<5.0
	8/14/2018	<0.10	39	<5.0	<5.0	15	290	58	8.0	<5.0	46	<5.0	5.2	7.4	13	<5.0	<5.0
	11/28/2018	<0.10	34	<5.0	<5.0	14	520	72	11	<5.0	46	<5.0	<5.0	19	18	<5.0	<5.0
	2/13/2019	<0.10	22	<5.0	<5.0	11	580	55	8.8	<5.0	32	<5.0	7.3	19	17	<5.0	<5.0
	4/4/2019	<0.10	<50.0	<50.0	<50.0	<50.0	529	67.4	<50.0	<50.0	<100	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0
MW-11	05/10/2018	<0.10	1,700	<50.0	<50.0	430	12,200	2,300	93	10,500	9,700	<50.0	64	240	280	<50.0	<50.0
	8/15/2018	<0.10	1,600	<5.0	<5.0	430	15,400	2,200	99	12,800	10,300	<5.0	69	250	210	11	20
	11/29/2018	<0.10	1,500	<5.0	<5.0	290	12,500	2,300	71	13,000	10,900	<5.0	26	660	200	5.8	11
(Blind Duplicate)	11/29/2018	<0.10	1,900	<250	<250	450	11,600	2,700	<250	11,500	12,900	<250	<250	620	290	<250	<250
	2/13/2019	<0.10	11,900	<250	<250	9,800	14,200	14,500	1,600	25,800	37,900	<250	3,100	1,400	7,300	380	840
	4/4/2019	<0.10	1,040	<500	<500	<500	9,570	1,750	<500	8,040	8,380	<500	<500	<500	<500	<500	<500
(Blind Duplicate)	4/4/2019	<0.10	1,320	<250	<250	322	11,000	2,030	<250	9,300	9,710	<250	<250	<250	<250	<250	<250
MW-12	05/10/2018	<0.10	1,400	<5.0	<5.0	350	5,300	1,700	87	9,100	8,100	<5.0	50	360	240	11	14
	8/15/2018	<0.10	1,100	<5.0	<5.0	220	3,100	1,200	78	2,600	7,000	<5.0	47	480	160	<5.0	16
	11/28/2018	<0.10	2,300	<5.0	<5.0	600	2,600	780	140	840	5,200	<5.0	180	710	280	56	72
	2/13/2019	<0.10	11,300	<120	<120	1,900	3,300	2,000	250	2,700	11,500	<120	670	270	990	160	200
	4/4/2019	<0.10	956	<100	<100	234	3,030	987	<100	1,640	4,760	<100	<100	267	141	<100	<100
MW-13	05/10/2018	<0.10	2,400	<50.0	<50.0	630	13,400	3,000	120	9,600	12,400	<50.0	81	220	380	<50.0	<50.0
	8/15/2018	<0.10	3,700	<5.0	<5.0	270	17,600	6,300	90	10,400	<10.0	<5.0	45	1,200	190	7.6	15
	11/28/2018	<0.10	1,500	<250	<250	390	14,100	2,500	<250	10,600	12,700	<250	<250	410	<250	<250	<250
	2/13/2019	<0.10	2,900	<5.0	<5.0	660	16,700	3,000	110	13,200	16,100	<5.0	99	270	370	12	22
	4/4/2019	<0.10	1,550	<250	<250	382	8,060	2,510	<250	8,030	12,800	<250	<250	271	<250	<250	<250
MW-14	05/09/2018	<0.10	210	<5.0	<5.0	73	120	120	10	690	1,000	<5.0	11	<5.0	24	<5.0	<5.0
	8/14/2018	<0.10	15	<5.0	14	11	9.9	<5.0	<5.0	14	50	<5.0	<5.0	<5.0	5.7	<5.0	<5.0
	11/28/2018	<0.10	<5.0	<5.0	13	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	2/13/2019	<0.10	<5.0	<5.0	<5.0	<5.0	22	<5.0	<5.0	17	21	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	4/4/2019	<0.10	<5.0	<5.0	12.1	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Table 9
Summary of Analytical Groundwater Results - VOCs/PCBs - May 2018 to April 2019
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Date Sampled	PCB - Arochlor 1260 (ppb)	Detected VOCs (ppb)														
			1,2,4-Trimethylbenzene	1,2-Dibromoethane (EDB)	1,2-Dichloroethane	1,3,5-Trimethylbenzene	Benzene	Ethylbenzene	Isopropylbenzene (Cumene)	Toluene	Xylene (Total)	cis-1,2-Dichloroethene	n-Butylbenzene	n-Hexane	n-Propylbenzene	p-Isopropyltoluene	sec-Butylbenzene
IDEM Screening Groundwater Tap Residential 2019		**0.078**	**56**	**0.05**	**5**	**60**	**5**	**700**	**450**	**1,000**	**10,000**	**70**	**1,000**	**1,500**	**660**	**NE**	**2,000**
IDEM Screening Vapor Exposure Groundwater Residential 2019		**NE**	**NE**	**NE**	**50**	**NE**	**28**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**
IDEM Screening Vapor Exposure Groundwater Commercial/Industrial 2019		**NE**	**NE**	**NE**	**210**	**NE**	**120**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**
MW-15	05/10/2018	<0.10	920	<5.0	<5.0	260	3,000	1,300	77	<5.0	4,300	<5.0	32	120	210	5.3	9.8
	8/15/2018	<0.10	740	<5.0	<5.0	140	3,800	1,000	52	<5.0	2,500	<5.0	22	17	100	<5.0	8.3
(Blind Duplicate)	8/15/2018	<0.10	1,000	<5.0	<5.0	130	3,600	1,100	49	12	3,000	<5.0	<5.0	22	90	9.3	7.6
	11/28/2018	<0.10	830	<5.0	<5.0	140	3,100	1,300	59	<5.0	2,600	<5.0	18	<5.0	160	<5.0	8.5
	2/14/2019	0.83	1,900	<5.0	<5.0	250	5,500	2,400	87	<5.0	6,000	<5.0	37	<5.0	260	<5.0	14
	4/4/2019	<0.10	952	<250	<250	<250	2,780	1,200	<250	<250	2,800	<250	<250	<250	<250	<250	<250
MW-16	05/10/2018	<0.10	6,000	<250	<250	9,400	10,200	3,500	2,000	24,800	18,600	<250	2,500	2,900	7,100	370	610
	8/15/2018	<0.10	2,700	16	<250	280	6,700	2,400	96	12,700	11,700	<5.0	77	2,300	210	12	23
	11/28/2018	<0.10	1,900	17	<5.0	440	4,300	1,800	120	9,600	9,400	<5.0	59	560	220	12	21
	2/14/2019	<0.10	3,900	<5.0	<5.0	920	6,800	2,900	110	19,900	16,100	<5.0	100	280	580	12	21
(Blind Duplicate)	2/14/2019	<0.10	2,900	<120	<120	660	5,800	2,400	<120	16,400	12,500	<120	<120	360	430	<120	<120
	4/4/2019	<0.10	3,240	<250	<250	765	4,570	3,340	<250	14,300	16,600	<250	<250	<250	517	<250	<250
MW-17	11/29/2018	<0.10	550	<5.0	<5.0	130	5,100	860	37	3,200	3,900	<5.0	18	160	100	<5.0	5.5
	2/13/2019	<0.10	203,000	<500	<500	13,900	5,500	9,600	2,100	11,400	60,500	<500	6,300	2,300	9,500	730	1,300
	4/3/2019	<0.10	1,140	<125	<125	288	8,180	1,080	<125	2,720	5,150	<125	<125	358	211	<125	<125
MW-18	11/27/2018	<0.10	2,100	16	<5.0	490	3,600	2,700	120	11,200	12,100	<5.0	41	530	220	10	17
	2/12/2019	<0.10	50,400	<250	<250	6,800	10,300	10,100	1,200	60,300	148,000	<250	2,700	530	4,900	320	590
	4/3/2019	<0.10	2,950	<250	<250	677	9,380	2,610	<250	3,560	12,400	<250	<250	<250	459	<250	<250
MW-19	11/29/2018	<0.10	11	<5.0	<5.0	<5.0	12,900	57	<5.0	120	120	<5.0	<5.0	5.4	<5.0	<5.0	<5.0
	2/13/2019	<0.10	<5.0	<5.0	48	<5.0	8,300	<0.025	15	<5.0	35	19	<5.0	<5.0	<5.0	<5.0	<5.0
	4/3/2019	<0.10	<250	<250	<250	<250	4,930	<250	<250	<250	<500	<250	<250	<250	<250	<250	<250
Trip Blank	05/09/2018	NA	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	8/14/2018	NA	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	11/20/2018	NA	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	2/12/2019	NA	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
	4/3/2019	NA	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0

Notes:
-NE = not established/ NA*= not analyzed
- Groundwater samples were analyzed for volatile organic compounds (VOCs) via SW 846 Method 8260 and polychorinated biphenyls (PCBs) via SW 846 Method 8082.
- Analytes not listed in the table were not detected above their respective laboratory detection levels.
- Analytical results presented in micrograms per liter (µg/L) or parts per billion (ppb).

BOLD	= Concentrations above their respective Remediation Closure Guide (RCG) Residential Tap (Direct Contact) Screening Levels (updated in March 2019).
BOLD	= Concentrations above their respective Remediation Closure Guide (RCG) Residential Vapor Exposure Screening Levels (updated in March 2019).
BOLD	= Concentrations above their respective Remediation Closure Guide (RCG) Commercial Vapor Exposure Screening Levels (updated in March 2019).

Table 10
Summary of Analytical Groundwater Results - PAHs - May 2018 to April 2019
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Date Sampled	Detected PAHs (ppb)																	
		1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene
IDEM Screening Groundwater Tap Residential 2019		11	36	530	NE	1,800	0.3	0.2	2.5	NE	25	250	0.25	800	290	2.5	1.7	NE	120
IDEM Screening Vapor Exposure Groundwater Residential 2019		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	110	NE	NE
IDEM Screening Vapor Exposure Groundwater Commercial/Industrial 2019		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	460	NE	NE
MW-1	05/10/2018	238	376	3.8	<1.0	<0.10	0.21	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	6.4	<1.0	479	7.3	<1.0
	8/15/2018	52.5	98.4	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	1.3	<1.0	284	1.4	<1.0
	11/29/2018	73.2	112	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	1.3	<1.0	230	2	<1.0
	2/13/2019	49.0	64.5	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	1.2	<1.0	135	1.3	<1.0
	4/4/2019	38.5	36.9	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	125	<1.0	<1.0
MW-2	05/09/2018	<1.0	1	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	3.0	<1.0	<1.0
	8/14/2018	*Not sampled due to insufficient water volume*																	
MW-2R	11/27/2018	71	25.1	<0.10	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	17.1	<1.0	<1.0
	2/12/2019	20.2	30.6	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	132	<1.0	<1.0
	4/3/2019	15.5	23.8	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	117	<1.0	<1.0
MW-3	05/09/2018	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	8/14/2018	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	11/27/2018	<1.1	<1.1	<1.1	<1.1	<0.11	<0.11	<0.10	<0.10	<0.10	<0.10	<0.53	<0.10	<1.0	<1.1	<1.0	<1.1	<1.1	<1.0
	2/12/2019	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	4/3/2019	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0
MW-4	05/09/2018	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	8/14/2018	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	11/27/2018	<1.1	<1.1	<1.1	<1.1	<0.11	<0.11	<0.10	<0.10	<0.10	<0.10	<0.53	<0.10	<1.0	<1.1	<1.0	<1.1	<1.1	<1.0
	2/12/2019	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	4/3/2019	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0
MW-5	05/09/2018	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	8/14/2018	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	11/27/2018	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.52	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	2/12/2019	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	4/3/2019	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0
MW-6	05/09/2018	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	8/14/2018	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	11/27/2018	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	2/12/2019	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	4/4/2019	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0
MW-7	05/09/2018	21.2	11.5	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	8/14/2018	65.6	52.7	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	3.9	<1.0	<1.0
	11/28/2018	54.5	17.9	<1.1	<1.1	<0.11	<0.11	<0.10	<0.10	<0.10	<0.10	<0.56	<0.10	<1.0	<1.1	<1.0	<1.1	<1.1	<1.0
	2/12/2019	46.3	15.9	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	4/4/2019	17.5	9.1	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0

Table 10
Summary of Analytical Groundwater Results - PAHs - May 2018 to April 2019
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Date Sampled	Detected PAHs (ppb)																	
		1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene
IDEM Screening Groundwater Tap Residential 2019		11	36	530	NE	1,800	0.3	0.2	2.5	NE	25	250	0.25	800	290	2.5	1.7	NE	120
IDEM Screening Vapor Exposure Groundwater Residential 2019		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	110	NE	NE
IDEM Screening Vapor Exposure Groundwater Commercial/Industrial 2019		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	460	NE	NE
MW-8	05/10/2018	67.6	134	1.4	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<1.0	<1.0	2.3	<1.0	216	3.5	<1.0
	8/15/2018	63.4	184	1.5	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<1.0	<1.0	2.3	<1.0	285	4.1	<1.0
	11/29/2018	275	424	<5.0	<5.0	<0.50	0.76	<1.0	<1.0	<1.0	<1.0	<2.5	<1.0	<1.0	5.8	<1.0	522	11.3	<1.0
	2/14/2019	6,020	9,740	72.4	<10.0	<1.0	8.1	2.1	1.4	1.4	<1.0	19.2	<1.0	15.4	83.5	<1.0	8,440	238	30.1
	4/5/2019	27.3	41.1	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	130	<1.0	<1.0
MW-9	05/10/2018	17.6	27.9	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	98.5	<1.0	<1.0
	8/15/2018	24.4	39.4	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	183	<1.0	<1.0
	11/29/2018	64.2	95.7	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	1.2	<1.0	221	2.3	<1.0
	2/14/2019	163	269	2.2	<1.0	<0.10	0.31	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	3.4	<1.0	417	8.2	<1.0
	4/5/2019	35.4	53.5	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	187	<1.0	<1.0
MW-10	05/10/2018	19.6	12.8	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	18.1	<1.0	<1.0
(Blind Duplicate)	5/10/2018	30.6	20.2	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	28	<1.0	<1.0
	8/14/2018	35.6	21.3	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	43.5	<1.0	<1.0
	11/28/2018	46.9	24.2	1.4	<1.0	0.16	<0.11	<0.10	<0.10	<0.10	<0.10	<0.55	<0.10	<1.0	1.2	<1.0	39.1	1.3	<1.0
	2/13/2019	37.4	9.8	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	20.2	<1.0	<1.0
	4/4/2019	23.5	4.3	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	4.6	<1.0	<1.0
MW-11	05/10/2018	35.9	53.3	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	145	1.2	<1.0
	8/15/2018	50	78.9	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	241	3.3	<1.0
	11/29/2018	54.2	79	<1.1	<1.1	<0.11	<0.11	<0.10	<0.10	<0.10	<0.10	<0.53	<0.10	<1.0	1.4	<1.0	212	2.6	<1.0
(Blind Duplicate)	11/29/2018	57.9	85.2	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	1.6	<1.0	225	2.9	<1.0
	2/13/2019	488	788	<10.0	<10.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<10.0	16.0	<1.0	742	36.1	<10.0
	4/4/2019	14.2	15.8	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	26.4	<1.0	<1.0
(Blind Duplicate)	4/4/2019	38.3	42.7	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	158	<1.0	<1.0
MW-12	05/10/2018	53.3	78.8	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.50	<5.0	<1.0	<0.50	181	<1.0	<1.0
	8/15/2018	28.3	43.5	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.50	<5.0	<1.0	<0.50	83.3	<1.0	<1.0
	11/28/2018	69.7	96.9	1.2	<1.2	<0.12	<0.12	<0.50	<0.50	<0.50	<0.50	<0.59	<0.50	<5.0	1.7	<0.50	97.2	2	<1.0
	2/13/2019	1,170	1,740	16.1	<5.0	<0.50	2.3	<0.50	<0.50	<0.50	<0.50	3.8	<0.50	<5.0	24.0	<0.50	1,210	52.6	5.9
	4/4/2019	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0
MW-13	05/10/2018	63.4	109	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	1	<0.10	322	1.2	<1.0
	8/15/2018	37	64.9	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	233	<1.0	<1.0
	11/28/2018	55.4	90.3	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	294	1.4	<1.0
	2/13/2019	28.7	43.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	210	<1.0	<1.0
	4/4/2019	17.5	15.7	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	19.0	<1.0	<1.0

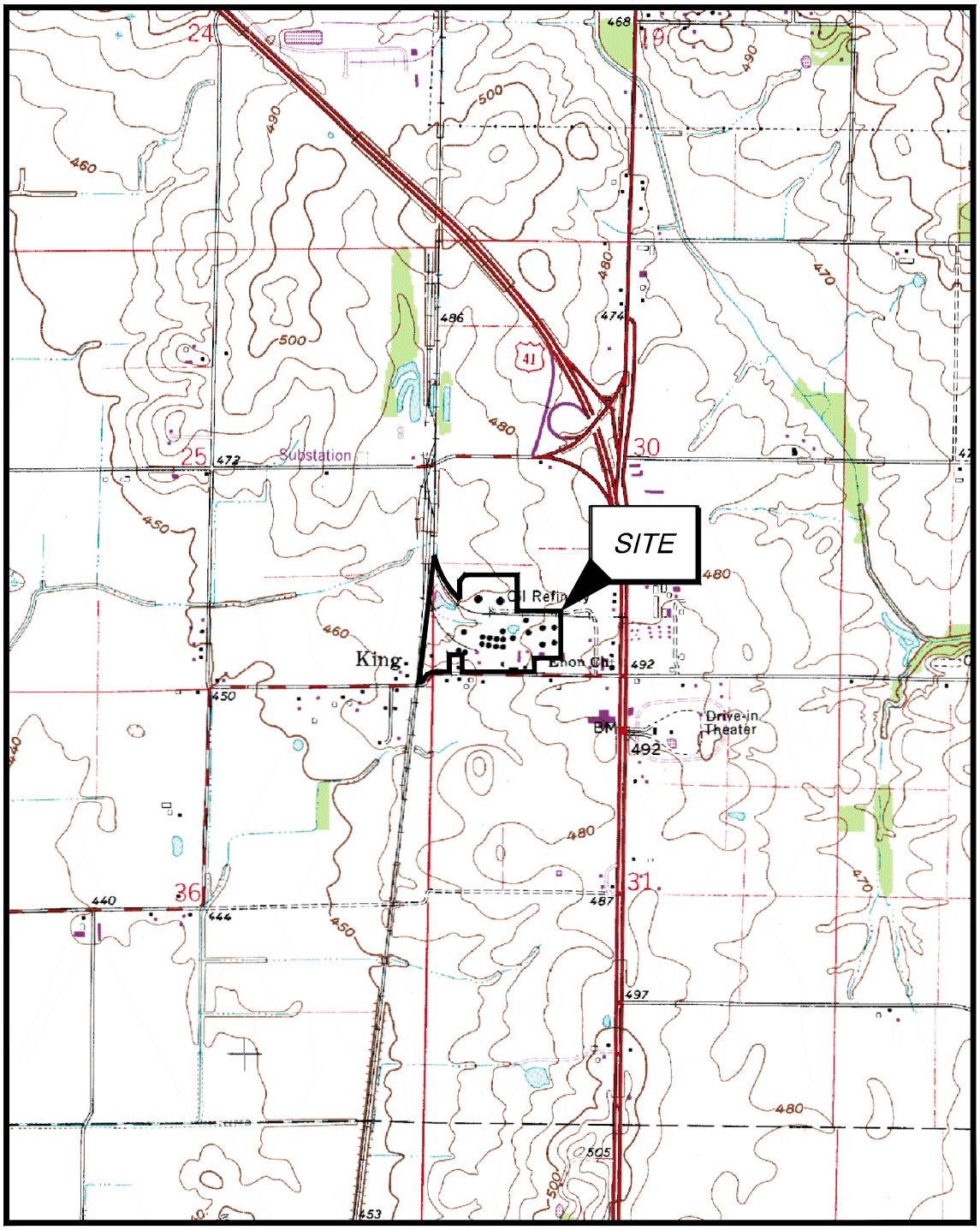
Table 10
Summary of Analytical Groundwater Results - PAHs - May 2018 to April 2019
Former RJ Refinery
County Road 350 South
Princeton, Indiana 47670

Sample ID	Date Sampled	Detected PAHs (ppb)																
		1-Methylnaphthalene	2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene
IDEM Screening Groundwater Tap Residential 2019		**11**	**36**	**530**	**NE**	**1,800**	**0.3**	**0.2**	**2.5**	**NE**	**25**	**250**	**0.25**	**800**	**290**	**2.5**	**1.7**	**NE**	**120**
IDEM Screening Vapor Exposure Groundwater Residential 2019		**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**110**	**NE**	**NE**
IDEM Screening Vapor Exposure Groundwater Commercial/Industrial 2019		**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**460**	**NE**	**NE**
MW-14	05/09/2018	9.5	6.8	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	**8.6**	<1.0	<1.0
	8/14/2018	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0
	11/28/2018	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0
	2/13/2019	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0
	4/4/2019	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0
MW-15	05/10/2018	**12.5**	22.8	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	**119**	<1.0	<1.0
	8/15/2018	10.3	16	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	**74**	<1.0	<1.0
(Blind Duplicate)	8/15/2018	**12**	17.8	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	**78.1**	<1.0	<1.0
	11/28/2018	**13.7**	19.9	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	**87.5**	<1.0	<1.0
	2/14/2019	**25.3**	**40.0**	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	0.15	<0.10	<0.50	0.17	<1.0	<1.0	0.12	**140**	<1.0	<1.0
	4/4/2019	**13.8**	20.5	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	**55.8**	<1.0	<1.0
MW-16	05/10/2018	**31.4**	**567**	2.2	1.6	0.73	**0.39**	<0.10	<0.10	<0.10	<0.10	0.55	<0.10	<1.0	3.7	<0.10	**758**	6.4	<1.0
	8/15/2018	**28.4**	**54.9**	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	**136**	<1.0	<1.0
	11/28/2018	**72.2**	**121**	<1.1	<1.1	<0.11	<0.11	<0.10	<0.10	<0.10	<0.10	<0.56	<0.10	<1.0	<1.1	<0.10	**244**	<1.1	<1.0
	2/14/2019	**47.5**	**80.4**	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	**143**	<1.0	<1.0
(Blind Duplicate)	2/14/2019	**77.8**	**109**	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	**200**	1.2	<1.0
	4/4/2019	**150**	**235**	<1.0	<1.0	<0.10	0.16	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	1.5	<0.10	**373**	2.6	<1.0
MW-17	11/29/2018	3.2	5	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	**17.5**	<1.0	<1.0
	2/13/2019	**330**	**555**	3.2	<1.0	<0.10	**0.57**	<0.10	<0.10	<0.10	<0.10	0.64	<0.10	<1.0	4.6	<0.10	**665**	10.2	1.5
	4/3/2019	**21.4**	34.7	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	**91.8**	<1.0	<1.0
MW-18	11/27/2018	**58.5**	**92.5**	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<20.0	<1.0	<0.10	**267**	1.2	<1.0
	2/12/2019	**1,080**	**1,910**	<20.0	<20.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<10.0	<2.0	<20.0	<20.0	<2.0	**1,890**	25.2	<20.0
	4/3/2019	**293**	**488**	2.6	<1.0	<0.10	0.23	<0.10	0.10	<0.10	<0.10	<0.50	<0.10	<1.0	4.0	<0.10	**629**	6.7	<1.0
MW-19	11/29/2018	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
	2/13/2019	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	<1.0	<1.0	<1.0
	4/3/2019	<1.0	<1.0	<1.0	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.50	<0.10	<1.0	<1.0	<0.10	**2.7**	<1.0	<1.0

Notes:
-NE = not established/ NA*= not analyzed
- Groundwater samples were analyzed for polynuclear aromatic hydrocarbons (PAHs) via SW 846 Method 8270.
- Analytes not listed in the table were not detected above their respective laboratory detection levels.
- Analytical results presented in micrograms per liter (µg/L) or parts per billion (ppb).

BOLD	= Concentrations above their respective Remediation Closure Guide (RCG) Residential Tap (Direct Contact) Screening Levels (updated in March 2019).
BOLD	= Concentrations above their respective Remediation Closure Guide (RCG) Residential Vapor Exposure Screening Levels (updated in March 2019).
BOLD	= Concentrations above their respective Remediation Closure Guide (RCG) Commercial Vapor Exposure Screening Levels (updated in March 2019).

Figures



VICINITY MAP

FORMER RJ REFINERY
COUNTY ROAD 350 SOUTH
PRINCETON, INDIANA

Project Number: 170IFA0010		Drn. By: JG
Drawing File: SEE LOWER LEFT		Ckd. By: JW
Date: 3/19	Scale: 1" = 2000'	App'd By:
ATC		Figure: 1

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LEGEND:

- MW-1 — SOIL BORING/ MONITORING WELL LOCATION (Well Identification)
- B-1 — SOIL BORING (Boring Identification)
- SB-1 — DAKOTA SOIL BORING (Boring Identification)
- FENCE
- RAILROAD TRACKS
- PROPERTY LINE
- (34) — FORMER AST LOCATION
- (S) — STAIN OBSERVED
- (D) — DEBRIS OBSERVED
- (P) — POND

NOTE: ALL LOCATIONS ARE APPROXIMATE

FORMER OIL SPILL

FORMER OIL SPILL

B-49 B-50 B-48 B-53 B-54 B-47 B-46 B-51 B-44 B-41 B-55 B-52 B-42 B-43 L-5 B-45 B-40 B-30 MW-15 B-31 B-26 B-32 B-33 B-28 B-24 MW-14 SB-2 SB-10 B-27 SB-9 MW-7 B-22 B-29 B-23 B-21 B-7 B-34 SB-11 MW-16 B-39 MW-6 B-25 B-38 SB-12 B-36 SB-1 SB-8 B-5 B-6 B-37 B-19 MW-8 B-12 B-4 B-20 B-16 MW-9 B-10 B-3 B-35 SB-5 MW-12 B-17 B-14 B-11 CONCRETE B-9 SB-6 CONCRETE SADDLES SB-3 B-15 B-8 MW-1 MW-17 MW-5 B-18 B-13 MW-10 B-2 FORMER ELECTRIC SUBSTATION B-1 SB-4 MW-19

COUNTY ROAD 350 SOUTH

MW-4 MW-3 MW-11 MW-13 SB-7 MW-2R MW-18

RESIDENTIAL

APPROXIMATE LOCATION OF IDNR WATER WELL 204808

N

200 0 50 100 150 200

SCALE: 1" = 200'

Drn. By:	Ckd. By:	App'd By:	Ckd. Date:
BH	BK		

Project Number: 170IFA0010

Drawing File: SEE LOWER LEFT

ATC

SITE PLAN

FORMER RJ REFINERY
COUNTY ROAD 350 SOUTH
PRINCETON, INDIANA

Date: 5/19

Scale: AS SHOWN

Figure: 2

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LEGEND:

- SOIL BORING/ MONITORING WELL LOCATION
  - MW-1 / 447.91 — Well Identification / Relative Groundwater Elevation(ft)
- FENCE
- RAILROAD TRACKS
- PROPERTY LINE
- 464 — INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- (34) FORMER AST LOCATION
- (S) STAIN OBSERVED
- (D) DEBRIS OBSERVED
- (P) POND

NOTE: ALL LOCATIONS ARE APPROXIMATE

FORMER OIL SPILL

FORMER OIL SPILL

MW-15 471.10

472

468

464

460

456

452

448

MW-14 473.01

MW-8 454.08

MW-7 471.80

MW-6 457.66

460

464

MW-16 449.01

MW-9 463.20

MW-12 450.21

MW-11 466.38

CONCRETE

CONCRETE SADDLES

468

MW-17 447.79

MW-19 447.74

FORMER ELECTRIC SUBSTATION

MW-1 447.91

COUNTY ROAD 350 SOUTH

MW-5 469.46

MW-4 469.94

MW-3 469.69

MW-10 465.37

MW-13 465.45

MW-18 447.96

MW-2R 446.71

RESIDENTIAL

APPROXIMATE LOCATION OF IDNR WATER WELL 204808

N

200 0 50 100 150 200

SCALE: 1" = 200'

Drn. By:	Ckd. By:	App'd By:	Ckd. Date:
BH	BK		

Project Number: 170IFA0010

Drawing File: SEE LOWER LEFT

ATC

POTENTIOMETRIC SURFACE MAP

QUARTERLY MONITORING REPORT – DATA DATE: APRIL 3 – 5, 2019

FORMER RJ REFINERY

COUNTY ROAD 350 SOUTH

PRINCETON, INDIANA

Date: 3/19

Scale: AS SHOWN

Figure: 3

H:\2019\INDIANA FINANCE AUTHORITY\FORMER RJ REFINERY\ENVIRO\1QMR2019\170IFA0010-POT.DWG, SITE

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Project Number: 170IFA0010
Drawing File: SEE LOWER LEFT
Date: 5/19
Scale: AS SHOWN
App'd By: | Ckd. By: BK | Dn. By: DH

Drawing Title:
SOIL ANALYTICAL MAP

FORMER RJ REFINERY
COUTNY ROAD 350 SOUTH
PRINCETON, INDIANA

Figure: 4

LEGEND:

MW-1 — MONITORING WELL LOCATION
Well Identification

0/0/00		Date
DCA	<1.0	1,2-Dichloroethane (ppb)
EDB	<1.0	1,2-Dibromoethane (ppb)
124TMB	<1.0	1,2,4-Trimethylbenzene (ppb)
135TMB	<1.0	1,3,5-Trimethylbenzene (ppb)
B	<1.0	Benzene (ppb)
E	<1.0	Ethylbenzene (ppb)
X	<1.0	Total Xylenes (ppb)
n-HEX	<1.0	n-Hexane (ppb)
NPABZ	<1.0	n-Propylbenzene (ppb)
T	<1.0	Toluene (ppb)
n-butyl	<1.0	n-butylbenzene (ppb)
C12DCE	<1.0	Cis-1,2,-Dichloroethene (ppb)
ISO	<1.0	Isopropylbenzene (ppb)
1-Meth	<1.0	1-Methylnaphthalene (ppb)
2-Meth	<1.0	2-Methylnaphthalene (ppb)
NAP	<1.0	Naphthalene (ppb)
BBA	<1.0	Benzo(a)anthracene (ppb)
ARO	<1.0	PCB - Arochlor 1260 (ppb)
BAP	<1.0	Benzo(a)pyrene (ppb)
COCs	<1.0	Compounds of Concern
RCOCs	<1.0	Remaining Compounds of Concern

ppb = PARTS PER BILLION

CONCENTRATIONS ABOVE THEIR RESPECTIVE RCG RESIDENTIAL TAP (DIRECT CONTACT) SCREENING LEVELS (UPDATED MARCH 2019)

CONCENTRATIONS ABOVE THEIR RESPECTIVE RCG RESIDENTIAL VAPOR EXPOSURE SCREENING LEVELS (UPDATED MARCH 2019)

CONCENTRATIONS ABOVE THEIR RESPECTIVE RCG COMMERCIAL/INDUSTRIAL VAPOR EXPOSURE SCREENING LEVELS (UPDATED MARCH 2019)

RCGSL = REMEDIATION CLOSURE GUIDE SCREENING LEVEL

PROPERTY LINE

(34) FORMER AST LOCATION

(S) STAIN OBSERVED

(D) DEBRIS OBSERVED

(P) POND

NOTE: ALL LOCATIONS ARE APPROXIMATE

FORMER OIL SPILL

FORMER OIL SPILL

MW-15	
4/4/2019	
B	2,780
E	1,900
124TMB	952
1-Meth	13.8
NAP	55.8
RCOCs	<RCGSL

MW-16	
4/4/2019	
B	4,570
E	3,340
T	14,300
X	16,600
124TMB	3,240
135TMB	765
1-Meth	150
2-Meth	235
NAP	373
RCOCs	<RCGSL

MW-14	
4/4/2019	
DCA	12.1
RCOCs	<RCGSL

MW-8	
4/5/2019	
B	25,300
E	2,430
T	17,400
124TMB	1,510
135TMB	372
X	12,300
1-Meth	27.3
2-Meth	41.1
C12DCE	851
NAP	130
RCOCs	<RCGSL

MW-7	
4/4/2019	
B	8.4
1-Meth	17.5
RCOCs	<RCGSL

MW-12	
4/4/2019	
B	3,030
E	987
124TMB	956
135TMB	234
T	1,640
RCOCs	<RCGSL

MW-17	
4/3/2019	
B	8,180
E	1,080
T	2,720
124TMB	1,140
135TMB	288
NAP	91.8
1-Meth	21.4
RCOCs	<RCGSL

MW-1	
4/4/2019	
B	8,850
E	2,070
T	15,600
124TMB	1,430
X	10,100
1-Meth	38.5
2-Meth	36.9
NAP	125
RCOCs	<RCGSL

MW-6	
4/4/2019	
B	175
RCOCs	<RCGSL

CONCRETE SADDLES

CONCRETE

FORMER ELECTRIC SUBSTATION

MW-2

MW-19	
4/3/2019	
B	4,930
NAP	2.7
RCOCs	<RCGSL

MW-2R	
4/3/2019	
B	4,700
E	1,680
T	2,920
124TMB	1,260
135TMB	294
1-Meth	15.5
NAP	117
RCOCs	<RCGSL

COUNTY ROAD 350 SOUTH

MW-5	
4/3/2019	
COCs	<RCGSL

MW-4	
4/3/2019	
COCs	<RCGSL

MW-3	
4/3/2019	
COCs	<RCGSL

MW-10	
4/4/2019	
B	529
1-Meth	23.5
NAP	4.6
RCOCs	<RCGSL

MW-9	
4/5/2019	
B	20,300
E	2,540
T	10,200
X	12,000
124TMB	1,540
1-Meth	35.4
2-Meth	53.5
NAP	187
RCOCs	<RCGSL

MW-11	
4/4/2019	
B	9,570
E	1,750
T	8,040
124TMB	1,040
1-Meth	14.2
NAP	26.4
RCOCs	<RCGSL

MW-13	
4/4/2019	
B	8,060
E	2,510
T	9,030
X	12,800
124TMB	1,550
135TMB	382
1-Meth	17.5
NAP	19.0
RCOCs	<RCGSL

MW-18	
4/3/2019	
B	9,380
E	2,610
T	3,560
X	12,400
124TMB	2,950
135TMB	677
1-Meth	293
2-Meth	488
NAP	629
RCOCs	<RCGSL

RESIDENTIAL

N

200 0 50 100 150 200

SCALE: 1" = 200'

H:\2019\INDIANA FINANCE AUTHORITY\FORMER RJ REFINERY\ENVIRO\QAPP\170IFA0010-GROUNDWATER.DWG, GROUNDWATER

Drn. By:	Ckd. By:	App'd By:	Ckd. Date:
BH	JW		

Project Number: 170IFA0010

Drawing File: SEE LOWER LEFT

ATC

GROUNDWATER ANALYTICAL MAP

FORMER RJ REFINERY
COUNTY ROAD 350 SOUTH
PRINCETON, INDIANA

Date: 3/19

Scale: AS SHOWN

Figure: 5

Appendix A

Soil Boring Logs

7988 Centerpoint Drive, Suite 100
Indianapolis, IN 46256
(317) 849-4990
Fax (317) 849-4278

TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
BORING #: **B-1**
PROJECT NAME: **Former RJ Refinery**
JOB #: **170SWIN05P**
PROJECT LOCATION: **County Road 350 South, Princeton, Indiana 47670**

DRILLING and SAMPLING INFORMATION

Date Started: **10/25/16**
Date Completed: **10/25/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
CONCRETE	0.5		1			0.0	
Light brown, dry SILTY CLAY (CL)			2	4.6		0.0	
		5	3			0.0	
			4			0.0	
- very moist below 15 ft			5	5.0		0.0	
		10	6			0.0	
			7	5.0		0.0	
- sandy clay below 15 ft		15	8			0.0	The soil samples collected from 0-2 ft and 23-24 ft intervals were submitted from laboratory analysis.
			9			0.0	
			10	5.0		0.0	
		20	11			0.0	
	23.0		12	5.0	▼	917	
Light gray, wet, fine to medium SAND (SW)			13			850	Olive green staining and hydrocarbon odor between 23-24 ft and 25-30 ft.
- light brown between 24-25 ft		25	14			806	
			15	3.0		170	
	30.0	30					
Bottom of Boring at 30 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
- Noted on Drilling Tools: **23.0** ft.
- At Completion (open hole): **23.8** ft.
- After -- hours: -- ft.
- Cave Depth: -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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Indianapolis, IN 46256
(317) 849-4990
Fax (317) 849-4278

TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
BORING #: **B-2**
PROJECT NAME: **Former RJ Refinery**
JOB #: **170SWIN05P**
PROJECT LOCATION: **County Road 350 South**, **Princeton, Indiana 47670**

DRILLING and SAMPLING INFORMATION

Date Started: **10/25/16**
Date Completed: **10/25/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
CONCRETE	0.5		1			1.0	
Light brown, dry SILTY CLAY (CL)			2	4.8		0.4	
			3			0.3	
		5					
- light green sandy clay below 5.0 ft			4	5.0		7.0	The soil samples collected from 0-2 ft and 8-10 ft intervals were submitted from laboratory analysis.
							Light green/black staining and hydrocarbon odor between 5-10 ft.
			5			10.0	
Bottom of Boring at 10 ft	10.0	10					Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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Fax (317) 849-4278

TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
BORING #: **B-3**
PROJECT NAME: **Former RJ Refinery**
JOB #: **170SWIN05P**
PROJECT LOCATION: **County Road 350 South, Princeton, Indiana 47670**

DRILLING and SAMPLING INFORMATION

Date Started: **10/25/16**
Date Completed: **10/25/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
TOPSOIL with trace concrete	0.5		1			0.0	
Light brown, dry SILTY CLAY (CL)			2	4.1		0.0	
		5	3			0.0	
			4			0.0	
- very moist below 7.0 ft			5	5.0		0.0	
- sandy clay below 9.5 ft		10	6			0.0	
			7	5.0		0.0	
		15	8			0.0	
			9			0.0	
			10	4.6		0.0	The soil samples collected from 0-2 ft and 24-25 ft intervals were submitted from laboratory analysis.
		20	11			1.2	
	23.0		12	5.0		1.5	
Light gray, moist, fine to medium SAND (SW)		25	13			730	Light olive green staining and hydrocarbon odor between 24-35 ft.
	27.0		14			237	
Light brown, very moist SANDY CLAY (CL)			15	5.0	●	95.1	
- wet at 29.7 ft		30	16			650	
			17	5.0		91.0	
	35.0	35	18			75.0	
Bottom of Boring at 35 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **29.7** ft.
▽ At Completion (open hole) **29.7** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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Indianapolis, IN 46256
(317) 849-4990
Fax (317) 849-4278

TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
PROJECT NAME: **Former RJ Refinery**
PROJECT LOCATION: **County Road 350 South, Princeton, Indiana 47670**

BORING #: **B-4**
JOB #: **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started: **10/25/16**
Date Completed: **10/25/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
TOPSOIL with trace wood fragments	0.5		1			0.0	
Light brown, dry SANDY CLAY (CL)			2	3.4		0.5	
		5	3			0.5	
			4			0.0	
			5	4.7		0.0	
		10	6			0.0	
- moist silty clay between 10.5-22 ft			7	2.3		0.0	
			8			0.0	
		15	9			0.0	
			10	4.2		0.0	The soil samples collected from 0-2 ft and 28-30 ft intervals were submitted from laboratory analysis.
		20	11			0.0	
- very moist below 22 ft			12	4.7		0.0	
		25	13			0.0	
			14			0.0	
			15	4.8	▽ ●	0.0	
- wet at 29.9 ft		30	16			0.0	
			17	5.0		0.0	
	35.0	35	18			0.0	
Bottom of Boring at 35 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **29.9** ft.
▽ At Completion (open hole) **28.4** ft.
▼ After **--** hours **--** ft.
▨ Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-5**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/25/16**
Date Completed **10/25/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
TOPSOIL	0.5		1			0.7	
Light brown, dry, crumbly CLAY (CL)			2	5.0		0.3	
			3			0.0	
- olive green to black, very moist silty clay		5					The soil samples collected from 0-2 ft and 8-10 ft intervals were submitted from laboratory analysis.
			4			2.5	
				5.0			Light olive green/black staining and hydrocarbon odor between 5-10 ft.
			5			24.5	
Bottom of Boring at 10 ft	10.0	10					Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
PROJECT NAME: **Former RJ Refinery**
PROJECT LOCATION: **County Road 350 South, Princeton, Indiana 47670**

BORING #: **B-6**
JOB #: **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started: **10/25/16**
Date Completed: **10/25/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
TOPSOIL	0.5		1			0.0	
Light brown, dry, crumbly CLAY (CL)			2	4.2		0.0	
		5	3			0.0	
			4			0.0	
- very moist silty clay below 7.0 ft			5	5.0		0.0	
		10	6			0.0	
- light gray, moist sandy clay below 12 ft			7	4.8		0.0	
		15	8			0.0	
- dark gray and very moist below 16 ft			9			0.0	
			10	4.0		0.0	The soil samples collected from 0-2 ft and 32-34 ft intervals were submitted from laboratory analysis.
		20	11			0.0	
			12	5.0		0.0	
		25	13			0.0	
			14			0.0	
			15	5.0	▽	0.0	
		30	16			0.0	
- wet at 33 ft			17	5.0	●	0.0	
	35.0	35	18			0.0	
Bottom of Boring at 35 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **33.0** ft.
▽ At Completion (open hole) **29.4** ft.
▼ After **--** hours **--** ft.
▨ Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
BORING #: **B-7**
PROJECT NAME: **Former RJ Refinery**
JOB #: **170SWIN05P**
PROJECT LOCATION: **County Road 350 South, Princeton, Indiana 47670**

DRILLING and SAMPLING INFORMATION

Date Started: **10/26/16**
Date Completed: **10/26/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry CLAYEY SAND (SC)	2.0		1			0.0	
Light brown, dry SANDY CLAY (CL)			2	4.6		0.0	
		5	3			0.0	
			4			0.0	
			5	5.0		0.0	
		10	6			0.0	
- light gray, moist silty clay below 11 ft			7	3.8		0.0	
		15	8			0.0	
			9			0.2	
- light brown below 17 ft			10	4.1		0.2	The soil samples collected from 0-2 ft and 26-28 ft intervals were submitted from laboratory analysis.
		20	11			0.0	
			12	5.0		0.0	
		25	13			0.0	
			14			0.0	
Light brown, wet, fine to medium SAND (SW) with interbedded sandy clay	28.0		15	5.0	●	0.0	
		30	16			0.0	
			17	5.0		0.0	
Light gray, moist SILTY CLAY (CL)	34.0						
Bottom of Boring at 35 ft	35.0	35	18			0.0	

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **28.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
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PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-8**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/25/16**
Date Completed **10/25/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
CONCRETE and debris			1			69.0	
Olive green, moist SILTY CLAY (CL)	2.0		2	3.2		37.0	
		5	3			420	The soil samples collected from 0-2 ft and 4-6 ft intervals were submitted from laboratory analysis.
			4			250	
			5	4.1		180	Olive green/black staining and hydrocarbon odor between 2-10 ft.
Bottom of Boring at 10 ft	10.0	10					Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
BORING #: **B-9**
PROJECT NAME: **Former RJ Refinery**
JOB #: **170SWIN05P**
PROJECT LOCATION: **County Road 350 South**
Princeton, Indiana 47670

DRILLING and SAMPLING INFORMATION

Date Started: **10/25/16**
Date Completed: **10/25/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
CONCRETE and debris	1.5		1			34.0	
Olive green, moist SILTY CLAY (CL)			2	4.5		196	
		5	3			177	The soil samples collected from 0-2 ft and 6-8 ft intervals were submitted from laboratory analysis.
			4			340	
- very moist below 7.0 ft				3.0			Olive green staining and hydrocarbon odor between 2-10 ft.
			5			144	
Bottom of Boring at 10 ft	10.0	10					Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-10**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/25/16**
Date Completed **10/25/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
TOPSOIL	0.5		1			1.5	
Light brown, dry, flaky SANDY CLAY (CL)			2	3.9		7.0	
			3			183	
- very moist slty clay below 5.0 ft		5					The soil samples collected from 0-2 ft and 8-10 ft intervals were submitted from laboratory analysis.
			4			718	
				4.3			Olive green staining and hydrocarbon odor between 5-10 ft.
			5			607	
Bottom of Boring at 10 ft	10.0	10					Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-11**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/28/16**
Date Completed **10/28/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry CLAYEY SILT (ML)	0.3		1			2.9	
Gray/olive green, moist SILTY CLAY (CL)			2	5.0		2.4	
			3			255	
		5					The soil samples collected from 0-2 ft and 8-10 ft intervals were submitted from laboratory analysis. MS/MSD samples were collected from the 0-2 ft and 8-10 ft intervals.
			4			248	
				5.0			
			5			267	
Bottom of Boring at 10 ft	10.0	10					Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-12**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/27/16**
Date Completed **10/27/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry CLAYEY SILT (ML)			1			5.5	
			2	4.0		4.1	
			3			214	
	5.0	5					
Black/olive green, moist SILTY CLAY (CL)			4			44.6	The soil samples collected from 0-2 ft and 4-6 ft intervals were submitted from laboratory analysis.
			5	4.7		133	
	10.0	10					
Bottom of Boring at 10 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-13**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **11/1/16**
Date Completed **11/1/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Gravel FILL			1			0.0	
	2.0						
Gray/olive green, slightly moist SILTY CLAY (CL)			2	4.8		30.4	
			3			186	
		5					The soil samples collected from 0-2 ft and 4-6 ft intervals were submitted from laboratory analysis.
			4			44.3	
- moist below 7.5 ft				4.7			
			5			15.2	
	10.0	10					
Bottom of Boring at 10 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-14**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/28/16**
Date Completed **10/28/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry CLAYEY SILT (ML)			1			0.0	
			2	5.0		0.0	
	3.0						
Black/olive green, moist SILTY CLAY (CL)		5	3			65.5	The soil samples collected from 0-2 ft and 6-8 ft intervals were submitted from laboratory analysis.
			4			265	
				5.0			
			5			160	
	10.0	10					
Bottom of Boring at 10 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
BORING #: **B-15**
PROJECT NAME: **Former RJ Refinery**
JOB #: **170SWIN05P**
PROJECT LOCATION: **County Road 350 South, Princeton, Indiana 47670**

DRILLING and SAMPLING INFORMATION

Date Started: **10/31/16**
Date Completed: **10/31/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)
Light brown, dry CLAYEY SILT (ML)			1			0.0
	2.0		2	3.3		126
Light brown/olive green, moist SILTY CLAY (CL)		5	3			92.4
			4			211
			5	4.5		35.7
		10	6			82.2
			7	4.9		143
			8			58.4
		15	9			53.0
			10	4.2		180
		20	11			42.1
			12	5.0		39.2
	24.0					
Brown, wet, fine to medium SAND (SW)		25	13		●	26.3
			14			1.7
			15	5.0		2.3
	30.0	30				
Bottom of Boring at 30 ft						

Sampling Notes

The soil samples collected from 0-2 ft and 6-8 ft intervals were submitted from laboratory analysis.

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **25.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-16**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/28/16**
Date Completed **10/28/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)
Light brown, dry CLAYEY SILT (ML)	2.0		1			0.0
Black/olive green, moist SILTY CLAY (CL)			2	4.0		0.0
		5	3			61.3
			4			57.8
- black between 8-17 ft			5	4.0		60.2
		10	6			359
			7	5.0		167
		15	8			1277
			9			595
- light brown below 17 ft			10	5.0		49.2
		20	11			27.1
			12	3.5		10.2
		25	13			143
			14			7.7
			15	4.3		0.0
	30.0	30			●	
Light gray, wet, fine SAND (SW)			16			0.0
			17	5.0		0.0
	35.0	35	18			0.0
Bottom of Boring at 35 ft						

Sampling Notes

The soil samples collected from 0-2 ft and 14-16 ft intervals were submitted from laboratory analysis.

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **30.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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Fax (317) 849-4278

TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-17**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/31/16**
Date Completed **10/31/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry CLAYEY SILT (ML)			1			0.0	
			2	4.7		0.0	
	4.0						
Light brown, dry SILTY CLAY (CL)		5	3			0.0	The soil samples collected from 0-2 ft and 8-10 ft intervals were submitted from laboratory analysis.
			4			0.0	
				5.0			
			5			0.0	
	10.0	10					
Bottom of Boring at 10 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
PROJECT NAME: **Former RJ Refinery**
PROJECT LOCATION: **County Road 350 South, Princeton, Indiana 47670**

BORING #: **B-18**
JOB #: **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started: **10/31/16**
Date Completed: **10/31/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Gravel/concrete debris (FILL)	1.0		1			0.3	
Light brown, dry CLAYEY SILT (ML)			2	4.3		0.0	
	5.0	5	3			0.0	
Brown/gray, moist SILTY CLAY (CL)			4			32.5	
			5	5.8		58.5	
		10	6			132	
			7	4.2		14.8	
- gray below 15 ft		15	8			52.9	
			9			61.2	
			10	4.0		6.5	The soil samples collected from 0-2 ft and 6-8 ft intervals were submitted from laboratory analysis. The duplicate 4 sample was collected from the 6-8 ft interval.
		20	11			4.6	
	22.0				●		
Light gray, wet, fine to medium SAND (SW)			12	4.8		0.0	
	25.0	25	13			0.0	
Gray, moist SILTY CLAY (CL)			14			0.0	
			15	4.8		0.0	
		30	16			16.2	
			17	5.0		1.0	
	35.0	35	18			0.0	
Bottom of Boring at 35 ft							

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **22.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-19**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/27/16**
Date Completed **10/27/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Gray/olive green, moist SILTY CLAY (CL)		5	1			8.3	
			2	4.7		35.2	
			3			105	
			4			235	
		10	5	4.7		52.5	
			6			94.6	
			7	5.0		47.6	
		15	8			82.8	
			9			163	
			10	4.8		71.7	The soil samples collected from 0-2 ft and 6-8 ft intervals were submitted from laboratory analysis. The duplicate 3 sample was collected from the 6-8 ft interval.
		20	11			30.7	
			12	5.0		45.5	
		25	13			17.7	
			14			4.3	
	28.0		15	5.0	●	97.7	
Light brown/olive green, wet, fine to medium SAND (SW)		30	16			0.0	
			17	5.0		0.0	
	35.0	35	18			0.0	
Bottom of Boring at 35 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **28.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-20**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/28/16**
Date Completed **10/28/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry CLAYEY SILT (ML)	2.0		1			0.5	
Olive green, moist SILTY CLAY (CL)			2	5.0		75.0	
		5	3			321	
			4			294	
			5	5.0		450	
		10	6			345	
			7	1.7		349	
		15	8			434	
			9			320	
- light to dark gray below 18 ft			10	4.0		106	
		20	11			636	The soil samples collected from 0-2 ft and 14-16 ft intervals were submitted from laboratory analysis.
			12	5.0		22.6	
		25	13			423	
			14			25.1	
			15	4.7		6.9	
		30	16			0.0	
			17	3.0		0.0	
		35	18			0.0	
- very moist and soft below 35 ft			19			0.0	
			20	3.8		0.0	
	40.0	40					
Bottom of Boring at 40 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
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TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
PROJECT NAME: **Former RJ Refinery**
PROJECT LOCATION: **County Road 350 South, Princeton, Indiana 47670**

BORING #: **B-21**
JOB #: **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started: **10/27/16**
Date Completed: **10/27/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)
TOPSOIL	0.5		1			15.3
Brown/olive green, moist SILTY CLAY (CL)			2	5.0		351
		5	3			253
- very moist below 6.0 ft			4			1263
			5	4.7		403
		10	6			79.3
			7	4.7		195
			8			150
- brown below 16 ft		15	9			344
			10	5.0		264
		20	11			544
	22.0					
Brown/olive green, moist, fine to medium SAND (SW)			12	4.5		1198
- wet at 25 ft		25	13		●	1252
			14			1346
			15	4.5		167
	30.0	30				
Bottom of Boring at 30 ft						

Sampling Notes

The soil samples collected from 0-2 ft and 24-26 ft intervals were submitted from laboratory analysis.

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **25.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-22**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/27/16**
Date Completed **10/27/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Brown, dry CLAYEY SILT (ML)			1			0.0	
			2	4.8		0.0	
			3			0.0	
	5.0	5					
Gray/olive green, moist SILTY CLAY (CL)			4			552	The soil samples collected from 0-2 ft and 6-8 ft intervals were submitted from laboratory analysis.
			5	5.0		310	
	10.0	10					
Bottom of Boring at 10 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-23**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/31/16**
Date Completed **10/31/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry CLAYEY SILT (ML)			1			2.0	
			2	5.0		27.2	
	3.0						
Brown/olive green, moist SILTY CLAY (CL)		5	3			344	The soil samples collected from 0-2 ft and 6-8 ft intervals were submitted from laboratory analysis.
			4	4.0		543	
			5			47.1	
	10.0	10					
Bottom of Boring at 10 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
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TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
BORING #: **B-24**
PROJECT NAME: **Former RJ Refinery**
JOB #: **170SWIN05P**
PROJECT LOCATION: **County Road 350 South, Princeton, Indiana 47670**

DRILLING and SAMPLING INFORMATION

Date Started: **10/28/16**
Date Completed: **10/28/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)
Light brown, dry CLAYEY SILT (ML)	1.0		1			0.0
Gray/black/olive green, moist SILTY CLAY (CL)			2	4.0		0.0
		5	3			8.3
			4			155
			5	5.0		177
		10	6			77.3
- light brown below 12 ft			7	4.8		94.2
		15	8			20.0
			9			8.4
			10	4.0		8.1
		20	11			450
			12	3.0		389
		25	13			20.2
			14			11.8
	28.0		15	5.0	●	5.6
Light brown, wet, fine to medium SAND (SW)		30	16			0.0
- light gray below 32 ft			17	5.0		0.0
	35.0	35	18			0.0
Bottom of Boring at 35 ft						

Sampling Notes

The soil samples collected from 0-2 ft and 20-22 ft intervals were submitted from laboratory analysis.

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **28.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-25**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/31/16**
Date Completed **10/31/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Gravel and sand FILL	0.5		1			13.8	
Gray/olive green, moist SILTY CLAY (CL)			2	3.8		890	
		5	3			49.7	
			4			770	
			5	4.7		270	
		10	6			174	
			7	4.2		79	
- light brown below 14 ft			8			21.6	The soil samples collected from 0-2 ft and 2-4 ft intervals were submitted from laboratory analysis. The duplicate 5 sample was collected from the 2-4 ft interval.
		15	9			282	
			10	3.0		13.1	
		20	11			32.1	
Gray, very moist, fine to medium SAND (SW)	23.0		12	3.0		82.3	
- wet at 25 ft		25	13		●	339	
			14			600	
			15	4.2		45.1	
Bottom of Boring at 30 ft	30.0	30					Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **25.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-26**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/31/16**
Date Completed **10/31/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry CLAYEY SILT (ML)			1			1.7	
			2	5.0		1.7	
	3.0						
Brown, moist SILTY CLAY (CL)							Green staining and hydrocarbon odor between 3-8 ft.
		5	3			280	
							The soil samples collected from 0-2 ft and 6-8 ft intervals were submitted from laboratory analysis.
			4			225	
				5.0			
			5			17.0	
	10.0	10					
Bottom of Boring at 10 ft							
							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-27**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/31/16**
Date Completed **10/31/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry CLAYEY SILT (ML)			1			3.9	
			2	4.3		16.3	
	4.0						
Gray/olive green, moist SILTY CLAY (CL)		5	3			32.5	The soil samples collected from 0-2 ft and 6-8 ft intervals were submitted from laboratory analysis.
			4	3.8		41.1	
			5			29.5	
	10.0	10					
Bottom of Boring at 10 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-28**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/26/16**
Date Completed **10/26/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry CLAYEY SAND (SC)			1			0.0	
	1.5						
Light brown, moist SANDY CLAY (CL)			2	4.7		0.0	
			3			0.0	
		5					The soil samples collected from 0-2 ft and 8-10 ft intervals were submitted from laboratory analysis.
- moist silty clay below 5.5 ft			4			0.0	
				4.3			
			5			0.0	
	10.0	10					
Bottom of Boring at 10 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
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SP - Submersible Pump

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TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
BORING #: **B-29**
PROJECT NAME: **Former RJ Refinery**
JOB #: **170SWIN05P**
PROJECT LOCATION: **County Road 350 South, Princeton, Indiana 47670**

DRILLING and SAMPLING INFORMATION

Date Started: **10/26/16**
Date Completed: **10/26/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light olive green, moist SILTY CLAY (CL)			1			7.5	
			2	5.0		26.5	
		5	3			6.7	Light olive green staining and hydrocarbon odor between 4-10 ft.
			4			57.9	
			5	4.8		9.7	
- light brown below 10 ft		10	6			6.8	
			7	4.9		0.8	
		15	8			0.1	
			9			0.2	
			10	5.0		0.4	The soil samples collected from 0-2 ft and 6-8 ft intervals were submitted from laboratory analysis.
		20	11			0.6	
			12	4.3		0.0	
		25	13			0.0	
	27.5		14		●	2.1	
Light brown, wet, fine to medium SAND (SW)			15	5.0		0.0	
		30	16			0.0	
			17	5.0		0.0	
	35.0	35	18			0.0	
Bottom of Boring at 35 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **27.5** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
BORING #: **B-30**
PROJECT NAME: **Former RJ Refinery**
JOB #: **170SWIN05P**
PROJECT LOCATION: **County Road 350 South, Princeton, Indiana 47670**

DRILLING and SAMPLING INFORMATION

Date Started: **10/26/16**
Date Completed: **10/26/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry SANDY CLAY (CL)			1			0.6	
			2	4.8		0.4	
		5	3			197	
			4			780	
			5	5.0		618	Hydrocarbon odor between 8-20 ft.
		10	6			147	
- moist silty clay below 12 ft			7	5.0		992	
			8			55.2	The soil samples collected from 0-2 ft and 12-14 ft intervals were submitted from laboratory analysis.
		15	9			154	
			10	4.9	▽	33.6	
		20	11			32.5	
	23.0		12	5.0		51.1	
Light brown, very moist, fine to medium SAND (SW)			13		●	20.4	
- wet at 25 ft		25	14			678	
			15	5.0		21.1	
	30.0	30					
Bottom of Boring at 30 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **25.0** ft.
▽ At Completion (open hole) **19.0** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-31**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/26/16**
Date Completed **10/26/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry SANDY CLAY (CL)			1			3.8	
			2	5.0		2.7	
			3			3.3	The soil samples collected from 0-2 ft and 4-6 ft intervals were submitted from laboratory analysis.
- olive green, moist to very moist silty clay below 4.5 ft		5	4			0.7	Olive green staining between 4.5-10 ft.
			5	5.0		0.0	
Bottom of Boring at 10 ft	10.0	10					Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-32**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/26/16**
Date Completed **10/26/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry, flaky SANDY CLAY (CL)			1			6.8	
			2	4.6		6.0	
			3			95.8	
- olive green, very moist silty clay below 5.0 ft		5					The soil samples collected from 0-2 ft and 4-6 ft intervals were submitted from laboratory analysis.
			4			4.2	
				4.4			Green staining and hydrocarbon odor between 5-10 ft.
			5			4.7	
	10.0	10					
Bottom of Boring at 10 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-33**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/25/16**
Date Completed **10/25/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
TOPSOIL	0.5		1			0.0	
Light brown, dry, crumbly CLAY (CL)			2	4.3		0.8	
		5	3			597	Hydrocarbon odor between 4-18 ft.
- light gray, moist silty clay below 5.5 ft			4			545	
			5	4.7		405	
		10	6			340	
			7	5.0		155	
			8			337	
		15	9			66.0	
			10	5.0		41.0	The soil samples collected from 0-2 ft and 4-6 ft intervals were submitted from laboratory analysis.
		20	11			16.0	
			12	5.0	●	330	
- light brown, wet sandy clay below 23 ft			13			35.0	
		25	14			15.0	
			15	5.0		9.5	
		30	16			4.2	
			17	5.0		3.1	
	34.0						
Brown, dry, fine to medium SAND (SW)	35.0	35	18			1.2	
Bottom of Boring at 35 ft							

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **24.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
PROJECT NAME: **Former RJ Refinery**
PROJECT LOCATION: **County Road 350 South, Princeton, Indiana 47670**

BORING #: **B-34**
JOB #: **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started: **10/25/16**
Date Completed: **10/25/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
TOPSOIL	0.5		1			1.4	
Light brown, dry, crumbly CLAY (CL)			2	3.5		104	
		5	3			381	Hydrocarbon odor between 4-10 ft.
- light gray/light brown, moist silty clay below 5.0 ft			4			626	
			5	5.0		1401	
		10	6			197	
			7	5.0		193	
		15	8			7.0	
			9			249	
			10	5.0		9.8	The soil samples collected from 0-2 ft and 8-10 ft intervals were submitted from laboratory analysis.
		20	11			41.3	
			12	5.0		13.8	
- light brown, wet sandy clay below 23.5 ft			13		●	0.8	
		25	14			25.1	
			15	5.0		29.3	
		30	16			7.1	
			17	5.0		5.2	
	34.0				▽		
Brown, dry, fine to medium SAND (SW)	35.0	35	18			3.3	
Bottom of Boring at 35 ft							

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **24.5** ft.
▽ At Completion (open hole) **33.9** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-35**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/25/16**
Date Completed **10/25/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)
TOPSOIL	0.5		1			0.0
Light brown, dry, crumbly SANDY CLAY (CL)			2	4.5		0.0
		5	3			0.0
			4			4200
			5	3.9		13.0
- light brown to gray, moist silty clay		10	6			9.0
			7	5.0		6.5
		15	8			3.5
			9			--
			10	0.0		--
		20	11			0.0
			12	4.2		0.0
		25	13			2.0
			14			2.1
			15	4.8		1.7
	31.0	30	16		●	2.0
Light brown, wet SILTY SAND (SM)			17	4.6		2.3
	35.0	35	18			16.0
Bottom of Boring at 35 ft						

Sampling Notes

The soil samples collected from 0-2 ft and 6-8 ft intervals were submitted from laboratory analysis.

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **31.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
PROJECT NAME: **Former RJ Refinery**
PROJECT LOCATION: **County Road 350 South, Princeton, Indiana 47670**
BORING #: **B-36**
JOB #: **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started: **11/1/16**
Date Completed: **11/1/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry SILTY CLAY (CL)			1			0.0	
			2	4.4		0.0	
		5	3			0.0	
- light gray/green and moist bbetween 5.5 and 14.5 ft			4			290	Olive green and hydrocarbon odor between 6-14.5 ft.
			5	5.0		9.6	
		10	6			1252	
			7	5.0		190	
			8			7.2	
		15	9			10.8	The soil samples collected from 0-2 ft and 10-12 ft intervals were submitted from laboratory analysis.
			10	3.3		4.8	
		20	11			212	
	21.5				●		
Light brown, wet, fine to medium SAND (SW)			12	5.0		4.5	
		25	13			1.2	
	27.0		14			0.0	
Light gray, moist SILTY CLAY (CL)			15	5.0		7.5	
	30.0	30					
Bottom of Boring at 30 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **21.5** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
PROJECT NAME: **Former RJ Refinery**
PROJECT LOCATION: **County Road 350 South, Princeton, Indiana 47670**

BORING #: **B-37**
JOB #: **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started: **11/1/16**
Date Completed: **11/1/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry SILTY CLAY (CL)			1			0.0	
			2	4.7		0.0	
		5	3			0.0	
			4			0.0	
			5	5.0		0.0	
		10	6			0.0	
- light brown and moist below 11 ft			7	5.0		0.0	The soil samples collected from 0-2 ft and 18-20 ft intervals were submitted from laboratory analysis.
		15	8			0.0	
			9			0.0	
	19.0		10	5.0		32.8	
Light brown, wet, fine to medium SAND (SW)		20	11			0.0	
- gray between 20-22 ft			12	5.0	●	0.0	
	25.0	25	13			0.0	
Bottom of Boring at 25 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **22.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-38**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **11/1/16**
Date Completed **11/1/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
TOPSOIL	0.5		1			0.2	
Light brown, dry SILTY CLAY (CL)			2	4.3		0.0	
		5	3			0.0	The soil samples collected from 0-2 ft and 8-10 ft intervals were submitted from laboratory analysis.
- moist below 6.0 ft			4	4.8		0.0	
			5			0.0	
Bottom of Boring at 10 ft	10.0	10					Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-39**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **11/1/16**
Date Completed **11/1/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry CLAYEY SAND (SC)			1			0.0	
	2.0						
Light brown, dry SANDY CLAY (CL)			2	4.2		0.0	
			3			0.0	
		5	4			0.0	
			5	4.9		0.0	
- moist to very moist silty clay below 10 ft		10	6			0.0	
			7	5.0		0.0	The soil samples collected from 0-2 ft and 18-19 ft intervals were submitted from laboratory analysis. The duplicate 6 sample was collected from the 0-2 ft interval.
		15	8			0.0	
			9			0.0	
	19.0		10	3.9	●	87	Light green staining and hydrocarbon odor from 18-19 ft.
Light brown, wet, fine to medium SAND (SW)		20	11			7.9	
			12	5.0		5.7	
	25.0	25	13			3.4	
Bottom of Boring at 25 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **19.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-40**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **11/1/16**
Date Completed **11/1/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
TOPSOIL with gravel	0.5		1			0.0	
Light brown, dry CLAYEY SILT (ML)			2	4.8		0.0	
		5	3			0.0	
	6.0		4			0.0	
Light gray, very moist SILTY CLAY (CL)			5	3.3	▽	0.0	The soil samples collected from 0-2 ft and 8-10 ft intervals were submitted from laboratory analysis.
- wet at 10 ft		10	6		●	0.0	
			7	4.2		0.0	
- light brown below 14 ft			8			0.0	
	15.0	15					
Bottom of Boring at 15 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **10.0** ft.
▽ At Completion (open hole) **8.5** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-41**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/31/16**
Date Completed **10/31/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry SILTY CLAY (CL)			1			0.0	
			2	4.3		0.0	
		5	3			0.0	The soil samples collected from 0-2 ft and 8-10 ft intervals were submitted from laboratory analysis. The MS/MSD 5 sample was collected from the 0-2 ft interval.
- moist below 5.0 ft			4	1.7		0.0	
			5			0.0	
Bottom of Boring at 10 ft	10.0	10					Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-42**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/26/16**
Date Completed **10/26/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry CLAYEY SAND (SC)			1			0.0	
	2.0						
Light brown, moist SILTY CLAY (CL)			2	3.3		0.0	
			3			0.0	
		5					The soil samples collected from 0-2 ft and 8-10 ft intervals were submitted from laboratory analysis.
			4			0.0	
				3.5			
			5			0.0	
	10.0	10					
Bottom of Boring at 10 ft							

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
PROJECT NAME: **Former RJ Refinery**
PROJECT LOCATION: **County Road 350 South, Princeton, Indiana 47670**

BORING #: **B-43**
JOB #: **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started: **11/1/16**
Date Completed: **11/1/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)
Light brown, dry SILTY CLAY (CL)			1			0.0
			2	1.0		0.0
			3			0.0
- gray and very moist below 5.0 ft		5				
			4			0.0
			5	5.0		0.0
- wet between 10-14 ft		10	6		●	0.0
			7	2.8		0.0
- light brown below 14 ft			8			0.0
	15.0	15				
Bottom of Boring at 15 ft						

Sampling Notes

The soil samples collected from 0-2 ft and 8-10 ft intervals were submitted from laboratory analysis.

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **10.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-44**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **11/1/16**
Date Completed **11/1/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Flameionizable Vapors (ppm)	Sampling Notes
Gravel FILL	0.5		1			1.2	
Light brown, slightly moist to moist SILTY CLAY (CL)			2	4.7		1.2	
		5	3			1.3	
			4			1.6	
			5	4.0		1.6	
		10	6			0.8	
			7	4.0		0.9	
		15	8			1.0	
			9			1.6	
			10	4.0		1.7	
		20	11			1.5	The soil samples collected from 0-2 ft and 33-35 ft intervals were submitted from laboratory analysis.
			12	5.0		2.1	
- gray and moist below 24 ft		25	13			2.6	
			14			0.6	
			15	2.7		0.6	
		30	16			0.1	
			17			0.0	
			18	4.7	●	0.1	
Gray, wet, fine to medium SAND (SW)	35.0	35	19			0.0	
			20	4.3		0.0	
Bottom of Boring at 40 ft	40.0	40					Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **35.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
PROJECT NAME: **Former RJ Refinery**
PROJECT LOCATION: **County Road 350 South, Princeton, Indiana 47670**

BORING #: **B-45**
JOB #: **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started: **10/31/16**
Date Completed: **10/31/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry CLAYEY SILT (ML)	0.5		1			1.0	
Light brown, moist SILTY CLAY (CL)			2	5.0		0.8	
		5	3			0.6	
			4			0.5	
			5	4.6		0.4	
		10	6			0.4	
			7	4.4		0.4	
			8			0.3	
		15	9			0.0	
			10	5.0		0.0	The soil samples collected from 0-2 ft and 24-26 ft intervals were submitted from laboratory analysis.
		20	11			0.0	
- gray below 23 ft			12	5.0		0.0	
		25	13			0.0	
	27.0		14		●	0.0	
Light brown, wet, coarse SAND (SW)	28.0						
Light gray, moist SILTY CLAY (CL)			15	5.0		0.0	
		30	16			0.0	
			17	5.0		0.0	
	35.0	35	18			0.0	
Bottom of Boring at 35 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **27.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-46**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/27/16**
Date Completed **10/27/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry clayey silt			1			0.0	
			2	5.0		0.0	
			3			0.0	
	5.0	5					
Light brown, moist SILTY CLAY (CL)			4			0.0	The soil samples collected from 0-2 ft and 8-10 ft intervals were submitted from laboratory analysis.
			5	3.8		0.0	
	10.0	10					
Bottom of Boring at 10 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-47**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/27/16**
Date Completed **10/27/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)
Light brown, dry CLAYEY SILT (ML)			1			0.0
			2	4.7		0.0
		5	3			0.0
	6.0		4			0.0
Gray, moist SILTY CLAY (CL)			5	4.8		0.0
		10	6			0.0
			7	3.5		0.0
		15	8			0.0
			9			0.0
			10	3.5		0.0
		20	11			0.0
			12	3.9		0.0
		25	13			0.0
	26.0				●	
Gray/brown, wet, fine to medium SAND (SW)			14			0.0
	28.0					
Gray, moist SILTY CLAY (CL)			15	4.4		0.0
	30.0	30				
Bottom of Boring at 30 ft						

Sampling Notes

The soil samples collected from 0-2 ft and 24-26 ft intervals were submitted from laboratory analysis.

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **26.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-48**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/27/16**
Date Completed **10/27/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry clayey silt			1			0.0	
			2	4.8		0.0	
			3			0.0	
	5.0	5					
Black, moist SILTY CLAY (CL)							The soil samples collected from 0-2 ft and 5-6 ft intervals were submitted from laboratory analysis.
light brown/olive green below 6.0 ft			4			0.0	
				4.0			
			5			0.0	
	10.0	10					
Bottom of Boring at 10 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-49**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/27/16**
Date Completed **10/27/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)
Light brown, dry CLAYEY SAND (SC)			1			1.2
			2	5.0		0.0
	5.0	5	3			0.0
Light brown/olive green, moist SILTY CLAY (CL)			4			0.0
			5	5.0		0.0
		10	6			0.0
			7	3.3		9.5
- light brown between 14-20 ft		15	8			0.0
			9			1.6
			10	5.0		0.0
		20	11			0.0
- light brown between 21-27 ft			12	4.5		0.0
		25	13			0.0
- light gray below 27 ft			14			0.0
			15	5.0		0.0
		30	16			0.0
			17	5.0		0.0
	35.0	35	18		●	0.0
Light gray, wet, fine to medium SAND (SW)			19			0.0
	40.0		20	5.0		0.0
		40				
Bottom of Boring at 40 ft						

Sampling Notes

The soil samples collected from 0-2 ft and 12-14 ft intervals were submitted from laboratory analysis.

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **35.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-50**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/27/16**
Date Completed **10/27/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry CLAYEY SAND (SC)			1			0.0	
	3.0		2	4.7		0.0	
Light gray, moist SILTY CLAY (CL)		5	3			19.8	
			4			10.1	
			5	4.5		10.1	
		10	6			12.1	
			7	3.7		25.1	
			8			4.6	
		15	9			9.8	
- light brown between 16-29 ft			10	3.7		0.0	
		20	11			24.1	The soil samples collected from 0-2 ft and 12-14 ft intervals were submitted from laboratory analysis.
			12	4.7		11.5	
		25	13			4.1	
			14			0.5	
			15	5.0		0.1	
- gray below 29 ft		30	16			0.0	
			17	4.7		0.0	
- very moist between 34-35 ft		35	18			0.0	
	36.0		19		●	0.0	
Light gray, wet, fine to medium SAND (SW)			20	5.0		0.0	
	40.0	40					
Bottom of Boring at 40 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **36.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT: **Economic Development Coalition of Southwest Indiana**
BORING #: **B-51**
PROJECT NAME: **Former RJ Refinery**
JOB #: **170SWIN05P**
PROJECT LOCATION: **County Road 350 South, Princeton, Indiana 47670**

DRILLING and SAMPLING INFORMATION

Date Started: **10/26/16**
Date Completed: **10/26/16**
Drill Foreman: **Z. Vaughn**
Boring Method: **Geoprobe**
Sampler OD: **2.0** in.
Inspector: **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)
TOPSOIL	0.5		1			0.0
Light brown, dry CLAYEY SAND (SC)			2	4.8		1.0
	4.0					
Light gray/green, moist SILTY CLAY (CL)		5	3			69.0
			4			6.0
- light brown and very moist below 7.0 ft			5	5.0		4.2
		10	6			3.1
			7	5.0		2.1
			8			1.1
		15	9			10.7
			10	5.0		1.9
		20	11			1.9
- light gray below 22 ft			12	5.0		0.6
- sandy clay below 24 ft	24.8		13		●	0.1
Light gray, wet, fine to medium SAND (SW)		25	14			0.1
			15	5.0		0.1
	30.0	30				
Bottom of Boring at 30 ft						

Sampling Notes

The soil samples collected from 0-2 ft and 4-6 ft intervals were submitted from laboratory analysis.

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **24.8** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-52**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/26/16**
Date Completed **10/26/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry CLAYEY SAND (SC)			1			0.0	
			2	4.3		0.6	
	4.5		3			92.0	
Light brown/olive green, moist SILTY CLAY (CL)		5					The soil samples collected from 0-2 ft and 4-6 ft intervals were submitted from laboratory analysis. The duplicate 2 sample was collected from the 4-6 ft interval.
			4			42.0	
				4.3			
			5			81.0	
	10.0	10					
Bottom of Boring at 10 ft							

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-53**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/26/16**
Date Completed **10/26/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
TOPSOIL	0.5		1			0.0	
Light brown, dry CLAYEY SAND (SC)			2	4.5		0.0	
	3.0						
Light brown, dry SILTY CLAY (CL)			3			0.0	
- moist below 4.5 ft		5					The soil samples collected from 0-2 ft and 8-10 ft intervals were submitted from laboratory analysis.
			4			0.0	
				5.0			
			5			0.0	
	10.0	10					
Bottom of Boring at 10 ft							

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-54**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/27/16**
Date Completed **10/27/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry CLAYEY SAND (SC)			1			0.0	
	1.0						
Light brown/olive green, moist SILTY CLAY (CL)			2	4.7		51.6	
			3			7.5	
		5					The soil samples collected from 0-2 ft and 2-4 ft intervals were submitted from laboratory analysis.
			4			6.6	
				5.0			
			5			1.9	
	10.0	10					
Bottom of Boring at 10 ft							

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
Noted on Drilling Tools -- ft.
At Completion (open hole) -- ft.
After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Economic Development Coalition of Southwest Indiana**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South**
Princeton, Indiana 47670

BORING # **B-55**
JOB # **170SWIN05P**

DRILLING and SAMPLING INFORMATION

Date Started **10/27/16**
Date Completed **10/27/16**
Drill Foreman **Z. Vaughn**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **R. Jennings**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)
Light brown, slightly moist CLAYEY SILT (ML)			1			0.0
			2	4.7		0.0
	4.0					
Light brown, moist SILTY CLAY (CL)		5	3			0.0
			4			0.0
			5	4.5		0.0
		10	6			0.0
			7	5.0		0.0
		15	8			0.0
			9			0.0
			10	5.0		0.0
		20	11			0.0
- gray below 22 ft			12	5.0		0.0
	25.0	25	13		●	0.0
Light brown, wet, fine to medium SAND (SW)			14			0.0
	27.0					
Gray, moist SILTY CLAY (CL)			15	5.0		0.0
	30.0	30				
Bottom of Boring at 30 ft						

Sampling Notes

The soil samples collected from 0-2 ft and 16-18 ft intervals were submitted from laboratory analysis.

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **25.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

BORING # **MW-01**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started	4/27/18	Well Material	PVC
Date Completed	4/27/18	Well Diameter	2.0 in.
Drill Foreman	Z. Vaughan	Screen Length	20 ft
Inspector	J. Winsett	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	WP

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Well Diagram	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)
White, dry, SILTY SANDY GRAVEL (GP)	0.5			1			0.0
Brown, slightly moist, SILTY SANDY CLAY (CL)				2			0.0
		5		3			0.0
- very moist silty clay below 5.0 ft				4			0.0
				5	4.2		0.0
		10		6			9.6
- grayish brown and moist between 12-14.5 ft				7	4.3		22.8
		15		8			49.5
- orangish brown with gray mottling, moist, sandy clay below 14.5 ft				9			0.0
				10	4.2		3.2
		20		11			0.0
	23.5			12	4.3		0.0
Brown, moist to wet, very fine to fine, CLAYEY SAND (SC)	24.0			13		●	0.0
Orangish brown, moist, SANDY CLAY (CL)	26.0	25		14			0.0
Brown, wet, very fine to fine, CLAYEY SAND (SC)	29.5			15	4.3		109
Dark brownish gray, wet, very fine, SAND (SP)	30.0	30		16			--
Blank drilled				17			--
				18			--
		35		19		▼	--
	40.0			20			--
		40					
Bottom of Boring at 40 ft							

Sampling Notes

A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.

The soil samples collected from the 0-2 ft and 14-16 ft intervals were submitted for laboratory analysis.

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater

●	Noted on Drilling Tools	26.0 ft.
▽	At Completion (open hole)	38.1 ft.
▼	After 24 hours	37.4 ft.
▩	Cave Depth	-- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
WP - Whale Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41, Princeton, Indiana 47670**

BORING # **MW-02**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started	4/27/18	Well Material	PVC
Date Completed	4/27/18	Well Diameter	2.0 in.
Drill Foreman	Z. Vaughan	Screen Length	10 ft
Inspector	J. Winsett	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	WP

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Well Diagram	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)
Dark brown, moist, CLAYEY SILT (ML)	1.0			1			0.0
Brown, moist, SILTY CLAY (CL)				2			0.0
		5		3			0.0
				4			10.2
- very moist, silty sandy clay between 8.0-12 ft				5	4.5		8.1
		10		6			4.9
- orangish brown, wet, sandy clay below 12 ft				7	4.3	●	4.2
				8			2.5
		15		9			4.2
	17.5						
Orangish brown, wet, fine, CLAYEY SAND (SC)	18.0			10	4.2		1.5
Brown, very moist, SANDY CLAY (CL)		20		11			0.9
	21.0						
Brown, wet, very fine to fine, CLAYEY SAND (SC)				12	4.2		0.3
		25		13			1.1
				14			0.0
				15	4.3	▼	0.0
	30.0	30				▽	
Bottom of Boring at 30 ft							

Sampling Notes

A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.

The soil samples collected from the 0-2 ft and 6-8 ft intervals were submitted for laboratory analysis.

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater

●	Noted on Drilling Tools	12.0	ft.
▽	At Completion (open hole)	29.4	ft.
▼	After 24 hours	28.1	ft.
▩	Cave Depth	--	ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
WP - Whale Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41, Princeton, Indiana 47670**

BORING # **MW-03**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started	4/26/18	Well Material	PVC
Date Completed	4/26/18	Well Diameter	2.0 in.
Drill Foreman	Z. Vaughan	Screen Length	10 ft
Inspector	J. Winsett	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	WP

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Well Diagram	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)
Dark brown, moist, CLAYEY SILT (ML)	0.5			1			0.0
Brown, moist, SILTY SANDY CLAY (CL)				2			0.0
		5		3			2.2
				4			30.7
- grayish brown, silty clay below 8.0 ft				5	5.0		456
		10		6			351
- orangish brown with gray mottling and moist to very moist below 12 ft				7	4.2	▼	166
				8			91.2
	16.0	15		9			188
Brown, moist to very moist, very fine, CLAYEY SAND (SC)				10	4.2		207
- orangish brown between 17.5-21 ft							
		20		11			202
- gray, very moist, very fine clayey sand below 21 ft	23.0			12	4.3	▽	445
Brown, moist to very moist, SANDY CLAY (CL)				13			120.3
		25		14		●	38.3
	27.0						
Orangish brown, very moist to wet, very fine, CLAYEY SAND (SC)	29.0			15	4.2		21.2
Grayish brown, wet, very fine, SAND (SP)		30		16			4.5
				17	4.2		4.0
	35.0	35		18			3.2
Bottom of Boring at 35 ft							

Sampling Notes

A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.

The soil samples collected from the 0-2 ft and 8-10 ft intervals were submitted for laboratory analysis.

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater

●	Noted on Drilling Tools		27.0 ft.
▽	At Completion (open hole)		22.2 ft.
▼	After 24 hours		12.5 ft.
▨	Cave Depth		-- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
WP - Whale Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

BORING # **MW-04**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started	4/26/18	Well Material	PVC
Date Completed	4/26/18	Well Diameter	2.0 in.
Drill Foreman	Z. Vaughan	Screen Length	10 ft
Inspector	J. Winsett	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	WP

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Well Diagram	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)
Dark brown, moist, SANDY SILTY CLAY (CL) - brown, silty clay between 0.5-11 ft				1			0.0
				2			0.0
		5		3			0.0
				4			0.0
				5	4.8	▼	0.0
		10		6			0.0
- grayish brown with gray mottling below 11 ft				7	4.0		0.0
- wet below 15 ft		15		8		● ▽	0.0
				9			0.0
	18.0			10	4.0		0.0
Orangish brown, wet, very fine to fine, CLAYEY SAND (SC)		20		11			0.0
				12	4.2		0.0
- grayish brown, very fine, clayey sand below 23 ft	25.0	25		13			0.0
Bottom of Boring at 25 ft							

Sampling Notes

A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.

The soil samples collected from the 0-2 ft and 8-10 ft intervals were submitted for laboratory analysis.

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater

●	Noted on Drilling Tools	15.0	ft.
▽	At Completion (open hole)	16.0	ft.
▼	After 24 hours	8.0	ft.
	Cave Depth	--	ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
WP - Whale Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

BORING # **MW-05**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started	4/26/18	Well Material	PVC
Date Completed	4/26/18	Well Diameter	2.0 in.
Drill Foreman	Z. Vaughan	Screen Length	10 ft
Inspector	J. Winsett	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	WP

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Well Diagram	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Dark brown, moist to very moist, CLAYEY SILT (ML)	0.5			1			0.0	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Brown, moist to very moist, SILTY CLAY (CL)				2			0.0	
		5		3			0.0	
				4			0.0	
				5	3.5	▼	0.0	
		10		6			0.0	The soil samples collected from the 0-2 ft and 10-12 ft intervals were submitted for laboratory analysis.
- grayish brown, very moist to wet, silty sandy clay below 11 ft				7	4.2		0.0	
		15		8		●	0.0	
	17.0			9			0.0	
Orangish brown, wet, fine to very fine, CLAYEY SAND (SC)				10	4.5		0.0	
	20.0	20						
Bottom of Boring at 20 ft								Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater

●	Noted on Drilling Tools	15.0 ft.
▽	At Completion (open hole)	15.2 ft.
▼	After 24 hours	8.3 ft.
▨	Cave Depth	-- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
WP - Whale Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41, Princeton, Indiana 47670**

BORING # **MW-06**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started	5/1/18	Well Material	PVC
Date Completed	5/1/18	Well Diameter	2.0 in.
Drill Foreman	Z. Vaughan	Screen Length	20 ft
Inspector	J. Winsett	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	WP

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Well Diagram	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Dark brown, moist to very moist, CLAYEY SILT (ML)	0.5			1			0.0	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Brownish gray with brown mottling, slightly moist, SILTY CLAY (CL) - brown and moist between 2.0-4.0 ft - greenish gray and moist to very moist between 4.0-12 ft		5		2	5.0		0.0	
				3			1707	
				4			1453	
		10		5	4.0		782	
				6			1106	
- brownish gray with brown mottling and moist between 12-13.5 ft - orangish brown with gray mottling, moist, silty sandy clay between 13.5-16 ft				7	4.0		246	
		15		8			132	
- orangish brown, moist, sandy clay below 16 ft				9			50.7	
Brown, wet, fine to very fine, CLAYEY SAND (SC)	18.0 20.0			10	4.2	●	19.8	The soil samples collected from the 0-2 ft and 4-6 ft intervals were submitted for laboratory analysis.
Dark gray, wet, very fine, SAND (SP)	20.5	20		11		▼	11.2	
Brown, wet, CLAYEY SAND (SC)	23.5			12	4.0		7.8	
Gray, wet, SANDY CLAY (CL)	25.0			13			0.0	
Blank drilled		25		14			--	
				15			--	
		30		16			--	
				17			--	
	35.0	35		18			--	
Bottom of Boring at 35 ft								Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools 18.0 ft.
▽ At Completion (open hole) 21.8 ft.
▼ After 24 hours 21.6 ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
WP - Whale Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

BORING # **MW-07**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started	4/24/18	Well Material	PVC
Date Completed	4/24/18	Well Diameter	2.0 in.
Drill Foreman	Z. Vaughan	Screen Length	10 ft
Inspector	J. Winsett	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	WP

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Well Diagram	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Dark brown, moist, CLAYEY SAND SILT (ML)	0.5			1			0.0	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Brown, moist, SILTY CLAY (CL)				2	3.5		62.1	
- brownish gray between 2.5-9.0 ft		5		3			2461	Strong hydrocarbon odor at 4.0 ft.
				4		▼	240	
				5	4.2	●	264	
- greenish gray, wet, sandy clay below 9.0 ft		10		6		▽	249	
				7	4.2		28.2	The soil samples collected from the 0-2 ft and 4-6 ft intervals were submitted for laboratory analysis.
	15.0	15		8			48.2	
Bottom of Boring at 15 ft								Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater

●	Noted on Drilling Tools	9.0 ft.
▽	At Completion (open hole)	11.3 ft.
▼	After 24 hours	6.1 ft.
▨	Cave Depth	-- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
WP - Whale Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41, Princeton, Indiana 47670**

BORING # **MW-08**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started	4/25/18	Well Material	PVC
Date Completed	4/25/18	Well Diameter	2.0 in.
Drill Foreman	Z. Vaughan	Screen Length	20 ft
Inspector	J. Winsett	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	WP

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Well Diagram	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Dark brown, slightly moist to moist, CLAYEY SILT (ML)				1			0.0	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
				2	1.0		57.4	
	5.0	5		3			60.3	
Brownish gray, very moist, SILTY CLAY (CL)				4			580	
- gray and very moist between 8.0-10 ft				5	4.0		774	
- wet between 10-13.5 ft		10		6			2204	
				7			4143	
- brown with gray mottling, moist, silty sandy clay below 13.5 ft				8	4.2		2107	
		15		9			716	
	18.0			10	4.3		2348	The soil samples collected from the 0-2 ft and 12-14 ft intervals were submitted for laboratory analysis. A blind duplicate soil sample was collected from the 12-14 ft interval.
Brown, very moist, fine to very fine, CLAYEY SAND (SC)						●		
- wet below 20 ft	21.0	20		11			550	
Orangish brown, wet, very fine, SAND (SP)				12	4.3		1780	
	25.0	25		13			2240	
Blank drilled				14			4603	
				15	4.2	▼	623	
		30		16			--	
				17			--	
	35.0	35		18			--	
Bottom of Boring at 35 ft								Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater

● Noted on Drilling Tools	20.0	ft.
▽ At Completion (open hole)	29.4	ft.
▼ After 24 hours	29.1	ft.
Cave Depth	--	ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
WP - Whale Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

BORING # **MW-09R**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started	4/24/18	Well Material	PVC
Date Completed	4/24/18	Well Diameter	2.0 in.
Drill Foreman	Z. Vaughan	Screen Length	10 ft
Inspector	J. Winsett	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	WP

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Well Diagram	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Dark brown, moist to very moist, CLAYEY SILT (ML)	0.3			1			0.0	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Brown with gray mottling, moist, SILTY CLAY (CL)				2	3.7		0.0	
		5		3			0.0	
				4			575	Hydrocarbon odor at 6.0 ft.
- gray, silty sandy clay between 7.5-12.5 ft				5	4.5		3820	
		10		6			668	
				7	4.7		3420	
- brown between 12.5-14.5 ft								
- greenish gray below 14.5 ft				8			2634	
		15						The soil samples collected from the 0-2 ft and 8-10 ft intervals were submitted for laboratory analysis.
				9			3109	
	17.5							
Greenish gray, moist to wet, CLAYEY SAND (SC)				10	4.5	●	3208	
		20		11			4001	
				12	4.5	▽	443	
				13			498	
		25						
				14			806	
- orangish brown and very moist to wet below 27.5				15	1.5		--	
	30.0	30						
Bottom of Boring at 30 ft								Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **19.0** ft.
▽ At Completion (open hole) **23.5** ft.
▼ After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
WP - Whale Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41, Princeton, Indiana 47670**

BORING # **MW-10**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started	4/25/18	Well Material	PVC
Date Completed	4/25/18	Well Diameter	2.0 in.
Drill Foreman	Z. Vaughan	Screen Length	20 ft
Inspector	J. Winsett	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	WP

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Well Diagram	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Dark brown, moist, clayey gravelly sandy SILT (ML)	0.3			1			12.0	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Brown, moist, SILTY CLAY (CL) with trace sand and gravel - black and very moist to wet between 4.0-4.75 ft - grayish brown and moist to wet between 4.75-10 ft		5		2 3 4 5	4.0 4.2		58.2 707 1603 242	Hydrocarbon odor at 4.0 ft.
- gray and very moist to wet between 10-12 ft		10		6			78.2	
- very moist, silty sandy clay below 12 ft				7	4.5		108.2	
	16.0	15		8		●	122	
Gray, wet, very fine CLAYEY SAND (SC)				9			128	
- brown, fine to very fine clayey sand between 19-23.5 ft		20		10 11 12	3.0 2.7	▼	140 78.2 42.3	The soil samples collected from the 0-2 ft and 6-8 ft intervals were submitted for laboratory analysis.
- orangish bown and wet to very wet below 23.5 ft		25		13 14			44.8 12.4	
		30		15 16	3.0	▽	39.4 21.3	
				17	3.5		14.0	
	35.0	35		18			28.2	
Bottom of Boring at 35 ft								Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater

●	Noted on Drilling Tools	16.0	ft.
▽	At Completion (open hole)	28.4	ft.
▼	After 24 hours	18.7	ft.
▨	Cave Depth	--	ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
WP - Whale Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41, Princeton, Indiana 47670**

BORING # **MW-11**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started	4/23/18	Well Material	PVC
Date Completed	4/23/18	Well Diameter	2.0 in.
Drill Foreman	Z. Vaughan	Screen Length	10 ft
Inspector	J. Winsett	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	WP

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Well Diagram	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Light brown, dry, SANDY CLAYEY SILT (ML)	1.0			1			3.4	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
- brown below 0.5 ft								
Brownish gray, moist, SILTY CLAY (CL)				2	3.0		15.6	
- gray below 4.0 ft		5		3			214	
				4			94.1	
				5	4.2		52.8	
		10		6			404	
				7	4.0		822	
- sandy clay below 14 ft		15		8			260	
				9			68.7	The soil samples collected from the 0-2 ft and 12-14 ft intervals were submitted for laboratory analysis.
- grayish brown below 18.5 ft				10	4.3		34.8	
		20		11			661	
	22.0					▼		
Brown, moist to very moist, fine to very fine, CLAYEY SAND (SC)				12	4.2		66.4	
- orangish brown with intermittent brown and gray sand seams between 24-26 ft		25		13			173	
- wet, very fine, clayey sand below 26 ft				14		●	28.9	
- gray below 28 ft				15	4.5	▽	54.1	
	30.0	30						
Bottom of Boring at 30 ft								Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools 26.0 ft.
▽ At Completion (open hole) 28.5 ft.
▼ After 24 hours 22.0 ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
WP - Whale Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41, Princeton, Indiana 47670**

BORING # **MW-12**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started	4/23/18	Well Material	PVC
Date Completed	4/23/18	Well Diameter	2.0 in.
Drill Foreman	Z. Vaughan	Screen Length	10 ft
Inspector	J. Winsett	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	WP

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Well Diagram	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Dark brown, slightly moist, CLAYEY SILT (ML)	0.3			1			0.0	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Brown, slightly moist, SILTY CLAY (CL)				2	2.7		0.0	
		5		3			0.0	
				4			0.0	
				5	4.0		0.0	
- gray between 9.0-11 ft		10		6			0.0	
- gray and orangish brown and moist between 11-13 ft				7	4.5		0.0	
- orangish brown with gray mottling and moist below 13 ft		15		8			0.0	
				9			0.0	
				10	4.5		0.0	The soil samples collected from the 0-2 ft and 24-26 ft intervals were submitted for laboratory analysis.
		20		11			0.0	
	23.0			12	4.3		132	
Orangish brown, moist, very fine, CLAYEY SAND (SC)				13			727	
- gray between 24-26 ft		25		14			253	
- gray between 27-29 ft				15	4.2		203	
		30		16			209	
	32.5			17	4.5	▼	650	
Blank drilled				18		▽	--	
		35						
	37.0			19			--	
Bottom of Boring at 37 ft								

Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater

● Noted on Drilling Tools	32.5	ft.
▽ At Completion (open hole)	35.2	ft.
▼ After 24 hours	33.1	ft.
Cave Depth	--	ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
WP - Whale Pump

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TEST BORING LOG

CLIENT: **Indiana Finance Authority**
PROJECT NAME: **Former RJ Refinery**
PROJECT LOCATION: **County Road 350 South and U.S. Highway 41, Princeton, Indiana 47670**

BORING #: **MW-13**
JOB #: **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started	4/25/18	Well Material	PVC
Date Completed	4/25/18	Well Diameter	2.0 in.
Drill Foreman	Z. Vaughan	Screen Length	20 ft
Inspector	J. Winsett	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	WP

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Well Diagram	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Dark brown, moist, CLAYEY SILT (ML)	0.5			1			5.9	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
- brown below 0.25 ft				2	4.0		8.9	
Brownish gray, moist, SILTY CLAY (CL)		5		3			122	Hydrocarbon odor at 3.5 ft.
				4			576	
				5	4.2		4561	
		10		6			1508	
- wet below 12 ft				7	4.5	●	3362	
- grayish brown, silty sandy clay below 12.5 ft	13.0			8			3892	The soil samples collected from the 0-2 ft and 8-10 ft intervals were submitted for laboratory analysis. A MS/MSD soil sample was collected from the 0-2 ft interval.
Blank drilled		15		9			1438	
				10	4.8		1130	
		20		11			423	
				12	4.5	▼	270	
		25		13			--	
				14			--	
Bottom of Boring at 28 ft	28.0							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools 12.0 ft.
▽ At Completion (open hole) -- ft.
▼ After 24 hours 23.1 ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
WP - Whale Pump

ENV_GEOPROBE_WELL REV1 170IFA0010.GPJ ATCENVGE.GDT 5/31/18

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

BORING # **MW-14**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started **4/30/18**
Date Completed **4/30/18**
Drill Foreman **Z. Vaughan**
Inspector **J. Winsett**
Boring Method **Geoprobe**

Well Material
Well Diameter in.
Screen Length ft
Slot Size in.
Development Method

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Well Diagram	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Dark brown, moist, CLAYEY SILT (ML)	0.3			1			0.0	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Brown, moist to very moist, SILTY CLAY (CL)				2	3.7		0.1	
		5		3			0.7	
				4			510	
- greenish gray with brown mottling and very moist between 7.0-13 ft				5	4.8		88.7	Hydrocarbon odor at 7.0 ft.
		10		6			62.1	
				7	4.2		37.4	
- orangish brown with gray mottling, moist, sandy clay below 13 ft				8			32.8	
- brown between 15-22 ft		15		9			1.7	The soil samples collected from the 0-2 ft and 6-8 ft intervals were submitted for laboratory analysis.
				10	4.0		1.3	
		20		11			0.0	
	22.0					●		
Brown, wet, CLAYEY SAND (SC)				12	4.0		0.0	
	24.0							
Gray, moist, SILTY SANDY CLAY (CL)		25		13			0.0	
				14		▼	3.2	
				15	3.8	▽	6.0	
	30.0	30						
Bottom of Boring at 30 ft								Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **22.0** ft.
▽ At Completion (open hole) **27.9** ft.
▼ After **24** hours **27.0** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
WP - Whale Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

BORING # **MW-15**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started	5/1/18	Well Material	PVC
Date Completed	5/1/18	Well Diameter	2.0 in.
Drill Foreman	Z. Vaughan	Screen Length	10 ft
Inspector	J. Winsett	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	WP

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Well Diagram	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Dark brown, moist, CLAYEY SILT (ML)	0.3			1			0.0	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Brown, moist, SILTY CLAY (CL)				2	5.0		0.0	
- greenish gray and moist to very moist below 4.0 ft		5		3			1090	
				4			1020	
				5	4.2		1152	
		10		6			642	
- moist below 11 ft								
- brownish gray with brown mottling, silty sandy clay below 12 ft				7	4.0		257	The soil samples collected from the 0-2 ft and 8-10 ft intervals were submitted for laboratory analysis. A MS/MSD soil sample was collected from the 8-10 ft interval.
	14.8			8			123	
Greenish gray, moist, CLAYEY SAND (SC)	15.0	15						
Orangish brown, very moist, SANDY CLAY (CL)				9		▼	561	
	18.0				3.7			
Brown, wet, CLAYEY SAND (SC)	18.5			10			88.1	
Orangish brown, very moist to wet, SANDY CLAY (CL)	20.0	20		11		▽	--	
Blank drilled				12			--	
	25.0			13			--	
		25						
Bottom of Boring at 25 ft								Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater

●	Noted on Drilling Tools		16.5 ft.
▽	At Completion (open hole)		20.3 ft.
▼	After 24 hours		17.2 ft.
▨	Cave Depth		-- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
WP - Whale Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

BORING # **MW-16**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started	4/30/18	Well Material	PVC
Date Completed	4/30/18	Well Diameter	2.0 in.
Drill Foreman	Z. Vaughan	Screen Length	10 ft
Inspector	J. Winsett	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	WP

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Well Diagram	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Dark brown, moist, CLAYEY SILT (ML)	0.3			1			0.0	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Brown, moist, SILTY CLAY (CL)				2	3.7		0.0	
- grayish brown with gray mottling and very moist to wet between 5.0-12 ft		5		3			0.0	
				4			0.0	
				5	4.2		0.0	
		10		6			0.0	
- orangish brown with gray mottling, very moist, sandy clay below 12 ft				7	4.0		0.0	
		15		8			0.0	
- brown below 16 ft				9			0.0	
	18.0			10	4.0		0.0	
Brown, very moist, fine to very fine, CLAYEY SAND (SC) - gray between 19-20 ft - fine clayey sand below 20 ft		20		11			3.4	The soil samples collected from the 0-2 ft and 28-30 ft intervals were submitted for laboratory analysis.
	23.0			12	3.0		6.5	
Gray, very moist, SANDY CLAY (CL)				13			3.6	
		25						
	27.0			14			4.7	
Gray, moist, very fine, CLAYEY SAND (SC)	28.5			15	3.1		82.5	
Orangish brown, moist, SAND (SP)		30		16			198	
- grayish brown, wet, fine, sand below 32 ft				17	2.7		1501	
	35.0	35		18		●	1603	
Blank drilled				19		▼	--	
				20		▽	--	
	40.0	40						
Bottom of Boring at 40 ft								Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater

●	Noted on Drilling Tools	35.0 ft.
▽	At Completion (open hole)	39.3 ft.
▼	After 24 hours	37.8 ft.
▨	Cave Depth	-- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
WP - Whale Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

BORING # **SB-01**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started **4/19/18**
Date Completed **4/19/18**
Drill Foreman **Z. Vaughan**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **J. Winsett**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Brown, moist, CLAYEY SILT (ML)	0.5		1			0.0	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Orangish brown with gray mottling, moist, SILTY CLAY (CL)			2	5.0		0.0	
		5	3			20.7	
- greenish gray and very moist below 6.0 ft			4			29.2	
			5	4.0		37.3	
		10					
- wet from 10-12 ft			6			15.8	Slight hydrocarbon odor at 10 ft.
			7	4.0		14.3	
			8			91.8	The soil samples collected from the 0-2 ft and 14-16 ft intervals were submitted for laboratory analysis. A blind duplicate soil sample was collected from the 14-16 ft interval.
- orangish brown, moist, sandy clay below 15 ft		15					
			9			27.0	
			10	3.8		11.2	
	20.0	20					
Orangish brown with greenish gray mottling, moist to very moist, CLAYEY SAND (SC)			11			4.8	
	23.0		12			2.1	
Gray, very moist to wet, fine, SAND (SP)				4.3			
		25	13			0.4	
	26.0				●		
Bottom of Boring at 26 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **26.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority** BORING # **SB-02**
PROJECT NAME **Former RJ Refinery** JOB # **170IFA0010**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

DRILLING and SAMPLING INFORMATION

Date Started **4/19/18** Boring Method **Geoprobe**
Date Completed **4/19/18** Sampler OD **2.0** in.
Drill Foreman **Z. Vaughan** Inspector **J. Winsett**

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Brown, moist, CLAYEY SILT (ML)	0.5		1			0.0	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Orangish brown with gray mottling, very moist, SILTY CLAY (CL)			2	4.5		0.0	
		5	3			20.8	
- greenish gray below 6.0 ft			4			87.4	
			5	4.3		65.7	
		10	6			50.7	Slight hydrocarbon odor and sheen on water between 10-12 ft.
- very wet between 10-12 ft							
- orangish brown, sandy clay below 12 ft			7	4.2		42.8	The soil samples collected from the 0-2 ft and 6-8 ft intervals were submitted for laboratory analysis.
			8			48.5	
Orangish brown, very moist to wet, CLAYEY SAND (SC)	15.0	15	9			30.2	
			10	3.0		4.5	
Bottom of Boring at 20 ft	20.0	20			●		Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **20.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority** BORING # **SB-03**
PROJECT NAME **Former RJ Refinery** JOB # **170IFA0010**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

DRILLING and SAMPLING INFORMATION

Date Started **4/19/18** Boring Method **Geoprobe**
Date Completed **4/19/18** Sampler OD **2.0** in.
Drill Foreman **Z. Vaughan** Inspector **J. Winsett**

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Slightly moist, sandy silty gravel FILL	0.5		1			3.7	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Orangish brown, moist, SILTY CLAY (CL)			2	2.7		2.8	
		5	3			20.2	
			4			304	
- black-greenish gray between 7.0-12 ft			5	4.2		242	hydrocarbon odor at 7.0 ft.
		10	6			215	
			7	4.2		402	The soil samples collected from the 0-2 ft and 12-14 ft intervals were submitted for laboratory analysis.
		15	8			49.3	
			9			17.7	
			10	4.2		15.2	
		20	11			78.8	
- sandy clay below 20 ft							
	22.5		12	4.0		22.4	
Orangish brown with gray and brown mottling, moist to wet, CLAYEY SAND (SC)							
	25.0	25	13		●	13.4	
Bottom of Boring at 25 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **25.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **---** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority** BORING # **SB-04**

PROJECT NAME **Former RJ Refinery** JOB # **170IFA0010**

PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

DRILLING and SAMPLING INFORMATION

Date Started **4/18/18** Boring Method **Geoprobe**

Date Completed **4/18/18** Sampler OD **2.0** in.

Drill Foreman **Z. Vaughan** Inspector **J. Winsett**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Brown and gray, dry to slightly moist, silty sandy FILL with some brick and gravel	1.5		1			9.5	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Grayish brown, very moist, SILTY CLAY (CL)			2			456	
		5	3			230	
			4			460	
			5	4.6		945	
- light gray, moist to very moist, sandy clay below 10 ft		10	6			1117	
			7	4.3		208	
- black to dark gray and very moist between 14-15 ft			8			503	
- orangish brown between 15-18 ft		15					The soil samples collected from the 0-2 ft and 10-12 ft intervals were submitted for laboratory analysis.
			9			372	
			10	4.0		210	
- brown and moist between 18-19 ft - orangish brown and moist to very moist below 19 ft		20	11			30.3	
	23.0		12	3.5		16.3	
Orangish brown, very moist, very fine, CLAYEY SAND (SC)			13			11.5	
		25	14		●	3.4	
			15	4.0		2.7	
	30.0	30					
Bottom of Boring at 30 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **27.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

BORING # **SB-05**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started **4/18/18**
Date Completed **4/18/18**
Drill Foreman **Z. Vaughan**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **J. Winsett**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Dark brown, slightly moist, CLAYEY SANDY SILT (ML)	0.5		1			1.0	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Brown with gray mottling, slightly moist, SILTY CLAY (CL)			2	5.0		8.5	
		5	3			20.7	
- grayish brown and moist to very moist below 5.0 ft			4			220	
- gray and moist below 7.0 ft			5	4.2		520	Hydrocarbon odor at 7.0 ft.
		10	6			810	The soil samples collected from the 0-2 ft and 12-14 ft intervals were submitted for laboratory analysis.
			7	4.3		960	
		15	8			720	
			9			43.8	
- orangish brown with gray mottling between 17.5-19.5 ft			10	4.0		4.8	
- wet below 19.5 ft	20.0	20			●		
Bottom of Boring at 20 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **20.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
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BLR - Bailer
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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

BORING # **SB-06**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started **4/18/18**
Date Completed **4/18/18**
Drill Foreman **Z. Vaughan**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **J. Winsett**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Dark brown, dry, CLAYEY SANDY SILT (ML)	0.5		1			0.0	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Brown with gray and brown mottling, slightly moist, SILTY CLAY (CL)			2			0.0	
		5	3			0.0	
- grayish brown and very moist to wet between 5.0-8.0 ft			4			0.0	
- moist, sandy clay below 8.0 ft			5			37.5	
		10	6			79.4	
			7			138	
- gray and very moist between 13-16 ft			8			235	The soil samples collected from the 0-2 ft and 18-20 ft intervals were submitted for laboratory analysis.
		15	9			426	
			10			745	
		20	11			896	
- orangish brown with gray mottling and slightly moist between 20-22 ft							
	22.0		12		●	237	
Orangish brown, wet, very fine, CLAYEY SAND (SC)							
	25.0	25	13			--	
Bottom of Boring at 25 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **22.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority** BORING # **SB-07**
PROJECT NAME **Former RJ Refinery** JOB # **170IFA0010**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

DRILLING and SAMPLING INFORMATION

Date Started **4/18/18** Boring Method **Geoprobe**
Date Completed **4/18/18** Sampler OD **2.0** in.
Drill Foreman **Z. Vaughan** Inspector **J. Winsett**

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Brown and gray, moist, silty FILL with some gravel	0.5		1			0.0	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Brown with grayish brown mottling, slightly moist, SILTY CLAY (CL)			2	5.0		12.4	
		5	3			22.1	
- gray and moist to wet between 6.0-8.0 ft			4			35.6	
- gray, moist, sandy clay below 8.0 ft			5	4.5		51.4	
		10	6			46.6	
			7	4.0		776	
- grayish brown and moist to very moist between 13-18 ft			8			121	
		15	9			54.1	The soil samples collected from the 0-2 ft and 12-14 ft intervals were submitted for laboratory analysis.
- orangish brown with gray mottling and slightly moist below 18 ft			10	4.0		18.2	
		20	11			4.1	
	23.0		12	4.2		24.2	
Orangish brown, moist to very moist, very fine, CLAYEY SAND (SC)			13			21.4	
		25			●		
- gray, wet, fine to very fine between 26-27 ft			14			959.4	
- brown, wet, and very fine below 27 ft			15	4.2		854.2	
	30.0	30					
Bottom of Boring at 30 ft							Drillers License No. 2581

TEST DATA

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **26.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
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PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
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BORING # **SB-08**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started **4/19/18**
Date Completed **4/19/18**
Drill Foreman **Z. Vaughan**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **J. Winsett**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Brown, silty sandy FILL	1.0		1			58.1	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
- white sandy gravel seam at 0.25 ft							
Black, slightly moist, CLAY (CL)			2	3.0		202	
- brownish gray, moist silty clay below 2.5 ft		5	3			261	
			4			289	
- gray between 8.0-13 ft			5	3.0		322	
		10	6			169	
			7	4.7		87.2	
- orangish brown below 13 ft	14.0						
Brown, moist, very fine, CLAYEY SAND (SC)		15	8			53.2	The soil samples collected from the 0-2 ft and 16-18 ft intervals were submitted for laboratory analysis. A ms/msd soil sample was collected from the 16-17 ft interval.
			9			889	
			10	4.2		305	
- orangish brown below 19 ft		20	11			67.1	
			12	4.2		73.8	
	23.5						
Grayish brown, moist to wet, SAND (SP)	25.0	25	13		●	48.1	
Bottom of Boring at 25 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **25.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority** BORING # **SB-09**
PROJECT NAME **Former RJ Refinery** JOB # **170IFA0010**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

DRILLING and SAMPLING INFORMATION

Date Started **4/19/18** Boring Method **Geoprobe**
Date Completed **4/19/18** Sampler OD **2.0** in.
Drill Foreman **Z. Vaughan** Inspector **J. Winsett**

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Brown, moist, CLAYEY SILT (ML)	1.3		1			76.8	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
- black below 1.0 ft							
Brownish gray, moist, SILTY CLAY (CL)			2	4.0		201	
		5	3			740	
			4			570	
- gray between 8.0-13 ft			5	4.5		412	
		10	6			830	
			7	4.5		676	
- brown with gray mottling between 13-17 ft							The soil samples collected from the 0-2 ft and 22-24 ft intervals were submitted for laboratory analysis.
			8			548	
- wet between 15-15.08 ft		15					
			9			592	
- orangish brown, sandy clay below 17 ft				4.5			
	19.0		10			248	
Orangish brown, moist, fine, CLAYEY SAND (SC)		20					
			11			642	
	22.0						
Gray, moist, SANDY CLAY (CL)	23.0		12	4.0		849	
Brayish brown, moist, fine, SAND (SP)	24.0						
Gray, moist to wet, SANDY CLAY (CL)	25.0	25	13		●	616	
Bottom of Boring at 25 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **25.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
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HA - Hand Auger
BLR - Bailer
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SP - Submersible Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

BORING # **SB-10**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started **4/20/18**
Date Completed **4/20/18**
Drill Foreman **Z. Vaughan**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **J. Winsett**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Brown, moist, CLAYEY SILT (ML)	1.0		1			8.7	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Brown, moist, SILTY CLAY (CL)			2	5.0		3.5	
- brownish gray and very moist to wet between 4.0-7.5 ft		5	3			80.1	
			4			155	
- grayish brown and very moist between 7.5-11 ft			5	4.5		47.8	The soil samples collected from the 0-2 ft and 6-8 ft intervals were submitted for laboratory analysis.
		10	6			75.6	
- orangish brown, very moist to wet, sandy clay below 11 ft			7	4.5		20.2	
			8			9.2	
Bottom of Boring at 15 ft	15.0	15			●		Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **15.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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TEST BORING LOG

CLIENT **Indiana Finance Authority** BORING # **SB-11**
PROJECT NAME **Former RJ Refinery** JOB # **170IFA0010**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

DRILLING and SAMPLING INFORMATION

Date Started **4/20/18** Boring Method **Geoprobe**
Date Completed **4/20/18** Sampler OD **2.0** in.
Drill Foreman **Z. Vaughan** Inspector **J. Winsett**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Brown, moist, SILTY CLAY (CL)	0.3		1			7.2	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Brown, moist, CLAYEY SILT (ML)	1.3		2	3.5		356	
Brownish gray, slightly moist, SILTY CLAY (CL) - grayish brown between 2.5-5.0 ft		5	3			458	
- moist between 5.0-16 ft			4			250	
			5	3.7		129	
		10	6			161	
			7	4.8		58.5	
			8			27.2	
		15	9			15.1	The soil samples collected from the 0-2 ft and 4-6 ft intervals were submitted for laboratory analysis.
- orangish brown, sandy clay with interbedded gray sand seams between 16-22.5 ft			10	4.8		7.8	
		20	11			5.3	
			12	4.8		5.2	
- brown, moist, sandy clay below 22.5 ft	24.0						
Brown, very moist to wet, fine, CLAYEY SAND (SC)		25	13			2.5	
			14			4.4	
			15	4.5		1308	
	30.0	30			●		Black inclusions with strong hydrocarbon odor between 29.5-30 ft.
Bottom of Boring at 30 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **30.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

7988 Centerpoint Drive, Suite 100
Indianapolis, IN 46256
(317) 849-4990
Fax (317) 849-4278

TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41**
Princeton, Indiana 47670

BORING # **SB-12**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started **4/19/18**
Date Completed **4/19/18**
Drill Foreman **Z. Vaughan**
Boring Method **Geoprobe**
Sampler OD **2.0** in.
Inspector **J. Winsett**

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Brown, very moist, SANDY CLAYEY SILT (ML)			1			11.2	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
- moist clayey silt below 0.5 ft	1.5						
Brown, moist, SILTY CLAY (CL)			2	4.2		4.8	
- black and very moist to wet below 3.0 ft			3			42.6	
		5					Hydrocarbon odor at 5.0 ft.
- moist clay between 6.5-9.75 ft			4			1146	
			5	4.8		657	
- brown with black mottling between 9.75-13 ft		10	6			326	
			7	4.8		420	
- orangish brown, moist, sandy clay below 13 ft			8			646	The soil samples collected from the 0-2 ft and 6-8 ft intervals were submitted for laboratory analysis.
	16.0	15					
- brown below 16 ft			9			340	
Brown, moist, fine to very fine, CLAYEY SAND (SC)			10	4.7		960	
		20					
- orangish brown with interbedded black and gray sand seams between 20-23 ft			11			580	
			12	4.0		147	
- grayish brown, very moist to wet, very fine clayey sand below 23 ft			13			220	
		25					
	27.0		14	3.0	●	156	
Bottom of Boring at 27 ft							Drillers License No. 2581

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools **27.0** ft.
▽ At Completion (open hole) **--** ft.
▼ After **--** hours **--** ft.
Cave Depth **--** ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
BP - Bladder Pump
PP - Peristaltic Pump
SP - Submersible Pump

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Fax (317) 849-4278

TEST BORING LOG

CLIENT: **Indiana Finance Authority**
BORING #: **MW-02R**
PROJECT NAME: **Former RJ Refinery**
JOB #: **170IFA0010**
PROJECT LOCATION: **County Road 350 South and U.S. Highway 41, Princeton, Indiana 47670**

DRILLING and SAMPLING INFORMATION

Date Started	11/13/18	Well Material	PVC
Date Completed	11/13/18	Well Diameter	2.0 in.
Drill Foreman	SCS	Screen Length	10 ft
Inspector	M. Foye	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	BLR

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Grass and roots over TOPSOIL	0.3					0.0	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Brown, moist, SILTY CLAY (CL)			1			0.0	
- orange below 2.5 ft			2			0.0	
		5	3			0.0	
			4			0.0	
		10	5			0.0	
			6			0.0	
		15	7			0.0	
			8			0.0	
- gray mottling, sandy clay with sandstone fragments below 18 ft		20	9			0.0	
			10			0.0	
	26.0	25	11			0.0	The soil samples collected from the 0-2 ft and 36-38 ft intervals were submitted for laboratory analysis. The duplicate soil sample was collected from the 36-38 ft interval.
Brown, moist, fine grained, SAND (SP)			12			0.5	
- orange, medium to coarse grained sand with interbedded brown, fine grained, clayey sand below 27.5 ft		30	13			28	Strong odor between 30 and 35 ft
			14			75	
		35	15			810	
			16		●	68	Gray staining with a sheen on the water between 37 and 40 ft.
- gray, wet, fine grained, sand below 38.5 ft		40	17			1.9	
			18			5.0	
- brown, medium grained, sand below 44 ft	45.0	45	19				
Bottom of Boring at 45 ft							Drillers License No. 637

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools 38.0 ft.
▽ At Completion (open hole) -- ft.
▼ After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
CV - Check Valve
PP - Peristaltic Pump
WP - Whale Pump

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Fax (317) 849-4278

TEST BORING LOG

CLIENT **Indiana Finance Authority**
PROJECT NAME **Former RJ Refinery**
PROJECT LOCATION **County Road 350 South and U.S. Highway 41, Princeton, Indiana 47670**

BORING # **MW-17**
JOB # **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started	11/12/18	Well Material	PVC
Date Completed	11/12/18	Well Diameter	2.0 in.
Drill Foreman	SCS	Screen Length	10 ft
Inspector	M. Foye	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	BLR

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Crushed stone	2.0	1	5.0		--	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Gray, moist, sandy clay with trace gravel fragments (FILL)	4.0	2			0.0	
Brown, moist, SANDY CLAY (CL) with trace gravel and sandstone fragments		3	3.2		0.0	
		4			0.0	
		5	2.5		0.0	
		6			0.0	
		7	3.0		0.0	
- orange below 17.5 ft		8			0.0	
		9	4.2		0.0	
Orange, moist, CLAYEY SAND (SC)	22.0	10			0.0	
Brown, moist to wet, SANDY CLAY (CL)	23.0	11	4.1	●	0.0	The soil samples collected from the 2-4 ft and 38-40 ft intervals were submitted for laboratory analysis.
		12			0.0	
		13	2.7		87.0	
Brown, moist, SAND (SP)	32.5	14				Odor at 33 ft.
		15	2.5		130	
		16			387	
		17	2.7		785	Black staining at 39.5 ft.
		18			1.9	
- gray and wet below 43 ft	45.0	19			1.5	
Bottom of Boring at 45 ft						Drillers License No. 637

Depth Scale: 5, 10, 15, 20, 25, 30, 35, 40, 45

Well Diagram

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools 24.0 ft.
▽ At Completion (open hole) -- ft.
▼ After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
CV - Check Valve
PP - Peristaltic Pump
WP - Whale Pump

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Indianapolis, IN 46256
(317) 849-4990
Fax (317) 849-4278

TEST BORING LOG

CLIENT: **Indiana Finance Authority**
BORING #: **MW-18**
PROJECT NAME: **Former RJ Refinery**
JOB #: **170IFA0010**
PROJECT LOCATION: **County Road 350 South and U.S. Highway 41, Princeton, Indiana 47670**

DRILLING and SAMPLING INFORMATION

Date Started	11/13/18	Well Material	PVC
Date Completed	11/13/18	Well Diameter	2.0 in.
Drill Foreman	SCS	Screen Length	10 ft
Inspector	M. Foye	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	BLR

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Well Diagram	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)	Sampling Notes
Grass and roots over TOPSOIL	0.5			1	5.0		0.0	A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.
Brown, moist, SILTY CLAY (CL)				2			0.0	
		5		3	3.7		0.0	
- wet between 7.0 and 12.5 ft				4			0.0	
		10		5	3.1		0.0	
				6			0.5	
- orange with gray mottling, sandy clay trace sandstone and coal fragments between 12.5 and 23 ft		15		7	2.5		0.2	
				8			0.0	
		20		9	2.7		0.0	
				10			0.0	
- light brown and very moist below 23 ft		25		11	2.4		0.0	The soil samples collected from the 0-2 ft and 36-38 ft intervals were submitted for laboratory analysis.
				12			0.0	
		30		13	2.6		0.0	
	32.0			14			0.0	
Brown, moist, fine grained, SAND (SP) - orange, fine to medium grained between 33 and 44 ft		35		15	2.4		21.5	Some black staining and odor at 32.5 ft.
				16			787	
		40		17	3.5	●	901	Sheen on water at 39.5 ft.
				18			12.2	
	45.0	45		19			15.9	Black staining at 44 ft.
Bottom of Boring at 45 ft								Drillers License No. 637

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools 39.5 ft.
▽ At Completion (open hole) -- ft.
▼ After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
CV - Check Valve
PP - Peristaltic Pump
WP - Whale Pump

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Indianapolis, IN 46256
(317) 849-4990
Fax (317) 849-4278

TEST BORING LOG

CLIENT: **Indiana Finance Authority**
PROJECT NAME: **Former RJ Refinery**
PROJECT LOCATION: **County Road 350 South and U.S. Highway 41, Princeton, Indiana 47670**

BORING #: **MW-19**
JOB #: **170IFA0010**

DRILLING and SAMPLING INFORMATION

Date Started	11/14/18	Well Material	PVC
Date Completed	11/14/18	Well Diameter	2.0 in.
Drill Foreman	SCS	Screen Length	10 ft
Inspector	M. Foye	Slot Size	0.010 in.
Boring Method	Geoprobe	Development Method	BLR

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION	Stratum Depth	Depth Scale	Well Diagram	Sample No.	Recovery (ft)	Groundwater	Total Photoionizable Vapors (ppm)
Crushed stone and gravel	1.5			1	5.0		0.0
Brown with black staining, moist, silt with gravel (FILL)	2.5			2			0.0
Brown, moist, SILTY CLAY (CL)		5		3	2.3		0.0
				4			0.0
		10		5	0.0		--
				6			--
- orange with gray mottling and trace sandstone fragments below 15 ft		15		7	4.2		0.2
				8			0.2
		20		9	4.3		0.0
- sandy clay below 21.5 ft				10			0.0
		25		11	4.0		0.0
	28.0			12			0.0
Orange, moist, fine grained, SAND (SP)		30		13	3.6		0.0
- brown with some gray staining below 29.5 ft				14			
		35		15	4.3		22.4
				16			0.2
- gray with trace black shale fragments below 39 ft		40		17	4.3	●	0.6
				18			4.5
		45		19	4.2		4.0
				20			0.1
	50.0	50		21			0.3
Bottom of Boring at 50 ft							

Sampling Notes

A hand-auger was used to advance the first five feet of this boring to reduce the possibility of damaging unidentified underground utilities.

The soil samples collected from the 0-2 ft and 34-36 ft intervals were submitted for laboratory analysis. The MS/MSD soil sample was collected from the 34-36 ft interval.

Drillers License No. 637

TPV - Total Photo-Ionization Vapors
TFV - Total Flame-Ionization Vapors
PPM - Parts Per Million
ND - None Detected
PVC - Polyvinyl Chloride
NA - Not Analyzed

Depth to Groundwater
● Noted on Drilling Tools 42.0 ft.
▽ At Completion (open hole) -- ft.
▼ After -- hours -- ft.
Cave Depth -- ft.

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
HA - Hand Auger
BLR - Bailer
CV - Check Valve
PP - Peristaltic Pump
WP - Whale Pump

Appendix B

Summary of Estimated Costs

Appendix B

Summary of Estimated Costs

Former RJ Refinery

County Road 350 South

Princeton, Gibson County, Indiana

RWP Remedial Technology Options	Total
Soil Remediation (Excavation of 132,500 square feet)	$4,000,000.00
Groundwater Remediation Options	
Groundwater Remediation - Pump and Treat System (3 years)	$1,060,000.00
In-Situ Enhanced Soil Mixing (ISESM)	$1,500,000.00
In-Situ Chemical Oxidation (ISCO)	$785,000.00

Notes:

- RWP = Remediation Work Plan

-Soil excavation costs based on estimated 132,500 square feet and approximately 34,351 tons (25%) of disposal waste based on 1.4 tons per cubic yard.

- All costs are estimates based on most current data.

Appendix C

Project Schedule

Appendix B

Proposed Project Timline

Former RJ Refinery
County Road 350 South
Princeton, Gibson County, Indiana

Tasks/Milestones	Weeks After RWP Submittal																		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Project Management																			
Review and Approval of RWP																			
Site Clearing																			
Groundwater Remediation																			
Submittal of Remediation Completion Report																			
Progress Evaluation																			

Notes: The above schedule is estimated and does not account for delays caused by Program review/approval times, contractor availability, or for changes to the scope.

Appendix D

Health and Safety Plan

ENVIRONMENTAL • GEOTECHNICAL
BUILDING SCIENCES • MATERIALS TESTING

HEALTH AND SAFETY PLAN

Prepared By:
ATC Group Services LLC
6149 Wedeking Avenue, Building D, Suite 2
Evansville, Indiana 47715

Prepared For:
INDIANA FINANCE AUTHORITY

FORMER R&J REFINERY
COUNTY ROAD 350 SOUTH
PRINCETON, INDIANA 47670

ATC PROJECT NO. 170IFA0010

THINK SAFETY First!

ENVIRONMENTAL • GEOTECHNICAL
BUILDING SCIENCES • MATERIALS TESTING

ATC
HEALTH AND SAFETY PLAN (HASP)
REVIEW AND APPROVAL

CLIENT Indiana Finance Authority

PROJECT NUMBER: 170IFA0010

SITE NAME: Former R&J Refinery SITE LOCATION: Princeton, IN

PROJECT DESCRIPTION: Conduct asbestos abatement oversight, site clearing activities, subsurface investigation (soil and groundwater sampling), monitoring well installation, remediation technologies

PREPARED BY: Brian Kleeman Senior Project Geologist DATE: March 19, 2018

Brian Kleeman		3/19/18
Project Manager	Signature	Date
Reviewer's Name	Signature	Date

This Health and Safety Plan (Plan) has been written for the use of ATC Group Services LLC (ATC) and its employees. It may also be used as a guidance document by properly trained and experienced ATC subcontractors. However, ATC does not guarantee the health or safety of any person entering this Site.

Due to the potential hazardous nature of this Site and the activity occurring thereon, it is not possible to discover, evaluate, and provide protection for all possible hazards which may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury at this Site. The health and safety guidelines in this Plan were prepared specifically for this Site and should not be used on any other Site without prior research by trained health and safety specialists.

ATC claims no responsibility for use of this Plan by others. The Plan is written for the specific Site conditions, purposes, dates, and personnel specified and must be amended if these conditions change.

TABLE OF CONTENTS

TABLE OF CONTENTS

EMERGENCY INFORMATION

Site Emergencies Call:

Ambulance **911**

Fire: **911**

Police: **911**

Nationwide Call Before You Dig **811**

Core Health Networks (24 hour First-Aid) **(855) 282-6331**

Poison Control Center: **(800) 222-1222**

National Response Center: **(800) 424-8802**

Spills: **Local USEPA Office (800)-621-8431**
State Health Department (800)-246-8909
State Environmental Agency (800) 451-6027

Hospital **(812) 547-7011**

Gibson General Hospital
1808 Sherman Drive, Princeton, IN 47670
(812) 385-3401

See attached map for directions
Approximate travel time is **12** minutes.

EMERGENCY ASSEMBLY LOCATION: South portion of the site near gate

FIRST-AID MEASURES

In the event that personnel exhibit symptoms of exposure call COMP-CARE immediately in first-aid assessment process. The following procedures will be used:

Eye Contact: Flush eye immediately with copious amount of water for a minimum of 15 minutes. Repeat until irritation is eliminated and seek medical attention.

Skin Contact: Wash exposed area with soap and water for at least 15 minutes. If dermatitis or severe reddening occurs, seek medical attention.

Inhalation: Move the person into fresh air. If symptoms persist, seek medical attention.
Ingestion: Do not induce vomiting. Seek immediate medical attention.

Important Numbers:

Project Manager: ……..	Brian Kleeman	812-457-0043
Site Safety and Health Officer: ……	Brian Kleeman	812-457-0043
Site Supervisor: ……...	Brent Crowthers	812-697-1573
Client Contact: ……	Ken Coad	317-233-8409
Regional Safety Coordinator: ……..	Maria Rysavy	480-469-8851
State Utility Locate Service: ……...	IUPPS	811

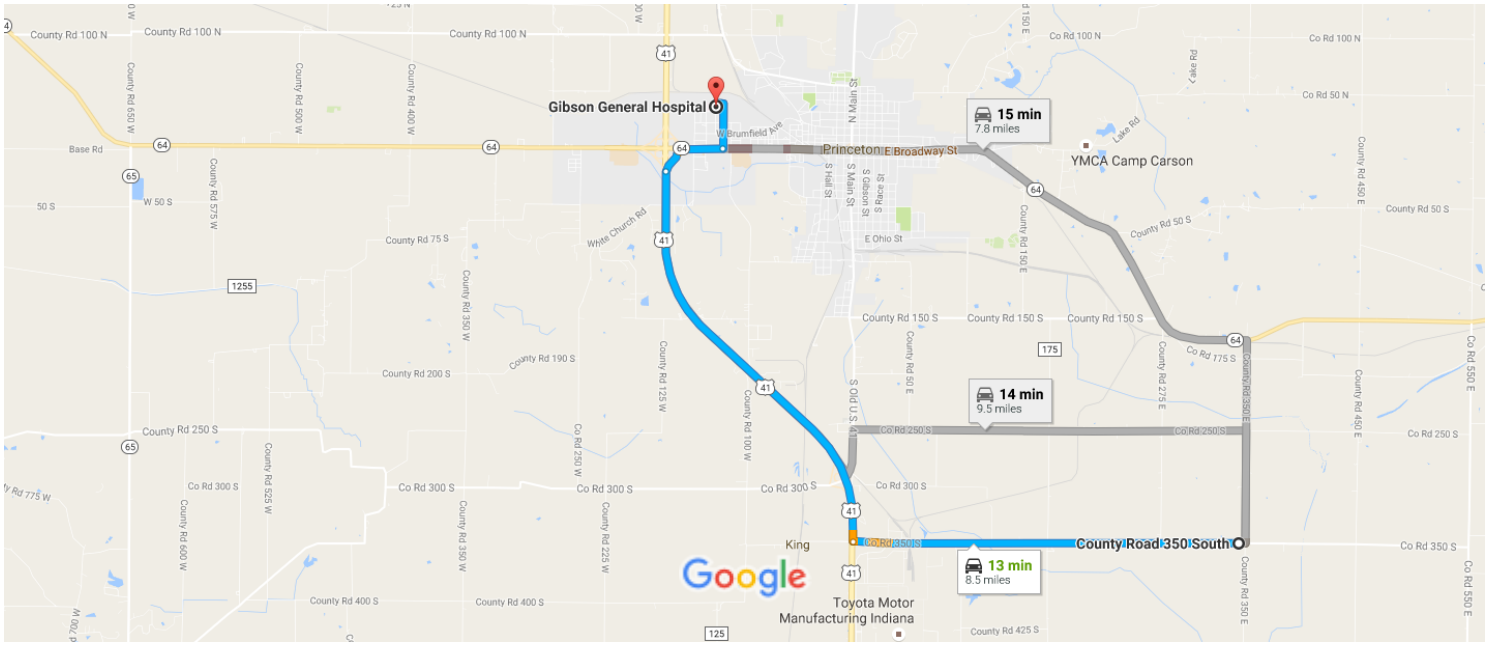
NOTE: For additional emergencies/important contacts, refer to your ATC Lifelines Card.

EMERGENCY MEDICAL ROUTE TO HOSPITAL

Google Maps

County Road 350 South, Princeton, IN 47670 to Gibson General Hospital

Drive 8.5 miles, 13 min



Map data ©2016 Google 1 mi

County Road 350 South

Princeton, IN 47670

1. Head west on Co Rd 350 S toward County Rd 275 E — 3.5 mi
2. Turn right onto US-41 N — 3.9 mi
3. Exit onto IN-64 E/W Broadway St toward Princeton — 0.6 mi
4. Turn left onto 3rd Ave — 0.5 mi

Destination will be on the left

Gibson General Hospital

1808 Sherman Drive, Princeton, IN 47670

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

1.0 - INTRODUCTION

1.1 Scope and Applicability of the Site Health and Safety Plan

This Health and Safety Plan (HASP) has been prepared by ATC Group Services LLC (ATC) for the activities associated with multiple activities associated with asbestos abatement, site clearing, subsurface investigation, and remediation at the Former R&J Refinery, located north of County Road 350 South and west of Highway 41 in Princeton, Indiana (Site).

The health and safety protocols established in this Plan are based on the ATC Employee Health and Safety Policy Manual, the Occupational Safety and Health Administration (OSHA) Regulations, past field experiences, specific Site conditions, and chemical hazards known or anticipated to be present from available Site data. The following Site Health and Safety Plan (HASP) is intended solely for use during the proposed activities described in the project documents and technical specifications. Specifications herein are subject to review and revision based on actual conditions encountered in the field during Site characterization activities. Such changes may be instituted by using the HASP List of Approved Amendments and/or Changes (see Appendix C).

Before Site operations begin, all employees, including subcontractors for ATC covered by this plan, involved in these operations will have read and understood this HASP and all revisions. All Site personnel have the authority to "Stop Work" if unsafe conditions are present or discovered during Site activities. Before work begins, all affected workers will sign the Health and Safety Plan Acknowledgment Form (see Appendix C). By signing this form, all individuals recognize the requirements of the HASP, known or suspected hazards, and will adhere to the protocols required for the project Site.

1.2 Historical Overview

The site is a former oil refinery that closed down in the 1970s. The site is undeveloped with mostly wooded areas. Remnants of site structures are present including debris piles and concrete slabs. Based on prior reports, asbestos containing materials (ACMs) are present at the site that need to be removed prior to any site clearing or additional activities can commence. A subcontractor will be utilized to remove ACMs and ATC will perform air monitoring and project oversight. Prior reports documented the presence of mercury in shallow soil above the IDEM excavation exposure screening level and petroleum contaminants in the groundwater above the IDEM industrial/commercial screening levels. Portion of the subsurface investigation will include assessing off-site properties for potential off-site migration of petroleum contaminants.

1.3 Visitors

All visitors to the Site must be instructed about the hazards of the activities that ATC or its subcontractors are performing. All visitors must sign the ATC Visitors Log (see Appendix C).

1.4 Subcontractor Activities

All subcontractors used at the Site have been Pre-Approved in the ATC Subcontractor Prequalification System.

2.0 - PROJECT ORGANIZATION

All personnel and visitors who may enter work areas on this Site must comply with the requirements of this HASP. All Site personnel have the authority to "Stop Work" if unsafe conditions are present. The specific responsibilities and authority of management, safety and health, and other personnel on this Site are detailed in the following sections.

2.1 Site Safety and Health Officer (SSHO)

The Site Safety and Health Officer (SSHO) has the responsibility and authority to develop and implement this HASP and to verify compliance. The SSHO reports to the Project Manager. The SSHO is on-site during all work operations and has the responsibility to halt Site work if unsafe conditions are detected. The responsibilities of the SSHO at the Site include the following:

- Managing the health and safety functions on the Site;
- Ensuring Site monitoring, worker training, and effective selection and use of PPE;
- Conducting daily Tailgate Safety Meetings for Site personnel and subcontractors and summarize the training on the Tailgate Meeting Form (see Appendix C). The following topics should be covered during safety meetings:
  - Hazard Communication (i.e., MSDS location, and container labeling, chemical hazards of non-routine tasks)
  - Determine applicability of Standard Operating Procedures (SOP) in Section 8 and communicate procedures
  - Review Site safety requirements
  - Give refresher training on heat or cold stress (Section 5.2 and 5.3) when appropriate
  - Review Site emergency procedures
  - Discuss location and use of a rig kill switch for drilling/boring operations
- Conducting daily safety inspections of the Site looking for unsafe acts or conditions and providing corrective action as appropriate.

2.2 Site Supervisor

The Site Supervisor is responsible for field operations and reports to the Project Manager. The Site Supervisor is the On-site Coordinator and overseer of operations. It is the Site Supervisor's duty to maintain Site security, supervise the personnel on the Site, coordinate the activities of the subcontractor personnel, and check that the HASP is followed and modified when necessary. The Site Supervisor's specific responsibilities include:

- Executing the work plan and schedule as detailed by the Project Manager
- Coordination with the SSHO on health and safety issues
- Ensuring Site work compliance with the requirements of the HASP
- Before Site activities, contact the hospital emergency room, local fire department, and local police department, as applicable. If outside town, contact county officials and local emergency services.

2.3 Project Manager (PM)

The Project Manager (PM) has the primary responsibility for the fulfillment of the terms of the contract and overseeing operations for the purpose that includes meeting legal and safety

requirements. It is the PM's responsibility to keep the project on schedule, within budget, and communicate with the Client regarding the progress toward specified goals.

The PM will inform the Regional Safety Coordinator of all HASP modifications, violations, injuries, exposures, and near-miss situations. The PM responsibilities include:

- Provide personnel time to read and understand the Site Health and Safety Plan (HASP) before fieldwork.
- Conduct project start-up health and safety briefing for: Field personnel, the Site Supervisor, the project team.
- Check that each subcontractor is pre-approved and that each subcontractor's Site workers have appropriate HAZWOPER Training Certificates.
- Check that Site personnel, if required, have received Respiratory Protection Training, Fit testing, and physician's approval to wear a respirator.
- That hazards identified during any Site audits are corrected. If necessary for immediate hazards, shut down field operations if hazards cannot be corrected or the hazards present an immediate threat to life and health.

2.4 Regional Safety Coordinator (RSC)

The Regional Safety Coordinator (RSC) is responsible for providing professional health and safety advice and oversight management to the project. The RSC will review and provide support for concerns regarding the health and safety of field personnel assigned to this project, including:

- If requested by the Project Manager, approval of Routine HASP;
- Approval of all Non-Routine HASP;
- Review of incident reports, inspections, and air monitoring results;
- When required, the RSC will conduct a field audit of the Site to evaluate the adequacy of the program and implement the necessary changes through the HASP.

2.5 Project Field Team

The Project Team includes technicians, engineers, scientists, geologists, and possibly subcontractors who perform field activities. Each individual team member will be responsible for understanding and personally complying with the HASP and Site health and safety requirements. Project Team members will report health and safety violations to either the Site Supervisor or the SSHO. Health and safety responsibilities, as discussed in this Plan, which are shared by all Site personnel include:

- Complying with the requirements of the HASP
- Reporting unsafe acts or conditions
- Retain copies at the Site of the following health and safety records:
  - Current HAZWOPER Training Certificate.
  - Respiratory Protection Training Certificate and current fit test record for potential respirator users.
  - Physician's approval for hazardous-waste fieldwork and/or respirator use.
  - First-aid/CPR and bloodborne pathogens training certificate.

3.0 – TASK/OPERATION HEALTH AND SAFETY RISK ANALYSIS SUMMARY

This chapter of the HASP describes the safety and health hazards associated with the Site work and control measures selected to protect workers. The purpose of the Job Safety Analysis (JSA) is to identify the routine safety and health hazards associated with the routine Site tasks and operations. Using this information, appropriate control methods are selected to eliminate the identified risks or effectively control them.

3.1 Job Safety Analysis (JSA)

Each specific JSA appears on a separate copy of the spreadsheets in Appendix A. A single JSA may be used for a task/operation performed in multiple locations if the hazards, potential exposures, and controls are the same at each location.

3.2 Health Analysis and Chemical Risk Assessment

Chemicals may be purchased and transported to the Site to support Site characterization and remediation operations. The principal chemical contaminants at the Site are expected to be petroleum, organic compounds, and metals. Appendix B contains information from the National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards about each of these chemicals. Additionally, the Hazard Communication Program (Policy No. 21) requires ATC to provide employees, contractors, subcontractors, and visitors with information on the health effects of these chemicals and necessary actions to protect against exposure. This information is transmitted through Material Safety Data Sheets (MSDS), the NIOSH Pocket Guide, container labels, training, and a written Hazard Communication program.

Site activities will adhere to the ATC Hazard Communication Program as described in the Policy. All Site personnel, including subcontractors, will be briefed on this Program as part of the Site orientation training before starting work. In accordance with this Program, the PM and Site Supervisor will check that each chemical brought to the Site is accompanied by its MSDS. A copy of each MSDS will be made available to each Site employee who may be potentially exposed to the chemical. In addition, the Site Supervisor will check that all subcontractors bring at least one copy of MSDS for each chemical they bring onto the Site. The Site Supervisor will also check that all chemical containers brought to the Site to determine if they are labeled as to its contents and appropriate hazard warnings.

3.3 Risks Associated With Drilling and Subsurface Activities

Drilling operations will conform to the Job Safety Analysis and Subsurface Investigation (ATC (Policy No. 33). During drilling operations, the subsurface is penetrated to obtain soil and/or groundwater samples. Contaminated soil cuttings and groundwater may be brought to the surface, creating a potential for exposure through skin contact and inhalation of vapors. The open borehole also creates a conduit for vapors to be released to the atmosphere. However, the amount of vapors released to the atmosphere is relatively small and vapors are usually quickly diluted and dispersed in air. Air monitoring is required to determine if protective equipment is necessary, as described in Section 4.0 of this HASP.

In addition to these chemical risks, the risk of drilling into a buried utility, such as a gas, water, electric line, or underground storage tank or other structures, is always present. Complete the Checklist for Subsurface Clearance prior to any subsurface work (see Appendix C) and follow the procedures in Table 3-1 for at least the first 5 feet of penetration:

TABLE 3-1
DRILLING/PROBING PROCEDURES
(First 5 feet below surface)

Step 1 - Site Walk	Conduct Site walk. Verify that the Checklist for Subsurface Clearance has been fully completed.
Step 2 - Locate Markouts	Locate all utility markouts and borehole locations. Start intrusive activities at least five (5) feet away and perpendicular to all marked utility lines.
Step 3 - Break Surface Cover	Use a jackhammer or concrete saw to break through the asphalt or concrete surface cover. The drill bit on the rig may also be used on the asphalt cover. Do **NOT** advance bit or cutting tools beyond the asphalt or concrete cover.
Step 4 - Surface Boring	Use air knife with vacuum extractors, hand auger, or hand shovel to remove soil from the borehole to a depth of at least 4 feet below surface. The soil in the borehole should be excavated to a diameter of at least three inches greater than the diameter of the drill bit on the lead auger or drill stem that is to be used. If it is not possible to perform a surface boring which meets the diameter requirements as stated above, surface borings should be installed to the required depth of 4 feet surrounding the proposed well/boring location in such a manner that any lines/utilities passing through the proposed well/boring location will be encountered while installing the investigation borings/well.
Step 5 - Soil Sampling	If soil samples are required to be collected within the first 4 feet below surface, a hand auger should be utilized to collect native, undisturbed soil samples.
Step 6 - Borehole Protection	If no piping or other structures are encountered within the first 4 feet below surface, normal drill/probe activities may proceed with caution. Containerize drill cuttings as appropriate. If excavation of the borehole is conducted the day before actual drilling is conducted, the borehole should be covered with barricades or cones and with a sheet of material sufficient in strength to support a person's weight until it is ready to be drilled. If the borehole is of sufficient size to potentially cause damage to a vehicle if driven over, the borehole should be covered with a material sufficient in strength to support vehicular weight. In lieu of barricades or cones and a material cover, the boring may be temporarily backfilled to surface. If a backfill material is utilized, it is important for the material to be flush with the surrounding pavement.

Risks of injury associated with the drilling operation itself also exist. The risks of working near overhead electrical lines may also present a safety hazard. The SSHO will check for the presence of overhead lines and other obstructions. No drilling operations will be performed within 10 feet of overhead lines with voltages 0-50 kV. For other voltages refer to ATC Electrical Safety Policy (No. 12) and Equipment (Drill Rigs, Mobile Equipment) Policy (No. 15).

Whenever possible, stay at least two feet from turning or rotating machinery. This includes augers, cathead, engine power takeoff, and drill rods. Learn where the rig kill switch is to shut the rig off in case of an emergency. A discussion should be held with the driller on each drill rig at the startup of the field work to discuss the location and use of the kill switch and for documentation of a Safety Inspection such as the Monthly Heavy Equipment Safety Inspection Checklist found in Appendix C.

3.4 Noise Hazards and Controls

Exposure to high levels of noise may occur when working near drill rigs or other heavy equipment. Also, depending upon where the work is being performed, local equipment (e.g., airports, factory machines, etc.) may produce high levels of noise. Employees exposed to noise levels in excess of the action level of 85 decibels (A-weighted, Slow Response) will be included into the ATC Policy on Hearing Conservation (Policy No. 34). The SSHO may evaluate employee noise exposures using a Noise Survey Meter or a Noise Dosimeter. The RSC may conduct additional noise monitoring to determine the appropriate response to be taken. Employees will be provided with ear plugs and/or earmuffs when exposed to noise levels in excess of the 8-hour Permissible Exposure Limit (PEL) of 90 decibel (A-weighted, Slow Response). This hearing protection shall have a Noise Reduction Rating (NRR) to protect hearing in accordance with Policy No. 34, including the NRR de-rating factor of [(NRR-7)/2].

3.5 Biological Hazards

Site activities on this Site may expose workers to other hazards such as poisonous plants, insects, animals, and indigenous pathogens. Protective clothing and respiratory protection equipment, and being capable of identifying poisonous plants, animals, and insects, can greatly reduce the chances of exposure. Thoroughly washing any exposed body parts, clothing, and equipment will also protect against infections. If working in wooded/grassy areas, use appropriate insect repellants (containing DEET and/or Permethrin) and apply them per the manufacturers' directions.

4.0 - AIR MONITORING AND PERSONAL PROTECTIVE EQUIPMENT

4.1 Site Air Monitoring Requirements

To prevent exposure to hazardous conditions and aid in the selection of personal protective equipment, monitoring for the presence of airborne contaminants will occur when knowledge of the Site indicates their potential presence. One or more of the following direct-reading instruments may be used to aid in this determination. Photoionization Detectors (PID) and Flame Ionization Detectors (FID) will measure non-specific organic gases and vapors. Combustible Gas Indicators (CGI) will detect explosive atmospheres. Oxygen (O_2) meters will detect fluctuations in oxygen concentrations. These instruments should be calibrated or bump tested daily and whenever the readings may be erratic. All readings should be recorded in the field log books.

Colorimetric detector tubes supplement PID and/or FID readings to measure specific gases and vapors. Other direct-reading instruments are available for use to monitor for the presence of specific airborne Site contaminants.

The breathing zone of the employee(s) anticipated to have the highest potential for exposure for each task will be monitored using an appropriate combination of some or all of these direct-reading instruments. Air monitoring will occur every 15 minutes during non-intrusive activities, or every 5 feet of penetration during intrusive activities. Site tasks and air monitoring requirements are shown in Table 4-1. Additional Site monitoring may occur at the discretion of the SSHO, Site Supervisor, or RSC.

NOTE: All air monitoring equipment must be calibrated as per manufacturer's instructions.

Table 4-1
Site Air Monitoring Requirements

Site Activity	Instrument	Frequency	Location	Caution
Drilling	PID	Every 15 minutes or 5 feet of penetration	In breathing zone of person nearest activity	Communicate with equipment operator before sampling
	CGI	Every 15 minutes or 5 feet of penetration	In work area near activity	Communicate with equipment operator before sampling
	Detector tubes	As indicated in Table 5-2 when exceed PID limits	In breathing zone of person nearest activity	Strong odors may require further testing.
Ground water sampling	PID	Every 15 minutes	In breathing zone of person nearest activity	Strongest likely concentration when opening cover
	CGI	Every 15 minutes	In work area near activity	Strongest likely concentration when opening cover

Site Activity	Instrument	Frequency	Location	Caution
	Detector tubes	Every 15 minutes	In breathing zone of person nearest activity	Strongest likely concentration when opening cover
Asbestos Air Monitoring	Sampling pump / PCM telescope	Daily	Near asbestos removal zones	Communicate results with on-site personnel

Air monitoring results obtained from the breathing zone during field activities will be recorded in field logbooks and the Air Quality Monitoring Record (see Appendix C). All such records will also include the location, date/time, weather conditions, person monitored, background concentration, and identification of specific contaminant whenever possible. Air monitoring information will be utilized to evaluate personnel exposure and assess the appropriateness of PPE for Site conditions. The PPE for the Site are discussed in Section 4.2. Photoionization detector (PID), combustible gas indicator (CGI), and detector tube readings measured in the employees breathing zone will be used to determine the level of protection required. PID readings refer to readings above background, which are sustained for at least 5 minutes and are measured during the performance of field tasks. PID readings are used for general screening.

4.2 Action Levels for Personal Protection Equipment

The first and foremost means of protecting employees from injuries or exposures is to eliminate the exposure. The general hierarchy for controlling potential exposures is: (1) Engineering Controls; (2) Administrative Controls; and (3) the use of PPE. PPE is a means of preventing injury or exposure when exposure elimination and/or other control means are not feasible.

The initial level of protection and the Action Levels at which the PPE will be upgraded are determined based on the identification of specific chemicals expected to be present at a Site and the established OSHA Permissible Exposure Levels (PEL) or ACGIH Threshold Limit Values (TLVs), whichever is lower. In the event more than one chemical is expected or exists at a Site, the most hazardous chemical will dictate the level of personal protection required. Table 4-2 shows the action levels for levels of personal protection equipment.

Table 4-2
Action Levels for Personal Protection Equipment

Monitoring Equipment	Hazard	Action Level Above Background	Action
PID/FID	Organic gas/vapor	< 10 ppm	Level D.
		10 to 50 ppm	Level C. Move upwind and continue air monitoring, cease operations, or use detector tube(s) and reference Table 4-3 below.
		> 50 ppm	Immediate Withdrawal. Contact the PM and RSC for further instructions to proceed.
Air Pump / 0.8 micron filter	Asbestos/ particulate	>1.0 f/cc – PEL >0.1 f/cc – TWA	Proper respiratory protection, protective clothing

Detector tubes to be used are indicated for given ranges based upon the PID readings (Table 4-2). As appropriate, PID readings in conjunction with detector tubes will be utilized during the field activity and location anticipated having the highest level of contamination. This location will be selected by the Site Supervisor. If these measurements indicate exposure levels appropriate for Level D work, the use of detector tubes will be limited to situations where field conditions or activities have changed. Detector tubes will be available for use at the discretion of the Site Supervisor and the SSHO.

If readings exceed the range for level of protection indicated, personnel should withdraw and not return until an appropriate level of protection has been donned. Upgrading protection shall be communicated to the SSHO, who will in turn convey this information to the RSC. Upon review of PID, CGI, and detector tube measurements, the RSC may further adjust the PPE requirements.

Any upgrading to higher levels of protection may require additional personal sampling using National Institute for Occupational Safety and Health (NIOSH) or Occupational Safety and Health Administration (OSHA) methods for the collection and analysis of airborne contaminants.

Air monitoring equipment used on the Site should be calibrated with the following:

Calibration/Response Check

Types	Frequency	Gas Standard
PID	Daily	100 ppm isobutylene in air
CGI	Daily	Pentane/Methane
Universal Test Pump-Sensidyne (refer to mfg. for other pumps)	Daily	Leak Test: Insert unbroken detector tube into orifice, pull and lock handle in sampling position, wait 15-30 sec. Slowly and carefully release the handle. If handle does not return to 1/8", pump leaks.

Field personnel, in conjunction with the Site Supervisor and SSHO, may choose to allow ventilation of vapors before resuming work (rather than using higher levels of PPE). If ventilation is conducted, additional air monitoring will be performed prior to the resumption of work to determine the level of PPE required.

OSHA established an asbestos standard in 1971, updated in 1994, primarily directed toward industrial applications (29 CFR 1910.1001). In response to the growing asbestos abatement industry and additional concern of asbestos exposure, a construction standard (29 CFR 1926.1101, formerly 29 CFR 1926.58) for asbestos became effective on July 21, 1986. This standard specifically outlines asbestos procedures, respirator selection and fit testing, air sampling and the analysis of asbestos air samples. It also includes an eight-hour time weighted average (TWA) permissible exposure limit (PEL) level of 0.1 fibers per cubic centimeter of air (f/cc), and an excursion limit of 1.0 f/cc for a 30-minute period. Concentrations above these levels require specific action such as respiratory protection and medical surveillance.

ATC will perform air monitoring using phase contrast microscopy (PCM) via NIOSH Method 7400, which considers an action complete when the results of clearance air samples collected and analyzed by are shown to be less than 0.1 f/cc inside containment areas and less than 0.01 outside containment areas.

4.3 Levels of Protection

Levels of protection for Site activities are described on the Site Air Monitoring Summary. The protection levels may include all or some of the following, based on work scope.

Level D:

- Work uniform – Long pants and shirt with sleeves (no tank tops) – refer to Policy No. 25 Personal Protective Equipment (Section 5.5)
- Disposable, inner nitrile gloves
- Chemical-resistant boots with steel toe
- Safety glasses with side shields
- High Visibility Reflective Vest Class 1, Class 2, or Class 3 (select based on Traffic speed)
- Hard hat
- Disposable, chemical-resistant outer boot covers*
- Hearing protection*

LEVEL C:

- Half-face or full-face, air purifying respirator (NIOSH approved)
- Disposable, hooded, chemical-resistant clothing
- Disposable, chemical-resistant outer gloves
- Disposable, inner nitrile gloves
- Chemical-resistant boots with steel toe
- Disposable boot covers
- Hard hat
- Safety Glasses with side shields
- High Visibility Reflective Vest Class 1, Class 2, or Class 3 (select based on Traffic speed)
- Coveralls*
- Hearing protection*

(* Optional Equipment, depending on conditions/exposures)

4.4 Respiratory Protection

Respiratory protection requirements are described in detail in the ATC Respiratory Protection Program. Basic rules of respiratory usage are listed below:

- Facial hair that interferes with a satisfactory fit of the mask-to-face seal is not allowed on personnel required to wear respirators.
- Respirator cartridges should be replaced after approximately 8-hours of continuous or intermittent usage, unless otherwise noted. Cartridges should also be replaced if they become damaged, after the expiration date is exceeded, if vapor smell breakthrough occurs, or if filters become clogged causing resistance to breathing.
- Contact lenses may be worn when respiratory protection is required, in conjunction with additional eye protection to protect against particles or splashes, provided there is no interference with the respirator seal.

- Respirators shall be cleaned and disinfected after each day's use or more often, if necessary.
- Prior to donning, respirators will be inspected for worn or deteriorated parts. Emergency respirators or self-contained devices will be inspected at least once a month and after each use.
- After donning, personnel should perform a positive and negative user fit-check to determine if a good seal has been achieved.
- Each employee shall make sure that they have an annual respirator fit test and respiratory protection training.

5.0 - HEALTH SURVEILLANCE PROGRAM

5.1 Employee Medical Examinations

All employees involved in work at the Site will participate in ATC's Medical Surveillance Program administered by Health Resources. Additionally, when respirators are required (as determined by the SSHO and project manager), each employee will also have current respirator clearance.

A post project, follow-up exam may be required if an exposure incident is reported or an employee shows specific symptoms associated with the known or suspected hazardous chemicals. The RSC and the Project Manager will determine when post project exams are required.

5.2 Heat Stress Program

This procedure applies to all employees when heat stress conditions exist at project sites.

5.2.1 Training

The SSHO will have received acceptable training in first-aid and Cardiopulmonary Resuscitation (CPR), including training in heat-related illnesses. The SSHO shall also be trained on the requirements of the ATC Policy for Industrial Hygiene (Policy No. 23), which contains the requirement for Heat Stress monitoring. All workers should be capable of recognizing and treating the signs and symptoms of heat stress conditions. During potential heat stress conditions, ice should be readily available to rapidly cool victims.

5.2.2 Fluid Replacement

Water will be made available at the Site for employee fluid replacement. When heat stress is determined to be a problem by the SSHO, employees will be provided with balanced, electrolyte solutions to replace fluid and electrolyte loss. Employees will be provided with replacement fluids at a minimum rate of 8 ounces every 15 to 20 minutes per person.

5.2.3 Acclimatization

Acclimatization is a gradual physiological adaptation that improves an individual's ability to tolerate heat stress. Full-heat acclimatization requires up to 3 weeks of continued physical activity under heat-stress conditions similar to those anticipated for the work. Its loss begins when the work activity in the heat stress conditions is discontinued. A noticeable loss usually occurs within 3 – 4 days.

5.2.4 Rest Breaks

When heat stress conditions are applicable, all rest breaks should be taken out of the zone of exclusion into a cooler, shaded, rest area. If these conditions are not available, more frequent rest breaks will be taken.

5.2.5 Heat Stress Monitoring

Heat Stress and heat strain are conditions resulting from environmental factors including temperature, relative humidity, radiant heat transfer, and air movement, as they are affected by clothing. The primary objective of the heat stress management program is to prevent heat

stroke which is life threatening and the most serious of the heat-induced disabilities. Extra caution should be taken for workers who are not acclimated to working in the heat.

The following Heat Stress Index (refer to ATC Policy No. 23) should be used as a guide to evaluate heat stress situations. If the Heat Stress exceeds 105° F, contact the RSC prior to work for detailed guidance.

Heat Stress Index

Temp. °F	Relative Humidity								
	10%	20%	30%	40%	50%	60%	70%	80%	90%
105	98	104	110	120	132				
102	97	101	108	117	125				
100	95	99	105	110	120	132			
98	93	97	101	106	110	125			
96	91	95	98	104	108	120	128		
94	89	93	95	100	105	111	122		
92	87	90	92	96	100	106	114	122	
90	85	88	90	92	96	100	106	114	122
88	82	86	87	89	93	95	100	106	115
86	80	84	85	87	90	92	96	100	109
84	78	81	83	85	86	89	91	95	99
82	77	79	80	81	84	86	89	91	95
80	75	77	78	79	81	83	85	86	89
78	72	75	77	78	79	80	81	83	85
76	70	72	75	76	77	77	77	78	79
74	68	70	73	74	75	75	75	76	77

NOTES: Add 10° F when protective clothing is being used; Add 10° F when in direct sunlight

HSI Temp	Category	Injury Threat
Above 130° F	Extreme Danger	No work unless emergency exists. Contact ATC RSC and Corporate Risk Management Department prior to proceeding. Heat cramps or exhaustion likely, heat stroke possible if exposure is prolonged and there is physical activity.
105° to 130° F	Danger	Contact RSC prior to proceeding. Requires strict adherence to ACGIH Heat Stress Guidelines, including use of on-site WBGT equipment. Heat cramps or exhaustion likely, heat stroke possible if exposure is prolonged and there is physical activity.
90° to 105° F	Extreme Caution	Heat cramps or exhaustion likely, heat stroke possible if exposure is prolonged and there is physical activity.
80° to 90° F	Caution	Heat cramps or exhaustion likely, heat stroke possible if exposure is prolonged and there is physical activity.
Below 80° F	Normal Range	Typical conditions for time of year. Little or no danger under normal circumstances. As always, anticipate problems and work safely.

5.3 Cold Stress Program

This procedure applies to all employees who perform field work in cold environments at risk of cold stress injury and intended to protect workers from the most severe effects of cold stress.

5.3.1 Training

ATC Site employees have been trained in cold stress as part of their HAZWOPER 40-hour initial training. Site workers will receive refresher training by the SSHO in cold stress safety and health procedures. The training program will include, as a minimum, instruction in the following areas:

- Proper first-aid treatment
- Proper clothing practices
- Proper eating and drinking habits
- Recognition of impending frostbite
- Recognition of the signs and symptoms of impending hypothermia or excessive cooling of the body when shivering does not occur
- Safe working practices

The SSHO will be trained in first-aid, CPR, and cold stress conditions.

5.3.2 Environmental Monitoring

Frostbite and hypothermia are two types of cold injury that personnel must be protected against during the performance of field duties. The objective is to prevent the deep body temperature from falling below
96.8° F and to prevent cold injury to body extremities. Two factors influence the development of a cold injury the ambient temperature, and wind velocity.

The SSHO will monitor environmental conditions by recording ambient temperature and estimated wind-speed. Information contained in Tables 5-1 and 5-2 will be used to evaluate the possibility of hypothermia among workers on-site.

5.3.3 Protective Clothing and Rest Breaks

Use appropriate cold weather clothing when temperatures are at or below 40°F as exposed skin surfaces must be protected. These protective items can include facemask, hand wear, and foot wear. Workers handling evaporative solvents during cold stress conditions will take special precautions to avoid soaking gloves and clothing because of the added danger of prolonged skin contact and evaporative cooling. Personnel will wear protective clothing appropriate for the level of cold and planned physical activity. The objective is to protect all parts of the body, with emphasis on the hands and feet. Eye protection against glare and ultraviolet light should be worn in snowy and icy conditions.

The work rate should not be so great as to cause heavy sweating that could result in wet clothing. If heavy work must be done, opportunities for rest breaks will be provided where workers have the opportunity to change into dry clothing. Conversely, plan work activities to minimize time spent sitting or standing still. Rest breaks should be taken in a warm, dry area. Windbreaks can also be used to shield the work area from the cooling effects of wind.

5.3.4 Identification and Treatment of Cold Stress

When frostbite, hypothermia, or other cold stress symptoms are suspected, treat the patient to relieve symptoms or transport them to the medical facility identified on page TC-4.

TABLE 5-1
Threshold Limit Values Work/Warm-up Schedule for Four-Hour Shift*

Air-Temperature--Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
˚C (approx.)	˚F (approx.)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
-26˚ to -28˚	-15˚ to -19˚	(Norm. Breaks) 1		(Norm. Breaks) 1		75 min	2	55 min	3	40 min	4
-29˚ to -31˚	-20˚ to -24˚	(Norm. Breaks) 1		75 min	2	55 min	3	40 min	4	30 min	5
-32˚ to -34˚	-25˚ to -29˚	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
-35˚ to -37˚	-30˚ to -34˚	55 min	3	40 min	4	30 min	5	Non-emergency work should cease		Non-emergency work should cease	
-38˚ to -39˚	-35˚ to -39˚	40 min	4	30 min	5	Non-emergency work should cease		Non-emergency work should cease		Non-emergency work should cease	
-40˚ to -42˚	-40˚ to -44˚	30 min	5	Non-emergency work should cease		Non-emergency work should cease		Non-emergency work should cease		Non-emergency work should cease	
-43˚ & below	-45˚ & below	Non-emergency work should cease		Non-emergency work should cease		Non-emergency work should cease		Non-emergency work should cease		Non-emergency work should cease	

*1. Schedule applies to any 4-hour work period with moderate to heavy work activity, with warm-up periods of ten. (10) Minutes in a warm location and with an extended break (e.g., lunch) at the end of the 4-hour work period in a warm location. For Light-to-Moderate Work (limited physical movement): apply the schedule on step lower. For example, at -35˚C (-30˚F) with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (Step 5).

2. The following is suggested as a guide for estimating wind velocity if accurate information is not available: 5 mph: light flag moves; 10 mph: light flag fully extended: 15 mph: raises a newspaper sheet: 20 mph: blowing and drifting snow.

3. If only the wind chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be 1) special warm-up breaks should be initiated at a wind chill cooling rate of about 1750 watts per square meter (W/m^2); 2) all non-emergency work should have ceased at or before a wind chill of 2250 W/m^2. In general, the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly overcompensates for the actual temperatures in the cooler ranges because windy conditions rarely prevail at extremely low temperatures.

4. TLVs apply only for workers in dry clothing.

* Adapted from Occupational Health & Safety Division, Saskatchewan Department of Labor.

TABLE 5-2
Cooling Power of Wind on Exposed Flesh Expressed as Equivalent Temperature (under calm conditions)*

Estimated Wind Speed (mph)	Actual Temperature Reading (degrees F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent chill Temperature (degrees F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds > 40 mph have little additional effect)	LITTLE DANGER If < hr with dry skin. Maximum danger of false sense of security				INCREASING DANGER Danger from freezing of exposed flesh within one minute.			GREAT DANGER Flesh may freeze within 30 seconds.				
	Trench foot and immersion foot may occur at any point on this chart.											

* Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA

6.0 - SITE SECURITY AND CONTROL

6.1 Work Zones

Restricted Site areas will include, but not necessarily be limited to, the following zones:

- **Exclusion Zone or Hot Zone** - any area where contamination is either known or likely to be present in concentrations that could pose a threat to human health and safety or that potential for harm to personnel exists because of the type of work activities being conducted. Appropriate PPE and warning signs should be utilized in this area.
- **Contamination Reduction Zone** - any area where workers conduct personal and equipment decontamination.
- **Support Zone** - areas where access is controlled, but the chance to encounter hazardous materials or conditions are minimal.

Access to the work zones will be controlled by work zone delineators (e.g. traffic cones, flags, vehicles, DOT approved devices, temporary or permanent fencing, and/or safety barrier tape). Figure 6-1 is an example of a work zone. Additionally, ATC employees should follow the requirements of the Employee Health and Safety Policy Manual, Policy No. 36, Work Zones in Traffic Areas for additional information.

In the event on-site personnel must upgrade their personal protective equipment, the work zones may require substantial modification in order to provide for the safety of nearby personnel not associated with this work. Any upgrade level will be communicated by the Site Supervisor to the PM. The PM will then inform the RSC of this occurrence.

6.2 Buddy System

The Buddy System will be used at all times by field personnel in the Exclusion Zones. The Buddy System means that personnel work in pairs and stay in close visual contact to be able to observe one another and summon rapid assistance in case of emergency. No one is to perform fieldwork alone without the approval of the Branch Safety Officer and/or the Regional Safety Officer.

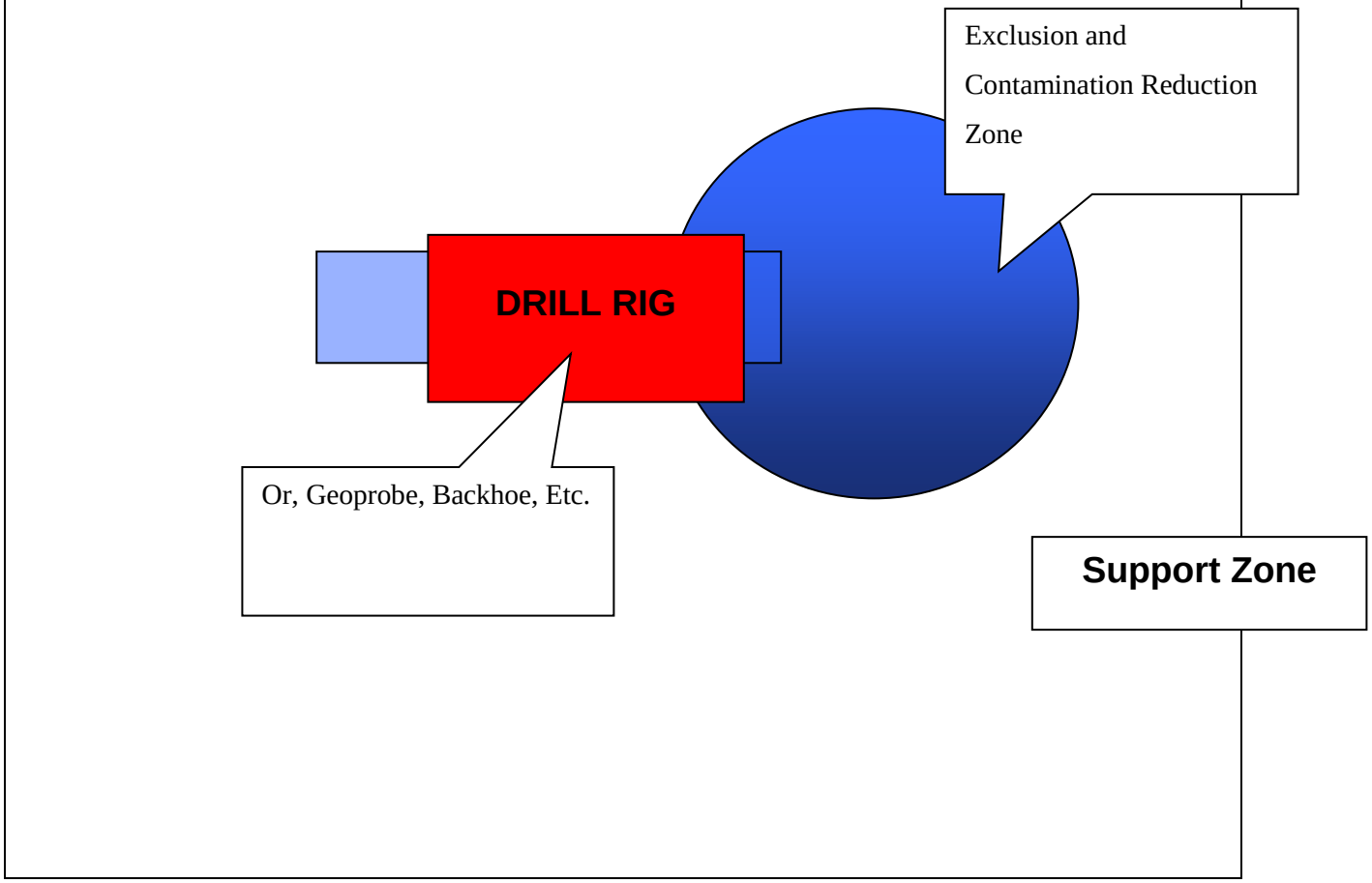
6.3 Site Communication

A loud and clear form of communication should be made available for Site personnel entering the work zones. Site communication may be in the form of hand signals, voice, or other communication devices. All forms of communication should be understood by all workers on the Site prior to starting work.

6.4 Roadway Work Zones

When ATC employee and subcontractors are required to perform Site operation in a city street or public right-of-way, a Traffic Control Plan may be required and included with this HASP. Check with the State or local government Department of Transportation for when a traffic control plan is required. Traffic Control Plans will include Transition Areas, Activity Areas, and Termination Areas.

FIGURE 6-1
TYPICAL EXCLUSION ZONE



7.0 - DECONTAMINATION PROCEDURES

7.1 Personnel Decontamination

All personnel must complete appropriate decontamination procedures in a way that is responsive to actual Site conditions before leaving the Site. The decontamination of personnel and equipment will be performed within the exclusion and contamination reduction zones. Wash tubs containing an appropriate decon solution and soft bristle brushes will be used to decontaminate personal protective clothing and boots. Deionized water will be used for the final rinse. The SSHO will visually inspect all PPE and other equipment once decontamination procedures are completed. In general, the four types of decontamination solutions to be considered for PPE include:

- Water for removal of low-molecular weight hydrocarbons, inorganic compounds, salts, some organic acids, and other polar compounds.
- Dilute acids (vinegar) for removal of basic (caustic) compounds, amines, and hydrazines.
- Dilute bases (soaps and detergents) for removal of acidic compounds, phenols, thiols, and some nitro and sulfonic compounds.
- Organic solvents for removal of nonpolar compounds (organic).

LEVEL D/LEVEL C

- Establish a segregated equipment drop
- Remove disposable, outer boot covers, if applicable
- Remove chemical resistant, outer gloves, if applicable
- Remove hard hat and goggles, safety glasses, or face shield
- Remove disposable, inner gloves
- Remove full-face air purifying respirator (Level C only)

Each individual will be responsible for inspecting and decontaminating their own respirator in accordance with the ATC Respiratory Protection Program (Policy No. 27).

At a minimum the hands and face of each employee must be thoroughly washed upon leaving the work area. Trash receptacles will be provided for all disposable clothing. Commercial laundries or cleaning establishments that decontaminate clothing or equipment will be informed of the potentially harmful effects of exposure.

7.2 Equipment Decontamination

The subcontractor will decontaminate field equipment according to the work plan. This may include manual removal of gross contamination with shovels or other tools, followed by a high-pressure, hot water sprayer. Because decontamination at the high-pressure, hot water station poses the possibility of a splash and/or mist inhalation hazard, the task should be performed using Level D personal protective equipment at a minimum.

Field tool including split-barrel soil samplers, brass liners, and sample knives and trowels will be decontaminated. The field tools may be scrubbed visually clean using a detergent solution

(Alconox/Liquinox) with water and a stiff, long-bristled scrub brush. Following the solution scrubbing, the tools may be rinsed with distilled water or isopropyl alcohol.

7.3 Disposition of Decontamination Wastes

All materials and equipment used for decontamination should be disposed of in accordance with local, State, and/or Federal Regulations. Clothing, tools, buckets, brushes, and all other equipment that is contaminated must be properly packaged and stored on the Site until disposal arrangements are finalized. Clothing not completely decontaminated on-site should be secured in plastic bags before being removed from the Site.

8.0 - STANDARD OPERATING PROCEDURES

The following Standard Operating Procedures (SOPs) will be applied to each location and activity where work is performed on a hazardous chemical site. As hazards increase or decrease on the Site, the applicability of each SOP must be determined by the SSHO with the approval of any changes by the Project Manager or the RSC.

8.1 Personnel Precautions

1. Eating, drinking, chewing gum or tobacco, smoking, and any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in the exclusion and contamination reduction zone or in any area known to be contaminated.

2. When decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.

3. Contact with contaminated or suspected contaminated surfaces should be avoided. When possible, do not walk through puddles, leachate, or discolored surfaces; kneel on the ground; or lean, sit, or place equipment on drums, containers, or the ground.

4. Medicines and alcohol can increase the effects from exposure to toxic chemicals. Personnel should not take prescribed drugs at hazardous waste operations where the potential for absorption, inhalation, or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverage intake should be minimized or avoided.

5. All personnel must be familiar with Standard Operating Procedures and any additional instructions and information contained in this HASP. All visitors and subcontractors will read the HASP before entering the Site.

6. All personnel will be aware of symptoms for heat or cold stress.

7. All personnel will be familiar with the chemicals used on-site and the associated hazards as described in each respective MSDS. The MSDS for the chemicals on-site will be available and located in the company vehicle.

8.2 Operations

1. All personnel going to the Site must be adequately trained and thoroughly briefed on anticipated hazards, equipment, safety practices, emergency procedures, and communications.

2. Personnel on the Site must use the Buddy System when engaged in Level C work as specified in ATC Policy No. 35 (Hazwoper). The purpose of the Buddy System is to provide rapid assistance to employees in the event of an emergency.

3. Visual contact must be maintained between pairs of Site and safety personnel. Entry team members should remain close to assist each other during emergencies.

4. Personnel should practice unfamiliar operations before the actual procedure.

5. Entrance and exit locations must be designated, and emergency escape routes delineated. Warning signals for Site evacuation must be established by the SSHO before field activities.

6. Communications using radios, hand signals, or other means, must be maintained between initial entry members at all times. Emergency communications should be prearranged in case of radio failure, the necessity for evacuating the Site, or other reasons.

7. Wind indicators visible to all personnel should be strategically located throughout the Site.

8. Personnel and equipment in the contaminated area should be minimized, consistent with effective Site operations.

9. Work areas for various operational activities will be established.

10. Procedures for leaving a contaminated area will be planned and implemented before going to the Site. Work areas and decontamination procedures will be established based on expected Site conditions.

11. Frequent and regular inspections of Site operations will be conducted by the SSHO to check compliance with this HASP. If changes in operation occur, the HASP must be modified to reflect these changes.

12. All electrical equipment (power tools, extension cords, instruments, radios, etc.) will conform with ATC Policy No. 12 (Electrical) The SSHO will ensure that electrical equipment is free from recognized hazards that may cause physical harm to employees.

13. Fire prevention and protection (appropriate signs for flammable liquids, smoking areas, storage areas of combustible or flammable materials, etc.) will be according to ATC Policy No. 18, Fire Protection.

14. Site Tailgate Safety Meetings will be held daily to discuss anticipated Site conditions and daily activities. This meeting will be summarized in field logbooks and the Tailgate Safety Meeting Form (see Appendix C).

9.0 - CONTINGENCY PLAN

This chapter of the HASP describes potential emergencies at this Site and the procedures for responding to those emergencies.

9.1 Medical Emergencies

1. The name, address, telephone number, travel distance, and travel time to the nearest medical treatment facility are found in the Emergency Information section (see Page TC-4) of this HASP. A map and direction for locating the facility is available in the Emergency Information section (see Page TC-6) of this HASP.

2. Emergency routes will be verified and driven before any Site activities. It may be quicker to transport a person with minor injuries than to wait for Emergency Medical Services (EMS) to respond. Check with the local authorities for response times. Life threatening emergency situations will only be handled by emergency medical services.

3. Before mobilization on-site, the Site Supervisor will contact the local hospital emergency room personnel, local fire department, and local police department to brief them regarding the scope and hazards associated with the scheduled fieldwork. If the Site is outside an established town, contact will be made with county officials and local emergency services.

4. An emergency first-aid kit with contents per ATC Policy No. 20 (First-Aid) will be readily available on the Site, and personnel will have first-aid training. The first-aid kit also contains equipment necessary to protect first-aid providers against exposure to bloodborne pathogens. All first-aid providers will have received Bloodborne Pathogens training and can receive Hepatitis B vaccinations according to the ATC Policy No. 09 (Bloodborne Pathogens) if exposed to bodily fluids.

5. Any person who becomes ill or injured in the exclusion zone must be decontaminated as well as possible with consideration to which risk will be greater, the spread of contamination or the health of the individual. If the injury or illness is minor, full decontamination (remove contaminated clothing and wash hands and face with soap and water, See Section 7.0) should be completed and first-aid administered before transport. If the patient's condition is serious, at least partial decontamination should be completed (i.e., complete disrobing of the victim and redressing in clean coveralls or wrapping in a blanket). First-aid should be administered while awaiting an ambulance or paramedics.

6. The following steps should be followed if an injury or illness case occurs:

    - Check the Scene.
    - If safe to do so, check the condition of the injured.
    - Call 911 if the victim is unconscious or your training dictates to do so.
    - Care for the injured. Always use “Universal Precautions”.
    - Call COMP-CARE (800) 756-1130, if the injury is non-life threatening. COMP-CARE will assist you with the location of the nearest clinic, if referral is needed.

7. Provisions must be made to identify the substance to which the worker has been exposed. This information must be given to medical personnel.

9.2 Emergency Equipment

1. A personal eyewash unit that meets ANSI Z358.1-1998, Section 6 will be available in each ATC field vehicle at the Site if corrosive chemicals (chemicals with a pH of <3 or >11) will be on-site.

2. An emergency first-aid kit with contents as per ATC Policy No. 20 (First-Aid). The Site Supervisor shall be trained and certified in first-aid and CPR.

3. An emergency spill cleanup kit will be available at the Site at all times. Unplanned releases will be reported to the SSHO and/or Site Supervisor as soon as possible.

4. Sufficient water and/or multipurpose dry chemical (Class A, B, and C) fire extinguishers, rated not less than 2A:10B:C, will be maintained on the Site to cope with any situation until emergency services arrive.

9.3 Flammable Conditions

In the event that combustible vapors exceed 10 percent of the LEL or strong odors are detected in the borehole, the following actions should be taken:

- Continue investigation using extreme caution. Personal protective equipment may need to be upgraded.
- Allow vapors to dissipate or use intrinsically-safe mechanical ventilation.
- If atmospheric conditions do not change, call in the listed sequence:
  —Project Manager
  —Regional Safety Coordinator
  —Fire Department
- Provide answering personnel with the call back numbers, locations, directions, and situation assessment.

9.4 Site Evacuation Conditions

The following conditions will necessitate the cessation of field work in the area of concern, withdrawal from the work area, and revisions to this HASP:

- Fires and/or explosions
- Unexploded ordnance is detected
- A major incident or injury occurs
- Flammable atmosphere readings above 10 percent LEL
- Oxygen readings above 23.5 percent oxygen concentration
- Oxygen readings at or below 19.5 percent oxygen concentration
- PID readings over 50 ppm sustained for more than 5 minutes
- Detector tube readings over the maximum Action Level for the contaminant specified

9.5 Emergency Communication System

Emergency contacts and telephone numbers are provided at the beginning of this HASP. Field crews will have some communication device at each active work location. These may include radios, mobile telephones, or walkie-talkies. Such communication devices will have sufficient range to contact the field office and/or emergency services. If an emergency occurs on-site, the Site Supervisor is responsible for checking that appropriate emergency contact has been notified. At the time of the emergency response, the Site Supervisor or designee will brief the emergency personnel on the status of the emergency, including Site conditions.

Field personnel will use hand signals if there are noisy working conditions on the Site. The hand signals that will be used are shown below and will be reviewed by the SSHO during the on-site safety briefing.

Signal	Meaning
Hands on top of head	Need assistance
Grip partner′s wrist or place both hands around partner′s arm	Leave area immediately
Thumbs up	OK; I am all right
Thumbs down	No; Negative
Hand gripping throat	Cannot breathe; Out of air

9.6 Emergency Response Follow-Up

If there is an incident, near-miss, or emergency response, the SSHO will notify the Project Manager and Regional Safety Coordinator. The Project Manager or the Branch Safety Officer will complete a Supervisor's Investigation Report (SIR) (Policy No. 51; Appendix 51-1) and submit to the appropriate Regional distribution list. Prior to resuming work, a Site safety meeting should be held to discuss the circumstances surrounding the incident and what should be done to prevent a re-occurrence.

10.0 - EMPLOYEE TRAINING

10.1 Pre-Assignment and Annual Refresher Training

All ATC Employees and Subcontractors will participate in routine health and safety education and training programs. These programs are designed to provide employees with a thorough knowledge of hazardous materials, health and safety hazard potential, and Federal Occupational Safety and Health Administration (OSHA) requirements published in 29 Code of Federal Regulations (CFR) Part 1910. According to 29 CFR 1910.120(e), Site employees will have received 40 hours of initial Hazardous Waste Operations & Emergency Response (HAZWOPER) instruction and 24 hours of supervised field experience. Attending an annual 8-hour HAZWOPER refresher training session maintains this initial training. It is the responsibility of the Project Manager and each subcontractor's supervising manager to determine if the subcontractor staff meets these training requirements.

10.2 Site Supervisor's Training

On-site Managers and Supervisors on hazardous waste sites who are directly responsible for or who supervise workers engaged in hazardous wastes operations receive, in addition to the initial 40 HAZWOPER training, 8 additional hours of specialized supervisory training in compliance with the OSHA regulations. This training includes training on the employer's safety and health program and the associated employee training program, personal protective equipment program, spill containment program, and health hazards monitoring procedure and techniques.

10.3 Site Safety Training and Briefing Topics

The SSHO will conduct Site-specific health and safety briefing for field personnel before the start of all field work. Briefing attendees will include the Site Supervisor, the Project Team, and Subcontractor personnel. At the conclusion of the meeting, personnel are to sign the HASP Agreement and Acknowledgement Form in the Appendices. As additional people are assigned to the Site, it is the responsibility of the SHSO to ensure that new personnel are briefed on health and safety protocols and ensure that they have reviewed and signed the HASP Agreement and Acknowledgement Form. Items to be covered include:

- Site-specific health and safety rules
- Client-specific health and safety rules
- Health effects of various chemicals used on the Site
- Emergency response actions pertaining to operations on-Site

Additionally, daily Site Tailgate Safety Meetings will be conducted to review past activities, plan ahead for new or changed operations, to understand any near-miss and "lessons learned, establish safe working procedures for anticipated hazards, and provide pertinent safety and health training and motivation. The SSHO will complete the Tailgate Safety Meeting Form located in the Appendices.

10.4 Visitors

All visitors entering the designated work zones will be subject to all applicable health and safety requirements during field operations at the Site. All visitors to a work Site will be given the opportunity to review the HASP, will be escorted at all times, and will be required to stay a safe

distance from Site activities. The Site Supervisor and/or the SSHO will be responsible for briefing all visitors on the Site hazards, Site safety precautions, and the Site emergency response plan.

APPENDIX A
Job Safety Analysis (JSA)

JSA JOB SAFETY ANALYSIS

ATC ASSOCIATES INC.

For RM Department Use
Primary Category:
EM - Environmental Management
Secondary Category:
JSA NO. **EM-002d**

DESCRIPTION OF JOB:	OPERATOR JOB CLASSIFICATION:	DATE:	REVISION:
Well installation	**Field Technician**	**4/22/08**	

PREPARED BY:	REVIEWED BY:	APPROVED BY:	PAGE: of
Dan Mickelsen	**Dan Mickelsen**	**Dan Mickelsen**	

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT

☒ REFLECTIVE VEST	☒ LONG PANTS	☐ AIR PURIFYING RESPIRATOR	☐ OTHER:
☒ HARD HAT	☒ COTTON, LEATHER, OR CRAFTSMAN GLOVES	☐ SUPPLIED AIR RESPIRATOR	☐ OTHER:
☒ SAFETY TOED BOOTS	☐ CHEMICAL RESISTANT GLOVE:	☐ CHEMICAL RESISTANT CLOTHING:	☐ OTHER:
☒ SAFETY GLASSES	☒ HEARING PROTECTION	☐ GOGGLES	☐ OTHER:
☒ FACE SHIELD			☐ OTHER:

REQUIRED TOOLS/EQUIPMENT/SUPPLIES

☐ DRINKING WATER	☐ RATCHET WITH EXTENSION	☐ OTHER:	☐ OTHER:
☐ BUG REPELLENT	☐ WELL MAGNET	☐ OTHER:	☐ OTHER:
☒ TRAFFIC CONTROL DEVICES	☐ AIR MONITORING **SELECT FROM LIST**	☐ OTHER:	☐ OTHER:
☐ LADDER	☐ LOCKOUT/TAGOUT EQUIPMENT	☐ OTHER:	☐ OTHER:

1 JOB STEPS	2 POTENTIAL HAZARDOUS CONDITIONS or UNSAFE PRACTICES	3 SAFE PROCEDURES and PREVENTATIVE MEASURES
Develop Sand Pack	Back injuries	• Use proper lifting procedures – avoid lifting with the back and twisting. • If over 50 pounds or awkward ask for assistance. • Use cart or wheelbarrow to move the bags of sand close to the well opening.
	Hand pinch/cuts/crushed	• Always watch hand placement – do not place your hand in direct path of a tool. • Use craftsman, cotton or leather work gloves.
	Dust	• Pour contents of bag near the well opening. • Stand upwind and allow the wind to take any dust generated away from your breathing zone. • Pour contents slowly. • Do not use a chopping motion to open the bag this will cause dust to contact eyes.
Place PVC pipe	Back injuries	• Use proper lifting procedures – avoid lifting with the back and twisting. • If over 50 pounds or awkward ask for assistance.
	Falling pipe	• Use proper attachment to lift casing.
	Hand injuries	• Be alert for hand injuries. • Do not use your hand as the tool. Use a hammer to move objects that are stuck. • Use the right tool for the job. • Be aware of hand placement – do not place hands in the path of hammers, knifes or between objects.

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☒ FACE SHIELD			☐ OTHER:

REQUIRED TOOLS/EQUIPMENT/SUPPLIES

☐ DRINKING WATER	☐ RATCHET WITH EXTENSION	☐ OTHER:	☐ OTHER:
☐ BUG REPELLENT	☐ WELL MAGNET	☐ OTHER:	☐ OTHER:
☒ TRAFFIC CONTROL DEVICES	☐ AIR MONITORING **SELECT FROM LIST**	☐ OTHER:	☐ OTHER:
☐ LADDER	☐ LOCKOUT/TAGOUT EQUIPMENT	☐ OTHER:	☐ OTHER:

1 JOB STEPS	2 POTENTIAL HAZARDOUS CONDITIONS or UNSAFE PRACTICES	3 SAFE PROCEDURES and PREVENTATIVE MEASURES
		• Wear cotton, leather or craftsman gloves. • Communicate your intentions to others involved. Make sure they understand where and what you will be doing before you do it.
Remove auger as well is advanced	Back injuries	• Use proper lifting procedures – avoid lifting with the back and twisting. • If over 50 pounds or awkward ask for assistance. • Use a winch cable as a mechanical lift for auger pieces. • Tip the auger up on one end and roll the auger into place.
	Hot auger	• Do not touch the auger without gloves • Allow auger to cool down before handling • Use water to assist with cooling process
	Hand pinch/cuts/crushed	• Be alert for hand injuries. • Do not use your hand as the tool. Use a hammer to move objects that are stuck. • Use the right tool for the job. • Be aware of hand placement – do not place hands in the path of hammers, knifes or between objects. • Wear cotton, leather or craftsman gloves. • Communicate your intentions to others involved. Make sure they understand where and what you will be doing before you do it.

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☒ FACE SHIELD			☐ OTHER:

REQUIRED TOOLS/EQUIPMENT/SUPPLIES

☐ DRINKING WATER	☐ RATCHET WITH EXTENSION	☐ OTHER:	☐ OTHER:
☐ BUG REPELLENT	☐ WELL MAGNET	☐ OTHER:	☐ OTHER:
☒ TRAFFIC CONTROL DEVICES	☐ AIR MONITORING **SELECT FROM LIST**	☐ OTHER:	☐ OTHER:
☐ LADDER	☐ LOCKOUT/TAGOUT EQUIPMENT	☐ OTHER:	☐ OTHER:

1 JOB STEPS	2 POTENTIAL HAZARDOUS CONDITIONS or UNSAFE PRACTICES	3 SAFE PROCEDURES and PREVENTATIVE MEASURES
	Slips, Trips and Falls	• Maintain housekeeping. • Set up work zone with enough room for staging of equipment and supplies such that there are aisle ways for walking and working. • If on pavement or concrete sweep up loose sand, dirt or rock before lifting or moving equipment. • Wear slip resistant steel toed boots. • Keep foot wear clean of mud and other debris. Setup a boot cleaning area if needed. • Dry up water as quickly as possible. • Continue to clean and remove cuttings from drilling area. • Pickup tools that are not needed and place out of the way. • Walk your pathway before carrying an item. • Maintain three points of contact when climbing up and down. Always face the climbing surface. • If breaking a bolt on an auger make sure you have clean foot wear and work area, face the wrench and only use one foot on the wrench while holding onto a secure area that will not move.
Mixing water and grout	Back injuries	• Use proper lifting procedures – avoid lifting with the back and twisting. • If over 50 pounds or awkward ask for assistance.

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☐ BUG REPELLENT	☐ WELL MAGNET	☐ OTHER:	☐ OTHER:
☒ TRAFFIC CONTROL DEVICES	☐ AIR MONITORING **SELECT FROM LIST**	☐ OTHER:	☐ OTHER:
☐ LADDER	☐ LOCKOUT/TAGOUT EQUIPMENT	☐ OTHER:	☐ OTHER:

1 JOB STEPS	2 POTENTIAL HAZARDOUS CONDITIONS or UNSAFE PRACTICES	3 SAFE PROCEDURES and PREVENTATIVE MEASURES
		• Take turns mixing the grout or if possible use an automated mixer. • Do not lean over the drum while mixing. Take breaks when needed and change position.
	Noise	• Wear hearing protection when pump and drill rig are operating
	Splash with water grout mix	• Wear face shield with safety glasses • Slowly introduce water into the mix and use a long handle shovel to mix.
	Hand pinch/cuts/crushed	• Wear work gloves – cotton, leather or craftsman while working. • Watch hand placement – always know where your hands are at. • Do not place your hand in direct path of a tool or between two objects.
	Dust	• Pour contents of bag near the drum or mixing container opening. • Stand upwind and allow the wind to take any dust generated away from your breathing zone. • Pour contents slowly. • Do not use a chopping motion to open the bag this will cause dust to contact eyes. • Use dust goggles.

JSA JOB SAFETY ANALYSIS

VATC ASSOCIATES INC.

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☐ LADDER	☐ LOCKOUT/TAGOUT EQUIPMENT	☐ OTHER:	☐ OTHER:

1 JOB STEPS	2 POTENTIAL HAZARDOUS CONDITIONS or UNSAFE PRACTICES	3 SAFE PROCEDURES and PREVENTATIVE MEASURES
	Slips, trips and falls	• Maintain housekeeping. • Set up work zone with enough room for staging of equipment and supplies such that there are aisle ways for walking and working. • If on pavement or concrete sweep up loose sand, dirt or rock. • Wear slip resistant steel toed boots. • Keep foot wear clean of mud and other debris. • Dry up water as quickly as possible. • Place pallet of material close to work area to minimize walking and carrying items.
	Chemical contact – skin	• Do not contact wet grout without nitrile gloves on. Nitrile gloves can be worn under other gloves. • Wash off with clean water. • Do not use hands to mix.
Place well vault	Back injuries	• Use proper lifting procedures – avoid lifting with the back and twisting. • If over 50 pounds or awkward ask for assistance.
	Hand pinch/cuts/crushed	• Be alert for hand injuries. • Do not use your hand as the tool. • Use the right tool for the job. • Be aware of hand placement – do not place your hands between object. • Wear cotton, leather or craftsman work gloves.

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1 JOB STEPS	2 POTENTIAL HAZARDOUS CONDITIONS or UNSAFE PRACTICES	3 SAFE PROCEDURES and PREVENTATIVE MEASURES
	Slips, trips and falls	• Set up work zone with enough room for staging of equipment and supplies such that there are aisle ways for walking and working. • If on pavement or concrete sweep up loose sand, dirt or rock. • Wear slip resistant steel toed boots. • Keep foot wear clean of mud and other debris.
Pumping grout around well casing	Pressurized lines	• Reverse pump to remove excess pressure. • Open bleed off valve. • Slowly disconnect pipes allowing excess pressure to escape. • Wear face shield when disconnecting and pumping grout around well vault.
	Back injuries	• Use proper lifting procedures – avoid lifting with the back and twisting. • If over 50 pounds or awkward ask for assistance.
	Slips, Trips and Falls	• Maintain housekeeping. • Set up work zone with enough room for staging of equipment and supplies such that there are aisle ways for walking and working. • If on pavement or concrete sweep up loose sand, dirt or rock. • Wear slip resistant steel toed boots. • Keep foot wear clean of mud and other debris.

JSA JOB SAFETY ANALYSIS

For RM Department Use
Primary Category:
EM - Environmental Management
Secondary Category:
JSA NO. **EM-002d**

DESCRIPTION OF JOB:	OPERATOR JOB CLASSIFICATION:	DATE:	REVISION:
Well installation	**Field Technician**	**4/22/08**	

PREPARED BY:	REVIEWED BY:	APPROVED BY:	PAGE: of
Dan Mickelsen	**Dan Mickelsen**	**Dan Mickelsen**	

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT

☒ REFLECTIVE VEST	☒ LONG PANTS	☐ AIR PURIFYING RESPIRATOR	☐ OTHER:
☒ HARD HAT	☒ COTTON, LEATHER, OR CRAFTSMAN GLOVES	☐ SUPPLIED AIR RESPIRATOR	☐ OTHER:
☒ SAFETY TOED BOOTS	☐ CHEMICAL RESISTANT GLOVE:	☐ CHEMICAL RESISTANT CLOTHING:	☐ OTHER:
☒ SAFETY GLASSES	☒ HEARING PROTECTION	☐ GOGGLES	☐ OTHER:
☒ FACE SHIELD			☐ OTHER:

REQUIRED TOOLS/EQUIPMENT/SUPPLIES

☐ DRINKING WATER	☐ RATCHET WITH EXTENSION	☐ OTHER:	☐ OTHER:
☐ BUG REPELLENT	☐ WELL MAGNET	☐ OTHER:	☐ OTHER:
☒ TRAFFIC CONTROL DEVICES	☐ AIR MONITORING **SELECT FROM LIST**	☐ OTHER:	☐ OTHER:
☐ LADDER	☐ LOCKOUT/TAGOUT EQUIPMENT	☐ OTHER:	☐ OTHER:

1 JOB STEPS	2 POTENTIAL HAZARDOUS CONDITIONS or UNSAFE PRACTICES	3 SAFE PROCEDURES and PREVENTATIVE MEASURES
		• Dry up water as quickly as possible.
	Hand cuts and pinches	• Be alert for hand injuries. • Do not use your hand as the tool. • Use the right tool for the job. • Be aware of hand placement – do not place hands in the path of hammers, knifes or between objects. • Wear cotton, leather or craftsman work gloves.
	Noise	• Wear hearing protection
	Valve failing	• Clean valves and pipe after every use. • Verify valves are operational before the start of the work. If the valve is difficult to move, make sure system is off and remove valve to determine if it needs to be replaced or cleaned. • Do not force a valve open. The use of only one hand is needed to open a functional valve.

JOB SAFETY ANALYSIS

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	Rev. No.:		NEW	PAGES 2
	11	X	REVISED as of 7/11/2013	

WORK ACTIVITY: **Soil Sampling**

The JSA covers the hazards encountered when collecting soil samples during: hand auger, slide hammer soil sampler, split spoon sampler, and acetate sleeve.

Equipment: Auger, Auger Extension, Hammer, Chisel, Soil Sampling Equipment, Brush (to clean auger), Pipe Tape, Pipe Vise, Pipe Wrench, Box Wrenches, Slide Hammer, Chain Pipe Vise,

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Eric Clark	Staff Geologist	Robert Hays	Sr. Project Manager
Ian Desjarlais	Staff Geologist	Majd Neameh	Assistant Project Manager
		Peter Petro	Corporate Health & Safety Manager

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR TASK-SPECIFIC REQUIREMENTS)

X	REFLECTIVE VEST	X	GOGGLES		AIR PURIFYING	X	GLOVES (Nitrile & Level 3 Cut Resistant)
X	HARD HAT		FACE SHIELD		RESPIRATOR		OTHER
	LIFELINE/HARNESS	X	HEARING PROTECTION		SUPPLIED RESPIRATOR		
	SAFETY GLASSES	X	SAFETY SHOES	X	PPE CLOTHING: Long sleeve protection required		

[1] JOB STEPS	[2] POTENTIAL HAZARDS	[3] CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Hand Auger Soil Sampling - Turning Auger (SUBSURFACE WORK PERMIT REQUIRE)	• Damage to underground utility: shock, explosion, chemical	• Confirm subsurface protocol was completed and auger location cleared. (CSE2)
	• Over exertion, strain, muscle pull, struck-by	• Use good body mechanics, wide stance, do not overly twist back while turning auger, use chest and arm strength.
		• Do not use cheater bar to provide extra force on T-handle.
2. Hand Auger Soil Sampling - Sample Collection	• Pinch, cut, scrape or puncture hazard from removing soil	• Tap auger using hammer to loosen soil out of sleeve into sample container.
		• Do not put any body component in line-of-fire (within 1 foot) if using decontaminated screwdriver or chisel to pry soil from sleeve.
		• Block auger tips so they will not slip and come in contact with any body part while removing soil.
		• If sample container has preservative review MSDS, ensure use of correct protective gloves: HCL - Nitrile, Sodium Bisulfate - Nitrile, Methanol - Nitrile (Splash) Neoprene or PVC (immersion)
		• Inspect glassware for cracks before using to hold soil sample. Open slowly, place on level surface to prevent spilling any preservative.
3. Hand Auger Soil Sampling - Decontamination	• Exposure to impacted water/soil, cut or pinch/impact hazard	• Make sure gloves are in good condition and not ripped before placing hands in decon water. (CSE5)
		• Use brush (not hand) to clean auger. Inspect formetal burrs on auger or auger extension before cleaning, file down if present.
		• Pinch or impact hazard from disconnecting auger extensions. If screw type connection ,ensure threats coated with pipe tape to prevent locking. Use pipe vise if available to secure auger extensions. Use box wrenches (not adjustable wrenches or channel locks). If pin type keep hands 6 inches from connection points to prevent pinch hazard when reassembling.
4. Slide Hammer Soil Sampler - Sample Collection (SUBSURFACE WORK PERMIT REQUIRED)	• Damage to underground utility: shock, explosion, chemical exposure	• Confirm subsurface protocol was completed and auger location cleared. (CSE2)
	• Cut hazard loading sleeve into barrel	• Inspect barrel to slide hammer to ensure no metal burrs are present. Inspect metal sleeve insert as well. Remove or replace if burrs are present.
	• Impact, pinch, muscle pull hazards	• Place sampler head on surface for soil sample to check depth to avoid being too short and overextending arm or back when striking sampler.

[1] JOB STEPS	[2] POTENTIAL HAZARDS	[3] CRITICAL ACTIONS TO MITIGATE HAZARDS
5. Slide Hammer Soil Sampler - Sample Collection	• Impact, pinch, muscle pull hazards	• Check striking motion before applying heaving force to ensure arm and wrist movement are in straight lines and not at awkward angles.
		• Lift with legs and not back to extract sampler head when sampler is full. May need to use upward strikes to free equipment.
6. Slide Hammer Soil Sampler - Sample Removal	• Exposure to impacted Soil, Cut or Impact Hazard	• If sampler head is stuck, use pipe wrenches to free inner sleeve. Use chain pipe vise to secure head of sampler. Clear hands motion to prevent contact with other objects if wrench slips
		• Wear cut resistant and chemical protective gloves. (CSE5)
		• Inspect edges of sleeves from brass sample before capping to prevent cuts.
		• If sample container has preservative, review MSDS. Ensure use of correct protective gloves: HCL - Nitrile, Sodium Bisulfate - Nitrile, Methanol - Nitrile (Splash) Neoprene or PVC (immersion). (CSE5)
7. Slide Hammer Soil Sampler - Decontamination	• Exposure to impacted water/soil, cut or pinch/impact hazard	• Make sure gloves are in good condition and not ripped before placing hands in decon water. (CSE5)
		• Use brush (not hand) to clean sampler head. Be aware of metal burrs extensions or sampler head.
		• Pinch or impact hazard from disconnecting extensions. If screw type connection ensure threats coated with pipe tape to prevent locking. Use pipe vise if available to secure auger extensions and box wrenches not adjustable wrenches or channel locks. If pin type keep hands six inches away from connection points to prevent pinch hazard when reassembling.
8. Split Spoon Sampler - Sample Collection & Decontamination	• Line of Fire	• Review drilling company's JSA for sample handling.
		• Do not assist driller with handling of split spoon. Not trained on hazard recognition or protocol.
	• Burn or Cut or Scrape, or exposure to chemicals (rash or acute reaction)	• Geologic conditions during sample collection can make sample very hot. Test before grabbing and burning self.
		• Wear chemical and cut resistant gloves and goggles when handling soil. (CSE5)
		• Inspect edges of sleeves from brass sample before capping to prevent cuts.
		• If sample container has preservative, review MSDS. Ensure use of correct protective gloves: HCL - Nitrile, Sodium Bisulfate - Nitrile, Methanol - Nitrile (Splash) Neoprene or PVC (immersion). (CSE5)
		• Inspect glassware for cracks before using to hold soil sample. Open slowly, place on level surface to prevent spilling any preservative.
9. Acetate Sleeve - Sample Collection & Decontamination	• Line of Fire	• Review drilling company's JSA for sample handling.
		• Do not assist driller with handling of acetate sleeve. Not trained on hazard recognition or protocol.
	• Cut or Scrape	• Ensure driller is using vise to hold sleeve down when cutting sleeve with hand saw or opening sleeve for inspection with geoprobe. Review cutting process identifying line-of-fire hazards.
		• Wear chemical and cut resistant gloves and goggles when handling acetate sleeve. Edges of sleeve are very sharp cutting hazard. (CSE5)
		• If sample container has preservative, review MSDS. Ensure use of correct protective gloves: HCL - Nitrile, Sodium Bisulfate - Nitrile, Methanol - Nitrile (Splash) Neoprene or PVC (immersion). (CSE5)
		• Inspect glassware for cracks before using to hold soil sample. Open slowly, place on level surface to prevent spilling any preservative.

CORE SAFETY EXPECTATIONS

CSE1: Always follow Fall Protection standards when working at elevated heights

CSE2: Always follow Written Permit Procedures regarding: confined space, hot work, subsurface work & gas testing

CSE3: Always follow Lock Out/Tag Out (LOTO) procedures

CSE4: Always follow Defeat of Critical Device procedures

CSE5: Always follow written PPE requirements for the work being performed

1 Each Job or Operation consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the associated hazards in Column 2

2 A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - struck against, struck by, harmful contact with (cut, abrasion); Caught - in, under, between, by objects; Fall - slip/trip, fall on same level, fall from height; **Strain/Overexertion** - lifting, pushing/pulling, bending, twisting; **Energy Source** - electricity, pressure, compression/tension; **Exposure** - Temperature extreme, radiation, noise, chemical burn, hazardous atmosphere.

3 Aligning with the first two columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific.

1 JOB STEPS	2 POTENTIAL HAZARDS	3 CRITICAL ACTIONS TO MITIGATE HAZARDS

Use objective observable and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

JOB SAFETY ANALYSIS

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	Rev. No.:		2 PAGES
	9	[ ] NEW [X] REVISED as of 2/20/2013	

WORK ACTIVITY: **MONITORING AND GAUGING**

Routine gauging and monitoring groundwater wells both on site and off site. Working in a remote area around livestock.

Equipment: **Wrench, Screwdriver, Pry Bar**

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Aaron Ulishney	Project Geologist	Jennifer Lacy	LPS Manager
Chris Bumgarner	Senior Technician	Peter Petro	Corpora H&S Manager
Jonathan Love	Staff Geologist	Jake Prowse	QM Manager

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR TASK-SPECIFIC REQUIREMENTS)

[X] REFLECTIVE VEST	[ ] GOGGLES	[ ] AIR PURIFYING	[X] GLOVES (Nitrile & Cut Resistant Level 3)
[X] HARD HAT	[ ] FACE SHIELD	[ ] RESPIRATOR	[ ] OTHER:
[ ] LIFELINE/HARNESS	[ ] HEARING PROTECTION	[ ] SUPPLIED RESPIRATOR	
[X] SAFETY GLASSES	[X] SAFETY SHOES	[X] PPE CLOTHING:long sleeve shirt and pants	

[1] JOB STEPS	[2] POTENTIAL HAZARDS	[3] CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Movement of equipment and vehicles on/off site	• Items falling from truck or inside trailer	• Drive with the tailgate closed whenever possible. If the tailgate must remain open, strap down any loose items.
		• Stow equipment in cabinets and close cabinets inside trailer. Keep sample containers in coolers.
2. Establishing Work Zones	• Vehicle or pedestrian traffic entering the work zone; danger of being struck by a vehicle	• Review Traffic Control JSA for detail hazard mitigation
		• Use traffic watch in high risk traffic areas and when a second person is on site. For work in high pedestrian areas use traffic cage.
		• For work in high pedestrian areas use cones with flags.
3. Handling Equipment / Opening / Removing Well Lids	•Over Exertion- Lifting Heavy Equipment	•Do not lift anything over 40 lbs. without assistance. Bend knees and lift using legs/arms, not your back, keep the load close to your body, tighten stomach.
	•Coming into contact with sharp and/or heavy objects	•Wear cut resistant gloves and steel toes boots. (CSE5)
	• Crush/pinch/chop hazard from heavy well lids - loss of finger tip or broken finger	• When removing/opening well lids use wrench handle or screwdriver to place block between lid and ring incase lid slips it will not close in place.
		• Use hand tools (i.e., pry bar) to initially lift and hold heavy covers
		• Keep fingers and toes away from edge of well vault. Do not have fingers cross into well vault while opening lid.
	• Biological hazards - bit or stung causing injury	• Watch for spiders and other insects before putting hands into well vaults. Use tool (screw driver) and visual inspection to explore well vault before reaching in with gloved hand.
	•Coming into Contact with objects Slips/Trips/Falls	• If lid is removable store as close as possible, but clear of potential walkways to avoid tripping hazards. Consider placing lid underneath tailgate of truck if feasible.
4. Locking and Unlocking Well Caps	• Exposure to Contaminants - splash or pressurized release of vapors	• Wear Nitrile gloves and cut resistant gloves. (CSE5)
		• Loosen cap slowly, keeping control if pressure is release, keep face out of the line-of-fire
		• Ensure well cap is effectively sealing well and properly locked
5. Gauging Wells	• Fire/explosion hazards	• Do not smoke on site.
	• Exposure to Biological: bitting and stinging Insects	• Use tool (screwdriver) and visual inspection to explore well vault before reaching in with gloved hand. (CSE5)

[1] JOB STEPS	[2] POTENTIAL HAZARDS	[3] CRITICAL ACTIONS TO MITIGATE HAZARDS
5. Gauging Wells	• Splash hazard when gauging wells	• Safety glasses with side shields must be worn at all times. (CSE5)
		• Nitrile and cut resistant gloves must be worn while handling the DTW/DTP probe and during deconning.
	• Exposure to Vapors and Airborne particulates	• Stop work if excessive odors are present in well and call Supervisor prior to continuing with task.
		•Wear safety glasses with side shields (CSE2)
		• Keep lids closed on poly tanks and drums as much as possible.
	• Contact with contaminated materials or exposure to standing water in well vault	• Hand bail or pump out free liquid before opening well cap.
6. Cleaning Up and Departing the Site	• Slips, trips and falls	• Check that well covers are secure upon departure, and that all tools and purging equipment are removed from the site.
		• Walk around site and conduct 360° vehicle visual inspection before demobilization
	• Leaving the site - vehicle accident	• Review **Driving JSA**
CORE SAFETY EXPECTATIONS		
CSE1: Always follow Fall Protection standards when working at elevated heights		
CSE2: Always follow Written Permit Procedures regarding: confined space, hot work, subsurface work & gas testing		
CSE3: Always follow Lock Out/Tag Out (LOTO) procedures		
CSE4: Always follow Defeat of Critical Device procedures		
CSE5: Always follow written PPE requirements for the work being performed		
Field Change Section: document step, hazard and field change to capture/control hazards as seen during operations.		

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JOB SAFETY ANALYSIS

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	Rev. No.:			
	9	[ ] NEW	[X] REVISED as of 1/24/2013	2 PAGES

WORK ACTIVITY: **Hand Auger Excavation**

Covers the hazards with completing excavation using a hand auger.

Equipment: **Hand Auger, Extension Rods, Sand Trap, Shovel, Hammer, 5-Gallon Buckets, Bristle Brush, DOT Drum, Drum Dolly**

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Aaron Ulishney	Project Geologist	Steve Marie	Project Manager
Jonathan Love	Staff Geologist	Peter Petro	Health & Safety Manager

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR TASK-SPECIFIC REQUIREMENTS)

[X] REFLECTIVE VEST	[ ] GOGGLES on hard hat	[ ] AIR PURIFYING	[X] GLOVES (Nitrile over Cut Resistant Level 3)
[X] HARD HAT	[ ] FACE SHIELD	[ ] RESPIRATOR (Keep in Vehicle)	[ ] OTHER:
[ ] LIFELINE/HARNESS	[ ] HEARING PROTECTION	[ ] SUPPLIED RESPIRATOR	
[X] SAFETY GLASSES (ANSI 787.1)	[X] SAFETY SHOES	[X] PPE CLOTHING: FRC Clothing	

[1] JOB STEPS	[2] POTENTIAL HAZARDS	[3] CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Hand Auger Excavation Set Up	• Injury from / Damage to Underground Utilities and/or Structures - resulting in fire, explosion, release of water, electrocution	• Contact utility locator service (USA Alert) at least 48 hours before onset of fieldwork.
		• Follow ExxonMobil Subsurface Clearance and Excavation Permit procedures. - advance probe before augering (CSE2)
		• Do not force hand auger. If refusal, call PM to discuss potential subsurface obstructions.
2. Hang Auger	• Injury to hands	• Wear cut resistant gloves at all times when handling tools/equipment. (CSE5)
	• Muscle strain / overexertion from hand auger operation	• Inspect for broken welds, metal spurs on connections, do not use if damaged.
		• Do not use excessive force or cheater bar that can cause injury, choose alternate tool to loosen soil or step out with PM approval.
		• Take breaks based on heat stress appendix in SSP (to include drinking fluids to stay hydrated)
		• Rotate personnel performing hand augering once per hour.
		• Do not turn at waist, turn with arms and shoulders, keep feet square and lift with legs.
	• Injury from tripping/slipping - resulting in broken bones, torn ligaments and tendons	• Walking is working, focus on path avoid uneven ground and slopes when walking. Plan path which provides least number of obstacles.
		• Use shovel to level ground to create flat working surface.
		• Keep tools/equipment in designated area away from work area/borehole.
	• Hitting people or stationary objects with T handle / extension rods	• Be aware of hazards when hand auger is at full extension and maintain clear communication with co-workers.
		• Utilize two personnel to remove auger from hole when >10 ft. in length
		• Look up and watch the T handle while lowering auger into the hole, to avoid hitting yourself with the T handle
3. Emptying Soil from Hand Auger Bucket	• Pinch points / strike hazards / cut hazards	• Use hammer to remove soil from bucket. / Keep grip hand clear of bucket / hammer. Use probing tool such as screwdriver to remove higher plasticity soils.
Use of digging bar to remove rocks / debris (must have PM approval to use - Per XOM SAN "*The digging bar (or any other tool) may not be advanced into*	• Injury from losing control of bar	• Always keep two hands on bar
		• Keep head / face clear of end of bar
		• Do not use excessive force when using bar

[1] JOB STEPS	[2] POTENTIAL HAZARDS	[3] CRITICAL ACTIONS TO MITIGATE HAZARDS
soil that has not been probed or otherwise cleared; No tool should be utilized with inappropriate force that could cause damage;)	• Back injury	• Do not turn at waist, turn with arms and shoulders, keep feet square to hole.
4. Shoveling / transferring soil into drum	• Muscle strain / overexertion from shoveling	• When shoveling, move in straight lines, do not twist back to empty shovel or move dirt, step in direction. Switch arms (every ten to fifteen shovels) when shoveling to balance strain on back and arms.
		• Empty hand auger bucket directly into drum whenever possible. If transporting soil in 5-gallon buckets, fill each 1/2 way and balance load in two buckets.
	• Pinch points from drum lid	• Maintain required hand protection (listed above) when opening closing drum lids.
5. Decontaminating hand auger equipment	• Cut hazard	• Use bristle brush to clean auger blades. Keep hands clear of auger blades.
6. Backfilling hand auger boring	• Back strain from lifting	• Do not lift greater than 50 lbs. without assistance. Empty bags into 5-gallon buckets if > 50 Lbs.
	• Injury to hands	• Wear cut resistant level 3 gloves at all times when handling tools/equipment. (CSE5)
		• Thoroughly inspect shovel, do not use if damaged.
7. Cleaning Up and Departing the Site	• Trip hazards	• Ensure that surface completion matches existing grade. Do not leave open holes unattended, contact PM to discuss if work is not completed.
	• Back strain from moving drum	• Do not move drum without drum dolly, **review JSA drum management 2012**
CORE SAFETY EXPECTATIONS		
CSE1: Always follow Fall Protection standards when working at elevated heights		
CSE2: Always follow Written Permit Procedures regarding: confined space, hot work, subsurface work & gas testing		
CSE3: Always follow Lock Out/Tag Out (LOTO) procedures		
CSE4: Always follow Defeat of Critical Device procedures		
CSE5: Always follow written PPE requirements for the work being performed		
Field Change Section: document step, hazard and field change to capture/control hazards as seen during operations.		

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JOB SAFETY ANALYSIS

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	Rev. #			
	3	[ ] NEW [X] REVISED as of 1/31/14	2 PAGES	

WORK ACTIVITY: **DRILLING OVERSIGHT - DIRECT PUSH, SAMPLE COLLECTION, DECONSTRUCTION**

Drilling hazard activities covered are: ground disturbance, ground intrusion, bin/drum management, site cleanup and drum relocation.

Equipment: Traffic Control Devices, Temporary Fencing, Traffic Barricades and/or Delineators with Caution Tape, Defined Work Area Signs, Drill Rig, Borehole Plates, Multi-Gas Meter, Air Knife Equipment, Multi-Gas Meter and/or PID

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Jennifer Lacy	LPS Manager	Peter Petro	Corporate H&S Manager
Ryan Pozzuto	Staff Scientist	Jennifer Lacy	LPS Manager
Phil Cordell	Staff Geologist		

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR TASK-SPECIFIC REQUIREMENTS)

[X]	REFLECTIVE VEST	[X]	GOGGLES	[ ]	AIR PURIFYING	[X]	GLOVES (Nitrile & Level 3 Cut Resistant)
[X]	HARD HAT	[ ]	FACE SHIELD	[ ]	RESPIRATOR	[ ]	
[ ]	LIFELINE/HARNESS	[X]	HEARING PROTECTION	[ ]	SUPPLIED RESPIRATOR	[ ]	
[ ]	SAFETY GLASSES	[X]	SAFETY SHOES	[X]	PPE CLOTHING: Long sleeve protection required		

[1] JOB STEPS	[2] POTENTIAL HAZARDS	[3] CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Setup for Direct Push	•Multiple Task Hazards	• Requires review and use of JSA Drilling Oversight -Direct Push Setup
2. Ground Disturbance: Auger Boring Advancement/Direct Push Drill Rods (REQUIRES HOT WORK PERMIT and OIMS SUBSURFACE PROTOCOL)	• Faulty or Inappropriate Equipment	• Qualified driller must inspect drill rig prior to use; if found faulty and/or inappropriate, do not proceed until repaired or replaced
		• Inspect all hand tools prior to use; if found faulty or inappropriate, do not proceed until repaired or replaced.
	• Operating Equipment	• Clear area of obstructions and communicate with all workers involved that drilling is beginning.
		• Stay clear of moving drilling rods
		• Secure loose clothing, long hair and remove jewelry which can become entangled in operating equipment
		• Wear PPE including goggles, cut resistant gloves and safety shoes ANSI Z41. (CSE5)
		• Ensure that the "Hands Free" program is in use.
	• Suspended Loads	• Do not walk under suspended loads
		• When possible, remove overhead hazards promptly
		• Wear PPE including goggles, cut resistant gloves and safety shoes ANSI Z41. (CSE5)
	• High Noise Levels	• Use hearing protection when equipment is operating. (CSE5)
		• Request dB levels of operating equipment to establish single or double hearing protection. (CSE5)
	• Vapors and Airborne Particulates: Breathing and Explosion/Fire Hazards	• Monitor air concentrations using direct-reading, real-time instruments such as a LEL and/or PID meter(s)
		• HOT WORK permit is required. (CSE2)
		• 10% LEL in breathing zones require engineering controls to be implemented
		• Stop work if hazardous conditions arise as identified in the SSP, until hazard is removed by taking the following actions in order: implementing engineering controls, implementing administrative controls, upgrade PPE. (CSE5)
		• Wear PPE including goggles, dust masks (for particulates only, does not work for vapors) or respirators. (CSE5)
		• Stay upwind whenever possible • Identify windsock on mast or alternative means on nearby surroundings to determine wind direction

[1] JOB STEPS	[2] POTENTIAL HAZARDS	[3] CRITICAL ACTIONS TO MITIGATE HAZARDS
	• Impact to Subsurface Lines/Tanks	• Only drill in areas where underground features have been identified and cleared per SCP. If hole has to be moved, clear new location with air/water knife equipment first and ensure SCP specifications are met.
	• Impact to Subsurface Lines/Tanks	• Wear PPE including cut resistant gloes and hard hat. (CSE5)
	• Rod Removal Stuck Rod breaking striking Personnel	• Driller to understand limitations of rig and not force repeated blows trying to drive through restrictive formation
		• Use normal removal means for rod extraction. Do not use leveling jacks to apply upward force.
3. Air Monitoring	• Exposure to vapor and airborne contaminants	• While monitoring the air near a boring, keep yourself as far away as possible from the potential contaminants
		• Set up the PID to retain the highest value to eliminate having to read the display screen
		• Consider the use of an extension for the PID/LEL to increase the distance between the bore hole and the monitoring personnel
		• Make sure alarms are turned on -- audible and visible.
		• Wear respirator if the concentration reaches 100 PPM in your breathing air. (CSE5)
		• Notify all workers if the concentrations exceed 100 PPM in their breathing air.
		• If the concentrations exceed 100 PPM, increase the monitoring frequency to 7 minutes or between each rod change.
4. Ground Intrusion: Soil Samples Acetate Liners (REQUIRES HOT WORK PERMIT and OIMS Subsurface Protocol)	• Cut Hazards from accessing Soil Samples	• Open blades knives are not to be used for cutting acetate sleeve.
		• Acetate sleeve is to be secured when opened for logging or other soil investigation.
		• Level 3 cut resistant and nitril gloves to be worn when handling acetate sleeves. (CSE5)
		• Sleeves are to be cut away from operator.
5. Ensure bins/drums are properly secured and labeled	• Bins/drums could be removed from the sites and disposed of improperly or tampered	▪ Ensure correct signage and labeling is present on each side of bin and/or drum.
		▪ Ensure a chain and lock is present on the bin "picking eye" to discourage inadvertent bin removal.
		▪ Ensure bin top is secured and/or temporary fencing is secured.
6. Perform site cleanup/drum relocation	Back or muscle injury from moving heavy objects	▪ Conduct SPSA and keep alert for potential risk.
		▪ Review Drum Management JSA
		▪ Wear appropriate PPE including: cut resistant gloves and goggles
	• Slips/Trips and falls hazards	▪ Perform final site inspection to ensure well boxes are properly secured and all equipment is removed from site.
7. Weather	• Lightning strike	▪ Count the seconds between the flash and bang.
		▪ Every 5 seconds equals one mile. Greater than 30 seconds you are clear, 30 seconds or less means boom down and get to shelter.
		▪ All clear is 30 minutes from the last flash and bang that was 30 seconds or greater.
	• High wind	▪ Check with operator for maximum wind speeds at end of boom.
		▪ If wind approaches the maximum safe wind speed, boom down until wind speed decreases.
		▪ Wait 30 minutes after wind speed decreases.

CORE SAFETY EXPECTATIONS

CSE1: Always follow Fall Protection standards when working at elevated heights
CSE2: Always follow Written Permit Procedures regarding: confined space, hot work, subsurface work & gas testing
CSE3: Always follow Lock Out/Tag Out (LOTO) procedures
CSE4: Always follow Defeat of Critical Device procedures
CSE5: Always follow written PPE requirements for the work being performed

JOB SAFETY ANALYSIS

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	Rev. No.: 10	[ ] NEW [X] REVISED as of 1/31/14	2 PAGES

WORK ACTIVITY: **CONSTRUCTION - TRENCHING & EXCAVATING**

Includes tasks and hazards for trenching/excavation of concrete/asphalt, engineered fill and native materials.

Equipment: Heavy Equipment with Outriggers and Backup Alarm, Shovels, Breaker Bars, Brooms, Multi-Gas and/or PID, Non-Sparking Bucket or Blade for Earth Mover, "No Smoking" Signs, Marking Paint, Traffic-Rated Trench Plates, Lighted Barricades, Orange Construction Fence or/and Temporary Chain-Link Fencing

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Henry Leone	Construction Worker / Foreman	Peter Petro	Corporate H&S Manager
Ryan Rooks	Construction Worker / Foreman	Charlie Weber	Construction Manager
		David Klemme	Senior Engineer

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR TASK SPECIFIC REQUIREMENTS)

[X]	REFLECTIVE VEST	[X]	GOGGLES	[ ]	AIR PURIFYING	[X]	GLOVES (Nitrile and Level 3 Cut Resistant)
[X]	HARD HAT	[ ]	FACE SHIELD	[ ]	RESPIRATOR	[ ]	OTHER (as specified in HASP)
[ ]	LIFELINE/HARNESS	[X]	HEARING PROTECTION	[ ]	SUPPLIED RESPIRATOR		
[ ]	SAFETY GLASSES	[X]	SAFETY SHOES	[X]	PPE CLOTHING: Long sleeve protection required		

[1] JOB STEPS	[2] POTENTIAL HAZARDS	[3] CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Removing Asphalt or Concrete Using Heavy Equipment and Removing Soil Using Heavy Equipment or Hand Digging NOTE: THIS ACTIVITY REQUIRES A HOT WORK PERMIT	• Slips, trips and falls - resulting in broken bones, torn ligament/tendons	• Hard hat must be worn at all times. (CSE5)
		• Standing water, loose soil or backfill, loose parts, and tools are slip and trip hazards: keep out of walking paths, put tools away as soon as finished using.
		• Do not walk close to the edge of an excavation (within 5 ft. of an un-shored wall) to avoid slips or cave-ins. (CSE1)
	• On-site workers may be injured or killed by heavy equipment	• Heavy equipment shall be checked daily and documented for proper operation and equipped with a back up alarm.
		• Do not allow personnel to stand within the swing radius of equipment booms or arms when equipment is in operation. Enter kill distance for equipment here: _____ft., _____ ft., _____ ft.
		• When approaching operating equipment outside of kill radius use Hands Program (from the front and within the view of the operator, operator powers down equipment [placed in safe state where unintentional operation is impossible], shows you both of his/her hands being the signal it is safe to approach).
	• Heavy equipment may be unbalanced on unstable ground	• Where unstable soil exists, the soil should be assessed by a qualified professional engineer to ensure safe site conditions, stop work. Implement design control measures.
		• Stabilize equipment with outriggers if equipped
	• Back / muscle strains due to shoveling or lifting	• Ensure proper lifting techniques when conducting lifts; lift with legs, back straight, tighten core muscles (stomach), head looking forward.
		• Get help with objects that are too heavy (greater than 40 lbs.) or awkward for one person to lift.
		• When shoveling or sweeping, move in straight lines, do not twist back to empty shovel or move dirt, step in direction. Switch arms (every ten to fifteen shovels) when shoveling to balance strain on back and arms.
		• Use the proper tools (correct shovels, breaker bars) for each specific task.
		• Use heavy equipment (backhoe, bobcat) as much as possible to transport soil, asphalt/concrete or heavy equipment.
	• Injuries to hands	• Use the proper gloves for each specific task (Nitrile for chemical exposure [over glove] and level 3 cut resistant for all site work). (CSE5)
	• Hearing damage from working in areas of high noise	• Hearing protection must be worn when working around operating equipment. Rule of thumb, if you have to raise your voice to be heard from 2 feet away wear hearing protection (plugs, caps, or muff NRR > 28). (CSE5)

1 JOB STEPS	2 POTENTIAL HAZARDS	3 CRITICAL ACTIONS TO MITIGATE HAZARDS
	• Unaware of Approaching Hazard due to Hearing Protection	• Use of hearing protection can limit one's ability to hear instructions, warnings or approaching traffic, etc. Rely on using your eyes to be aware of your surroundings, visually check on work environment every 10 minutes.
1. Removing Asphalt or Concrete Using Heavy Equipment and Removing Soil Using Heavy Equipment or Hand Digging NOTE: THIS ACTIVITY REQUIRES A HOT WORK PERMIT	• Hazardous dust and/or particulate matter or organic vapors - resulting in lung damage or other organ acute or chronic health effects	• Visually monitor for dust and use the photo-ionization detector (PID) or other equipment to monitor hydrocarbon vapor concentrations. If air concentrations exceed action levels of 20 ppmv consistantly in breathing zone, take corrective action or stop work until the condition subsides. (CSE2)
		• Vapor suppressant or water spray may be used to control dust or to keep vapors from leaving the work zone.
		• Mandatory use respirators if gasoline vapor reaches 100 ppmv. (CSE5)
		• Use goggles to prevent dust and particulates from entering eye. (CSE5)
	• Highly impacted hydrocarbon soil may ignite if sparks occur during removal by equipment contact with rocks or other buried objects.	• Attach a non-sparking bucket or blade to earth-moving equipment.
		• If necessary, periodically wet the work area with water. Note: avoid creating slip hazard, do not create run-off when wetting soils.
		• Conduct fire watch utilizing ERI's Hot Work Permit protocol with 20 lb. ABC fire extinguisher. (CSE2)
		• Monitor the work area with a PID or lower explosion limit (LEL)/oxygen meter. Ensure vapor concentrations of < 10% LEL and below action levels. (CSE2)
		• Post "No Smoking" signs; smoking on site is prohibited.
	• Potential fire, explosion or electrocution if underground utilities are damaged during excavation activities	• The location of underground utilities, piping, and other services must be marked out prior to excavation activities.
		• Follow ExxonMobil subsurface clearance protocol and subsurface permit. (CSE2)
		• Ensure that Underground Service Alert is notified and that the work area is cleared prior to activity. Missing USA marks is immediate STOP WORK, call PM. (CSE2)
		• Obtain the latest As-built drawing for the site and conduct a utility inspection.
2. Entering the Trench/Excavation	• Possible suffocation or death due to soil cave-in	• Do not enter an excavation that is greater than 4 feet deep unless it is professionally shored or sloped in accordance with ExxonMobil trenching protocol and OSHA requirements. (CSE2)
		• Ensure soil is stockpiled greater than 2 feet from the edge of excavation.
	• Toxic or flammable atmosphere	• Test the atmosphere prior to entry for oxygen content ($23>O_2>19.5$), LEL percentage (<10%) and toxic vapor concentrations (< PEL). (CSE2)
		• Do not enter an excavation that is greater than 4 feet deep without completed air monitoring compliance and documentation.
	• Slips, trips and falls	• Do not jump across an open trench; instead, walk around it. (CSE1)
		• Use a trench plate to cover the area of the open trench that is not currently being worked upon.
3. Securing, Cleaning-Up	• Possibility of personnel or pedestrians falling into the open excavated area and sustaining injury or death	•OIMS requires lighted barricades if the excavation is to be left overnight
		• Install an orange construction fence or and temporary chain-link fencing around the excavated area. (CSE1)
		• Cover the open excavation with traffic rated trench plates if the dimensions of the trench or excavation allow. (CSE1)
	• Eye damage dust, dirt entering	• Wear goggles to prevent dust from entering eyes when working around soil. (CSE5)

CORE SAFETY EXPECTATIONS

CSE1: Always follow Fall Protection standards when working at elevated heights

CSE2: Always follow Written Permit Procedures regarding: confined space, hot work, subsurface work & gas testing

CSE3: Always follow Lock Out/Tag Out (LOTO) procedures

CSE4: Always follow Defeat of Critical Device procedures

CSE5: Always follow written PPE requirements for the work being performed

JOB SAFETY ANALYSIS

COMPANY/PROJECT NAME or ID/LOCATION (City, State)	Rev. No.: 13	[ ] NEW [X] REVISED as of 3/14/14	2 PAGES

WORK ACTIVITY: **GROUNDWATER SAMPLING**

Routine sampling of groundwater wells on property. Working in remote area around livestock. Requires the use of the **Monitoring and Gauging JSA**

Equipment: Screwdriver, Ratchet, Pry Bar, Groundwater Sampling Equipment and Sample Containers

DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Azat Magdanov	QM Technician	Jennifer Lacy	LPS Manager
Steve Church	QM Technician	Peter Petro	Corporate H&S Manager
		David Daniels	Project Manager

MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR TASK-SPECIFIC REQUIREMENTS):

[X] REFLECTIVE VEST	[ ] GOGGLES	[ ] AIR PURIFYING	[X] GLOVES (Cut resistant & nitrile)
[X] HARD HAT	[ ] FACE SHIELD	[ ] RESPIRATOR	[ ] OTHER:
[ ] LIFELINE/HARNESS	[ ] HEARING PROTECTION	[ ] SUPPLIED RESPIRATOR	
[X] SAFETY GLASSES	[X] SAFETY SHOES	[X] PPE CLOTHING: Long sleeve protection required	

[1] JOB STEPS	[2] POTENTIAL HAZARDS	[3] CRITICAL ACTIONS TO MITIGATE HAZARDS
1. Maneuvering Vehicle/Trailer On Site	• Collision with person/vehicle/property - damage to property, person being hit and run over	• Communicate with other onsite personnel where work is taking place and how long it will take.
		• Visually assess pathway before relocating vehicle to ensure safe route before moving.
		• Clear communication between spotter and driver, including agreed position for spotter and hand signals for left, right, move and stop.
		• Wear traffic vest. (CSE5)
		• Driver must stop vehicle if spotter is not visible.
	• Items falling from truck	• Drive with the tailgate closed whenever possible. If the tailgate must remain open, strap down any loose items.
		• Conduct a walk around of the vehicle before moving to another location. Secure loose items
2. Handling Equipment/Removing Well Lids	• Over Exertion- Lifting Heavy Equipment	• Do not lift anything >40 lbs. without assistance.
		• Keep aware of body positioning and use lifting techniques: Bend at knees, lift with legs, keep a straight back, tighten core muscles, keep load within 6 inches of body.
	• Coming into contact with sharp and/or heavy objects	• Wear cut resistant level 3 gloves and safety shoes as defined by ANSI Z41. (CSE5)
	• Coming into Contact with objects Slips/Trips/Falls - cuts, broken bones, damage ligaments/tendons	• If lid is removable, store as close as possible. Clear of potential walkways to avoid tripping hazards. Consider placing lid underneath tailgate of truck if feasible.
	• Exposure to Contaminants, biological hazards	• Watch for spiders and other insects before putting hands into well vaults. Use tool (screw driver) and visual inspection to explore well vault before reaching in with gloved hand. (CSE5)
	• Heavy Well Lids/Covers - crushed or amputated fingers/toes	• Wear cut resistant under and Nitrile over gloves. (CSE5)
		• Keep hands/fingers away from raised covers.
		• Use hand tools to initially lift and hold heavy covers; do not place fingers under lid
		• Block opening to well with tool (ratchet, pry bar, etc.) to prevent lid from directly contacting ground/well skirt. Tool will take impact, not fingers or toes.

[1] JOB STEPS	[2] POTENTIAL HAZARDS	[3] CRITICAL ACTIONS TO MITIGATE HAZARDS
3. Purging Wells	• Splash hazard when gauging wells	• Safety glasses with side shields must be worn at all times. (CSE5)
		• Nitrile/cut resistant gloves must be worn while handling the bailer. (CSE5)
	• Exposure to Vapors and Airborne particulates	Check for the presence of NAPL. Call PM if NAPL is encountered for instructions on how to proceed.
		If NAPL is confirmed and the PM decides to proceed with work on the well, consult the NAPL bailing JSA.
		• Keep lids closed on poly tanks and drums as much as possible.
4. Collecting Groundwater Samples	• Contact with sharp objects (broken Sampling Bottles) - cuts	• Use clear glass VOAs.
		• Visually inspect each glass bottle for defects prior to use.
		• Place VOA in holding device and then tighten on lid
		• Wear cut-resistant gloves under Nitrile gloves while handling glass sample bottles. (CSE5)
	• Sample bottle falling and breaking - exposure to impacted water, cuts	• Large sample containers must be secured in event it tips. Place large sample container in plastic tote or box to secure while opening, filling and closing container.
		• Review **Sample Packing SOP** before packing and shipping samples.
5. Locking Well Caps	• Exposure to Contaminants, biological hazards, cuts to hands	• Wear cut resistant level 3 under and Nitrile over gloves. (CSE5)
		• The well cap must be effectively sealing well and be locked.
		• Watch for spiders and other insects before putting hands into well vaults. Use tool (screw driver) and visual inspection to explore well vault before reaching in with gloved hand. (CSE5)
6. Cleaning Up and Departing the Site	• Slips, trips and falls - results in broken bones and torn ligaments/tendons	• Check that well covers are secure upon departure, and that all tools and bailing equipment are removed from the site.
		• Walk around site and vehicle to perform a visual inspection before demobilization.
	• Demobilization	• **Review Driving JSA**
Field Change Section: document step, hazard and field change to capture/control hazards as seen during operations.		

CORE SAFETY EXPECTATIONS

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CSE4: Always follow Defeat of Critical Device procedures
CSE5: Always follow written PPE requirements for the work being performed

1 Each Job or Operation consists of a set of steps. Be sure to list all the steps in the sequence that they are performed. Specify the equipment or other details to set the basis for the associated hazards in Column 2

2 A hazard is a potential danger. What can go wrong? How can someone get hurt? Consider, but do not limit, the analysis to: **Contact** - struck against, struck by, harmful contact with (cut, abrasion); Caught - in, under, between, by objects; Fall - slip/trip, fall on same level, fall from height; **Strain/Overexertion** - lifting, pushing/pulling, bending, twisting; **Energy Source** - electricity, pressure, compression/tension; **Exposure** - Temperature extreme, radiation, noise, chemical burn, hazardous atmosphere.

3 Aligning with the first two columns, describe what actions or procedures are necessary to eliminate or minimize the hazards. Be clear, concise and specific. Use objective observable and quantified terms. Avoid subjective general statements such as "be careful" or "use as appropriate".

APPENDIX B
Chemical Hazard Information

Material Safety Data Sheet
Arsenic 100 ppm

ACC# 88076

Section 1 - Chemical Product and Company Identification

MSDS Name: Arsenic 100 ppm
Catalog Numbers: MCC-031368
Synonyms: None
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7732-18-5	Water	7732-18-	231-791-2
7664-93-9	Sulfuric Acid	<2.0%	231-639-5
1310-73-2	Sodium Hydroxide	<1.0%	215-185-5
1327-53-3	Arsenic trioxide	<1.0%	215-481-4

Hazard Symbols: None listed.
Risk Phrases: None listed.

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: Not available. May cause skin irritation. May cause respiratory and digestive tract irritation. May cause severe eye irritation and possible injury. May cause fetal effects. **Danger!** Contains inorganic arsenic. Cancer hazard. Harmful if inhaled or swallowed. Use only with adequate ventilation or respiratory protection.
Target Organs: None.

Potential Health Effects
Eye: May cause severe eye irritation. May result in corneal injury.
Skin: May cause skin irritation.
Ingestion: May cause irritation of the digestive tract.
Inhalation: May cause respiratory tract irritation.
Chronic: May cause fetal effects.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.
Skin: Get medical aid if irritation develops or persists. Flush skin with plenty of soap and water.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.
Extinguishing Media: Use water fog, dry chemical, carbon dioxide, or regular foam.
Flash Point: Not available.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: Not published.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Do not get on skin or in eyes. Avoid ingestion and inhalation.
Storage: Store in a cool, dry place.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Water	none listed	none listed	none listed
	0.2 mg/m3 TWA (thoracic	1 mg/m3 TWA 15 mg/m3	

Sulfuric Acid	particulate mass); 3 mg/m3 STEL	IDLH	1 mg/m3 TWA
Sodium Hydroxide	2 mg/m3 Ceiling	10 mg/m3 IDLH	2 mg/m3 TWA
Arsenic trioxide	none listed	none listed	none listed

OSHA Vacated PELs: Water: No OSHA Vacated PELs are listed for this chemical. Sulfuric Acid: 1 mg/m3 TWA Sodium Hydroxide: No OSHA Vacated PELs are listed for this chemical. Arsenic trioxide: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to minimize contact with skin.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: Not available.
Odor: none reported
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: Not available.
Freezing/Melting Point: Not available.
Decomposition Temperature: Not available.
Solubility: Not available.
Specific Gravity/Density: Not available.
Molecular Formula: Mixture
Molecular Weight: Not available

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: None reported.
Incompatibilities with Other Materials: None reported.
Hazardous Decomposition Products: Oxides of arsenic, arsine.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 7732-18-5: ZC0110000

CAS# 7664-93-9: WS5600000
CAS# 1310-73-2: WB4900000
CAS# 1327-53-3: CG3325000
LD50/LC50:
CAS# 7732-18-5:
Oral, rat: LD50 = >90 mL/kg;
CAS# 7664-93-9:
Draize test, rabbit, eye: 250 ug Severe;
Inhalation, mouse: LC50 = 320 mg/m3/2H;
Inhalation, mouse: LC50 = 320 mg/m3;
Inhalation, rat: LC50 = 510 mg/m3/2H;
Inhalation, rat: LC50 = 510 mg/m3;
Oral, rat: LD50 = 2140 mg/kg;
CAS# 1310-73-2:
Draize test, rabbit, eye: 400 ug Mild;
Draize test, rabbit, eye: 1% Severe;
Draize test, rabbit, eye: 50 ug/24H Severe;
Draize test, rabbit, eye: 1 mg/24H Severe;
Draize test, rabbit, skin: 500 mg/24H Severe;
CAS# 1327-53-3:
Oral, mouse: LD50 = 20 mg/kg;
Oral, rabbit: LD50 = 20190 ug/kg;
Oral, rat: LD50 = 10 mg/kg;
Carcinogenicity:
CAS# 7732-18-5: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA. CAS# 7664-93-9:
ACGIH: A2 - Suspected Human Carcinogen (contained in strong inorganic acid mists)
OSHA: Select carcinogen
IARC: Group 1 carcinogen CAS# 1310-73-2: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
CAS# 1327-53-3:
ACGIH: A1 - Confirmed Human Carcinogen (listed as 'Arsenic').
California: carcinogen, initial date 2/27/87 (listed as Arsenic, inorganic compounds).
NIOSH: potential occupational carcinogen (listed as Arsenic)
NTP: Known carcinogen (listed as Arsenic, inorganic compounds).
OSHA: Select carcinogen (listed as Arsenic).
IARC: Group 1 carcinogen (listed as Arsenic).
Epidemiology: In a large number of studies, exposure to inorganic arsenic compounds in drugs, food, and water as well as in an occupat ional setting have been casually associated with the devel opment of cancer, primarily of the skin and lungs.
Teratogenicity: Teratogenic effects, including exencephaly, skeletal defects, and genitourinary system defects have occured when arsenic compounds were administered intravenously or intraperitoneally at high doses in hamsters, rats and mice.

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: CAS# 1327-53-3: waste number P012.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	No information available.				No information available.
Hazard Class:					
UN Number:					
Packing Group:					

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7732-18-5 is listed on the TSCA inventory.
CAS# 7664-93-9 is listed on the TSCA inventory.
CAS# 1310-73-2 is listed on the TSCA inventory.
CAS# 1327-53-3 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

CERCLA Hazardous Substances and corresponding RQs
CAS# 7664-93-9: 1000 lb final RQ; 454 kg final RQ CAS# 1310-73-2: 1000 lb final RQ; 454 kg final RQ CAS# 1327-53-3: 1 lb final RQ; 0.454 kg final RQ
SARA Section 302 Extremely Hazardous Substances
CAS# 7664-93-9: 1000 lb TPQ CAS# 1327-53-3: 100 lb TPQ (lower threshold); 10000 lb TPQ (upper thre shold)
SARA Codes
CAS # 7664-93-9: acute, chronic, reactive. CAS # 1310-73-2: acute, reactive. CAS # 1327-53-3: acute, chronic.
Section 313
This material contains Sulfuric Acid (CAS# 7664-93-9, 2 0%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373. This material contains Arsenic trioxide (listed as Arsenic), 1 0%, (CAS# 1327-53-3) which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 7664-93-9 is listed as a Hazardous Substance under the CWA. CAS# 1310-73-2 is listed as a

Hazardous Substance under the CWA. CAS# 1327-53-3 is listed as a Hazardous Substance under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.
CAS# 7664-93-9 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
CAS# 1310-73-2 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
CAS# 1327-53-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.
WARNING: This product contains Arsenic trioxide, listed as `Arsenic (inorganic oxides)', a chemical known to the state of California to cause birth defects or other reproductive harm. California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

Not available.

Risk Phrases:

Safety Phrases:

WGK (Water Danger/Protection)

CAS# 7732-18-5: No information available.
CAS# 7664-93-9: 2
CAS# 1310-73-2: 1
CAS# 1327-53-3: 3

Canada - DSL/NDSL

CAS# 7732-18-5 is listed on Canada's DSL List.
CAS# 7664-93-9 is listed on Canada's DSL List.
CAS# 1310-73-2 is listed on Canada's DSL List.
CAS# 1327-53-3 is listed on Canada's DSL List.

Canada - WHMIS

WHMIS: Not available.

Canadian Ingredient Disclosure List

CAS# 7664-93-9 is listed on the Canadian Ingredient Disclosure List.
CAS# 1310-73-2 is listed on the Canadian Ingredient Disclosure List.
CAS# 1327-53-3 is listed on the Canadian Ingredient Disclosure List.

Exposure Limits

CAS# 7664-93-9: OEL-ARAB Republic of Egypt:TWA 1 mg/m3 OEL-AUSTRALI A:TWA 1 mg/m3 OEL-BELGIUM:TWA 1 mg/m3;STEL 3 mg/m3 OEL-CZECHOSLOVAKI A:TWA 1 mg/m3;STEL 2 mg/m3 OEL-DENMARK:TWA 1 mg/m3 OEL-FINLAND:TWA 1 mg/m3;STEL 3 mg/m3;Skin OEL-FRANCE:TWA 1 mg/m3;STEL 3 mg/m3 OEL-GER MANY:TWA 1 mg/m3 OEL-HUNGARY:STEL 1 mg/m3 OEL-JAPAN:TWA 1 mg/m3 OEL -THE NETHERLANDS:TWA 1 mg/m3 OEL-THE PHILIPPINES:TWA 1 mg/m3 OEL-POL AND:TWA 1 mg/m3 OEL-RUSSIA:STEL 1 mg/m3;Skin OEL-SWEDEN:TWA 1 mg/m3; STEL 3 mg/m3 OEL-SWITZERLAND:TWA 1 mg/m3;STEL 2 mg/m3 OEL-THAILAND:T WA 1 mg/m3 OEL-TURKEY:TWA 1 mg/m3 OEL-UNITED KINGDOM:TWA 1 mg/m3 OE L IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEA LAND, SINGAPORE, VIETNAM check ACGI TLV
CAS# 1310-73-2: OEL-AUSTRALIA:TWA 2 mg/m3 OEL-BELGIUM:STEL 2 mg/m3 OEL-DENMARK:TWA 2 mg/m3 OEL-FINLAND:TWA 2 mg/m3 OEL-FRANCE:TWA 2 mg

/m3 OEL-GERMANY:TWA 2 mg/m3 OEL-JAPAN:STEL 2 mg/m3 OEL-THE NETHERLA NDS:TWA 2 mg/m3 OEL-THE PHILIPPINES:TWA 2 mg/m3 OEL-SWEDEN:TWA 2 mg/ m3 OEL-SWITZERLAND:TWA 2 mg/m3;STEL 4 mg/m3 OEL-THAILAND:TWA 2 mg/m3 OEL-TURKEY:TWA 2 mg/m3 OEL-UNITED KINGDOM:TWA 2 mg/m3;STEL 2 mg/m3 OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV
CAS# 1327-53-3: OEL-AUSTRALIA;Carcinogen OEL-BELGIUM;Carcinogen OE L-FINLAND;Carcinogen OEL-FRANCE:STEL 0.2 ppm;Carcinogen OEL-GERMANY; Carcinogen OEL-JAPAN:STEL 0.5 ppm;Carcinogen OEL-THE PHILIPPINES:TWA 0.1 mg/m3;Carcinogen JAN9 OEL-SWITZERLAND:TWA 0.15 mg/m3 OEL-UNITED KINGDOM:TWA 0.1 mg/m3 OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV OEL -ARAB Republic of Egypt:TWA 0.2 mg(As)/m3 OEL-ARAB Republic of Egypt: TWA 0.2 mg(Se)/m3 JAN9 OEL-AUSTRALIA:TWA 0.05 mg(As)/m3;Carcinogen O EL-AUSTRALIA:TWA 0.2 mg(Se)/m3 OEL-BELGIUM:TWA 0.2 mg(As)/m3 OEL-BEL GIUM:TWA 0.2 mg(Se)/m3 OEL-CZECHOSLOVAKIA:TWA 0.2 mg(As)/m3;STEL 0.6 mg(As)/m3 OEL-DENMARK:TWA 0.05 mg(As)/m3 OEL-DENMARK:TWA 0.1 mg(Se)/ m3 OEL-FINLAND:TWA 0.1 mg(Se)/m3;STEL 0.3 mg(Se)/m3 OEL-FINLAND;Carc inogen OEL-FRANCE:TWA 0.2 mg(As)/m3 OEL-GERMANY:TWA 0.1 mg(Se)/m3 O EL-HUNGARY:STEL 0.1 mg(Se)/m3 OEL-HUNGARY:STEL 0.5 mg(As)/m3;Carcinog en OEL-INDIA:TWA 0.2 mg(As)/m3 OEL-THE NETHERLANDS:TWA 0.2 mg(Se)/m3 OEL-THE PHILIPPINES:TWA 0.2 mg(Se)/m3 OEL-THE PHILIPPINES:TWA 0.5 m g(As)/m3 OEL-POLAND:TWA 0.1 mg(Se)/m3 OEL-POLAND:TWA 0.3 mg(As)/m3 OEL-SWEDEN:TWA 0.03 mg(As)/m

Section 16 - Additional Information

MSDS Creation Date: 8/24/1997
Revision #2 Date: 3/18/2003

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

MSDS Number: **B0335** * * * * * *Effective Date: **06/26/00*** * * * * * *Supercedes: 05/20/97*

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

Barium, 1000 ug/mL (0.10% w/v)

1. Product Identification

Synonyms: None
CAS No.: Not applicable to mixtures.
Molecular Weight: 137.33
Chemical Formula: $BaCO_3$ and HNO_3 in H_2O
Product Codes: 6920

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Barium Carbonate	513-77-9	< 1%	No
Nitric Acid	7697-37-2	1 - 2%	Yes
Water	7732-18-5	97 - 98%	No

3. Hazards Identification

Emergency Overview

DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. VAPOR IRRITATING TO EYES AND RESPIRATORY TRACT. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. The following hazards are for concentrated solutions. Hazards of less concentrated solutions may be reduced. Degree of hazard for reduced concentrations is not currently addressed in the available literature.

Inhalation:
Corrosive! Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death.
Ingestion:
Corrosive! Swallowing can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract. May cause nausea, vomiting, and diarrhea, and in severe cases, death.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

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4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Not combustible, but concentrated material is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition.
Explosion:
Concentrated material reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

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7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Nitric Acid:
OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA)
ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Canister-type respirators using sorbents are ineffective.
Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Odorless.
Solubility:
Complete (100%)

Specific Gravity:
No information found.
pH:
No information found.
% Volatiles by volume @ 21C (70F):
ca. 99
Boiling Point:
No information found.
Melting Point:
No information found.
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Heat and incompatibles.

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11. Toxicological Information

For Nitric Acid: Investigated as a mutagen and reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Barium Carbonate (513-77-9)	No	No	None
Nitric Acid (7697-37-2)	No	No	None
Water (7732-18-5)	No	No	None

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12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (NITRIC ACID)
Hazard Class: 8
UN/NA: UN3264
Packing Group: III
Information reported for product/size: 500ML

International (Water, I.M.O.)

Proper Shipping Name: CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (NITRIC ACID)
Hazard Class: 8
UN/NA: UN3264
Packing Group: III
Information reported for product/size: 500ML

International (Air, I.C.A.O.)

Proper Shipping Name: CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (NITRIC ACID)
Hazard Class: 8
UN/NA: UN3264
Packing Group: III
Information reported for product/size: 500ML

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Barium Carbonate (513-77-9)	Yes	Yes	Yes	Yes
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Barium Carbonate (513-77-9)	Yes	Yes	No	Yes
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Barium Carbonate (513-77-9)	No	No	No	Barium compo
Nitric Acid (7697-37-2)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Barium Carbonate (513-77-9)	No	No	No
Nitric Acid (7697-37-2)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: None allocated.
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL

BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. VAPOR IRRITATING TO EYES AND RESPIRATORY TRACT. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

Label Precautions:

Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep container closed.

Label First Aid:

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 3, 14, 16.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Material Safety Data Sheet
Cadmium metal, granular

ACC# 03720

Section 1 - Chemical Product and Company Identification

MSDS Name: Cadmium metal, granular
Catalog Numbers: AC612135000, S79935, C3-500
Synonyms: None.
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7440-43-9	Cadmium	100	231-152-8

Hazard Symbols: T+ F
Risk Phrases: 11 25 26 45

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: silver white granules. Inhalation of fumes may cause metal-fume fever. Flammable solid. Air sensitive. May cause reproductive and fetal effects. Harmful if swallowed. May be fatal if inhaled. **Danger!** Causes eye, skin, and respiratory tract irritation. Contains cadmium. Avoid creating dust. Can cause lung and kidney disease. Cancer hazard.
Target Organs: Blood, kidneys, liver, lungs, skeletal structures, prostate.

Potential Health Effects
Eye: Causes eye irritation.
Skin: Causes skin irritation.
Ingestion: Harmful if swallowed. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. Ingestion may produce fluid loss, acute renal failure, and cardiopulmonary depression.
Inhalation: May be fatal if inhaled. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. Damage may be delayed. May cause nausea, vomiting, abdominal pain, diarrhea, chest tightness, weakness, and delayed pulmonary edema. In humans inhalation causes proteinuria, an excess of protein in the urine.
Chronic: May cause respiratory tract cancer. Repeated inhalation may cause chronic bronchitis. Chronic inhalation may cause nasal septum ulceration and perforation. Cadmium and compounds

may cause lung, liver and kidney damage and lung and prostate cancer in humans. May cause loss of smell, emphysema, anemia, bone demineralization, and lung fibrosis. The primary target organ for chronic cadmium disease is clearly the kidney.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: POISON material. If inhaled, get medical aid immediately. Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Attempt rescue only after notifying at least one other person of the emergency and putting into effect established emergency procedures. Do not become a casualty yourself.
Notes to Physician: Administration of calcium disodium EDTA may be useful in acute poisoning with its use at the discretion of qualified medical personnel. Persons with kidney disease, chronic respiratory disease, liver disease, or skin disease may be at increased risk from exposure to this substance.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Material can spontaneously ignite (pyrophoric) when exposed to air at normal or slightly elevated temperatures. Dust can be an explosion hazard when exposed to heat or flame. Flammable solid. May burn rapidly with flare burning effect. May re-ignite after fire is extinguished. Dangerous fire hazard in the form of dust when exposed to heat or flame.
Extinguishing Media: Use dry sand, graphite powder, dry sodium chloride-based extinguishers.
Flash Point: Not available.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 4; Flammability: 2; Instability: 1

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Avoid generating dusty conditions. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. Place under an inert atmosphere.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Wash hands before eating. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Use spark-proof tools and explosion proof equipment. Avoid contact with skin and eyes. Do not breathe dust, vapor, mist, or gas. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep away from heat, sparks and flame. Do not ingest or inhale. Handle under an inert atmosphere. Store protected from air. Use only in a chemical fume hood. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from heat and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Do not expose to air. Store under an inert atmosphere.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood. See 29CFR 1910.1027 for regulations applying to all occupational exposures to cadmium and cadmium compounds, in all forms.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Cadmium	0.01 mg/m3 TWA	9 mg/m3 IDLH (dust and fume)	0.2 mg/m3 TWA (dust); 0.1 mg/m3 TWA (fume); 0.6 mg/m3 Ceiling (dust); 0.3 mg/m3 Ceiling (fume); 2.5 æg/m3 Action Level; 5 æ

OSHA Vacated PELs: Cadmium: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Granules
Appearance: silver white
Odor: odorless
pH: Not available.
Vapor Pressure: Not applicable.
Vapor Density: Not available.
Evaporation Rate: Not applicable.
Viscosity: Not applicable.
Boiling Point: 765 deg C @ 760 mm Hg
Freezing/Melting Point:321 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble.

Specific Gravity/Density:8.64 @ 25°C
Molecular Formula: Cd
Molecular Weight:112.40

Section 10 - Stability and Reactivity

Chemical Stability: Oxidizes when exposed to air. Easily tarnishes in moist air. Powder or liquid is pyrophoric. Contact with acid liberates gas.
Conditions to Avoid: Ignition sources, dust generation, excess heat, prolonged exposure to air.
Incompatibilities with Other Materials: Strong oxidizing agents, acids, sulfur, zinc, selenium, tellurium.
Hazardous Decomposition Products: Toxic cadmium oxide fumes.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 7440-43-9: EU9800000
LD50/LC50:
CAS# 7440-43-9:
Inhalation, rat: LC50 = 25 mg/m3/30M;
Oral, mouse: LD50 = 890 mg/kg;
Oral, rat: LD50 = 2330 mg/kg;
Carcinogenicity:
CAS# 7440-43-9:
ACGIH: A2 - Suspected Human Carcinogen
California: carcinogen, initial date 10/1/87
NIOSH: potential occupational carcinogen (dust)
NTP: Known carcinogen
OSHA: Select carcinogen
IARC: Group 1 carcinogen
Epidemiology: Occupational exposure to cadmium has been implicated in a si gnificant increase in prostate and respiratory tract cancer. There is evidence of a significant excess of respiratory cancer deaths among a cohort of cadmium production workers , and concluded that cadmium and its compounds are poten tial carcinogens.
Teratogenicity: Oral, rat: TDLo = 155 mg/kg (male 13 week(s) pre-mating and female 13 week (s) pre-mating - 3 week(s) after conception) Effects on Newborn - growth statistics (e.g.%, reduced weight gain) and Effects on Newborn - behavioral.; Oral, rat: TDLo = 23 mg/kg (female 1-22 day(s) after conception) Specific Developmental Abnormalities - blood and lymphatic systems (including spleen and marrow).; Oral, mouse: TDLo = 1700 mg/kg (female 8-12 day(s) after conception) Effects on Newborn - viability index (e.g., # alive at day 4 per # born alive) and Effects on Newborn - growth statis
Reproductive Effects: Oral, rat: TDLo = 21500 ug/kg (multigenerations) Fertility - pre-implantation mortality (e.g. reduction in number of implants per female; total number of implants per corpora lutea).; Intraperitoneal, rat: TDLo = 1124 ug/kg (male 1 day(s) pre-mating) Paternal Effects - spermatogenesis (incl. genetic material, sperm morphology, motility, and count).
Neurotoxicity: No information available.
Mutagenicity: Micronucleus Test: Mouse, Embryo = 6 umol/L.; Cytogenetic Analysis: Hamster, Ovary = 1 umol/L.
Other Studies: The long-term ingestion of water, beans and rice contaminate d with cadmium has

been proposed as the probable cause o f crippling condition (itai-itai disease) among Japa nese women who have had multiple pregnancies. Characte ristics of the disorder are: pain in the back and joints , a waddly gait, osteomalacia, bone fractures, and occas ional fatal renal failure.

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: TLm = 30 ppm; 24 Hr; Hard waterFish: Striped bass: LC50 = 0.001 ppm; 24-48 Hr; Static bioassayFish: Fathead Minnow: TL50 = 7.2 ppm; 96 Hr; UnspecifiedFish: Bluegill/Sunfish: LCO = 0.08 ppm; 96 Hr; Static bioassay (Hard water) No data available.
Environmental: Cadmium can enter the air from natural sources.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	TOXIC SOLIDS, FLAMMABLE, ORGANIC, N.O.S.				Toxic Solid, Flammable, Organic, N.O.S. (CADMIUM METAL)
Hazard Class:	6.1				6.1
UN Number:	UN2930				UN2930
Packing Group:	I				I

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7440-43-9 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.

Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

CERCLA Hazardous Substances and corresponding RQs
CAS# 7440-43-9: 10 lb final RQ (no reporting of releases of this hazardous substance is req
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 7440-43-9: acute, chronic, flammable.
Section 313
This material contains Cadmium (CAS# 7440-43-9, 100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. CAS# 7440-43-9 is listed as a Priority Pollutant under the Clean Water Act. CAS# 7440-43-9 is listed as a Toxic Pollutant under the Clean Water Act.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 7440-43-9 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act: WARNING: This product contains Cadmium, a chemical known to the state of California to cause cancer. WARNING: This product contains Cadmium, a chemical known to the state of California to cause birth defects or other reproductive harm. California No Significant Risk Level: CAS# 7440-43-9: 0.05 æg/day NSRL (inhalation)

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
T+ F
Risk Phrases:
R 11 Highly flammable.
R 25 Toxic if swallowed.
R 26 Very toxic by inhalation.
R 45 May cause cancer.

Safety Phrases:
S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53 Avoid exposure - obtain special instructions before use.

WGK (Water Danger/Protection)
CAS# 7440-43-9: No information available.
Canada - DSL/NDSL

CAS# 7440-43-9 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D1A, B2.

Canadian Ingredient Disclosure List

CAS# 7440-43-9 is listed on the Canadian Ingredient Disclosure List.

Exposure Limits

CAS# 7440-43-9: OEL-ARAB Republic of Egypt:TWA 0.05 mg/m3 OEL-AUSTRALIA:TWA 0.05 mg/m3 OEL-BELGIUM:TWA 0.05 mg/m3 OEL-CZECHOSLOVAKIA:TWA 0.05 mg/m3;STEL 0.1 mg/m3 OEL-DENMARK:TWA 0.01 mg/m3 OEL-FINLAND:TWA 0.02 mg/m3;Carcinogen OEL-GERMANY;Carcinogen OEL-INDIA:TWA 0.05 mg/m3 OEL-JAPAN:TWA 0.05 mg/m3 OEL-THE NETHERLANDS:TWA 0.02 mg/m3;STEL 0.1 mg/m3 OEL-THE PHILIPPINES:TWA 0.2 mg/m3 OEL-RUSSIA:TWA 0.01 mg/m3;STEL 0.05 mg/m3 OEL-SWEDEN:TWA 0.02 mg/m3;Carcinogen OEL-SWITZERLAND:TWA 0.05 mg/m3 OEL-THAILAND:TWA 0.2 mg/m3;STEL 0.5 mg/m3 OEL-TURKEY:TWA 0.2 mg/m3 OEL-UNITED KINGDOM:TWA 0.01 mg/m3 OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 6/28/1999
Revision #4 Date: 5/15/2002

Material Safety Data Sheet
Chromium

ACC# 05000

Section 1 - Chemical Product and Company Identification

MSDS Name: Chromium
Catalog Numbers: S79965, S79965-1, S799651, S79965-2, S799652
Synonyms: Chrome
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7440-47-3	CHROMIUM	>=99%	231-157-5

Hazard Symbols: XN
Risk Phrases: 40

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: silver-gray solid. Causes eye and skin irritation. Causes severe respiratory tract irritation. May cause kidney damage. May cause lung damage. Causes digestive tract irritation. May cause liver damage. May cause allergic skin reaction. **Warning!**
Target Organs: Liver.

Potential Health Effects
Eye: Causes eye irritation. May cause conjunctivitis.
Skin: Causes skin irritation. Prolonged and/or repeated contact may cause irritation and/or dermatitis. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material.
Ingestion: May cause irritation of the digestive tract. May cause liver damage.
Inhalation: Causes respiratory tract irritation. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. May cause asthma and shortness of breath. May cause headache, coughing, fever, weight loss, and pneumoconiosis.
Chronic: Prolonged inhalation may cause respiratory tract inflammation and lung damage.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.
Skin: Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists. Wash clothing before reuse.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid. Do NOT use mouth-to-mouth resuscitation.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: Evacuate area and fight fire from a safe distance. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. May burn with invisible flame. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Dust can be an explosion hazard when exposed to heat or flame. Finely divided dusts may exhibit pyrophoric tendancies.
Extinguishing Media: Use dry sand or earth to smother fire. Use dry chemical to fight fire. Contact professional fire-fighters immediately.
Flash Point: Not applicable.
Autoignition Temperature: 752 deg F (400.00 deg C)
Explosion Limits, Lower:.0230oz/ft3
Upper: Not available.
NFPA Rating: (estimated) Health: 2; Flammability: 1; Instability: 1

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up or absorb material, then place into a suitable clean, dry, closed container for disposal. Avoid generating dusty conditions. Remove all sources of ignition. Isolate area and deny entry. Place under an inert atmosphere. Do not use combustible materials such as paper towels to clean up spill.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Minimize dust generation and accumulation. Use spark-proof tools and explosion proof equipment. Avoid contact with skin and eyes. Keep container tightly closed. Keep away from heat, sparks and flame. Avoid ingestion and inhalation. Handle under an inert atmosphere.
Storage: Keep away from heat, sparks, and flame. Store in a tightly closed container. Keep from

contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from acids. Keep containers tightly closed. Do not expose to air. Store under an inert atmosphere.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
CHROMIUM	0.5 mg/m3 TWA	0.5 mg/m3 TWA 250 mg/m3 IDLH	1 mg/m3 TWA

OSHA Vacated PELs: CHROMIUM: 1 mg/m3 TWA

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: silver-gray
Odor: odorless
pH: Not available.
Vapor Pressure: Not applicable.
Vapor Density: Not available.
Evaporation Rate: Not applicable.
Viscosity: Not applicable.
Boiling Point: 4784 deg F
Freezing/Melting Point:3375 deg F
Decomposition Temperature: Not available.
Solubility: Insoluble in water.
Specific Gravity/Density:7.2 @28C
Molecular Formula: Cr
Molecular Weight:51.996

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, ignition sources, dust generation, exposure to air, acids, strong oxidants.

Incompatibilities with Other Materials: Ammonium nitrate, hydrogen peroxide, lithium, nitric oxiode, potassium chlorate, sulfuri dioxide, strong oxidizers, hydrochloric acid, sulfuric acid, nitrogen oxide,
Hazardous Decomposition Products: Toxic chromium oxide fumes.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 7440-47-3: GB4200000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 7440-47-3:
IARC: IARC Group 3 - not classifiable
Epidemiology: Certain hexavalent chromium compounds have been demonstrate d to be carcinogenic on the basis of epidemiologic investi gations on workers and experimental studies in animals. In creased incidences of respiratory cancer has been fo und in chromium (VI) workers. There is an increased incide nce of lung cancer in industrial workers exposed to chromi um (VI) compounds. Please refer to IARC volume 23 for a more detailed discussion.
Teratogenicity: No information found.
Reproductive Effects: No information found.
Neurotoxicity: No information found.
Mutagenicity: No information found.
Other Studies: See actual entry in RTECS for complete information.

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	No information available.				No information available.
Hazard Class:					

UN Number:
Packing Group:

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7440-47-3 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

CERCLA Hazardous Substances and corresponding RQs
CAS# 7440-47-3: 5000 lb final RQ (no reporting of releases of this hazardous substance is r
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 7440-47-3: acute, chronic, flammable.
Section 313
This material contains CHROMIUM (CAS# 7440-47-3, 99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. CAS# 7440-47-3 is listed as a Priority Pollutant under the Clean Water Act. CAS# 7440-47-3 is listed as a Toxic Pollutant under the Clean Water Act.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 7440-47-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols:
XN
Risk Phrases:
R 40 Limited evidence of a carcinogenic effect.

Safety Phrases:

WGK (Water Danger/Protection)
CAS# 7440-47-3: No information available.

Canada - DSL/NDSL
CAS# 7440-47-3 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of D2A, D2B.
Canadian Ingredient Disclosure List
CAS# 7440-47-3 is listed on the Canadian Ingredient Disclosure List.
Exposure Limits
CAS# 7440-47-3: OEL-ARAB Republic of Egypt:TWA 0.05 mg/m3 OEL-AUSTRALIA:TWA 0.05 mg/m3 OEL-BELGIUM:TWA 0.5 mg/m3 OEL-DENMARK:TWA 0.5 mg/m3 OEL-FINLAND:TWA 0.01 mg/m3 OEL-FRANCE:TWA 0.5 mg/m3 OEL-JAPAN:TWA 0.5 mg/m3 OEL-THE NETHERLANDS:TWA 0.5 mg/m3 OEL-THE PHILIPPINES:TWA 1 mg/m3 OEL-SWEDEN:TWA 0.5 mg/m3 OEL-UNITED KINGDOM:TWA 0.5 mg/m3 OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 3/01/1999
Revision #5 Date: 3/18/2003

Material Safety Data Sheet
Mercury

ACC# 14020

Section 1 - Chemical Product and Company Identification

MSDS Name: Mercury
Catalog Numbers: S71967, S71968, M139-1LB, M139-5LB, M140-14LB, M140-1LB, M140-5LB, M141-1LB, M141-6LB, NC9534278, S40672B, S41542, S41599, S41599B, S41599E, S41599G, S41599J, S41599K, S41599M, S41600P, S41600S, S41600W, S41630A, S41630B, S41630C, S41631, S41631A, S41631B, S41631C, S41645, S45245, S46981, S50443, S71966, S78777
Synonyms: Colloidal mercury; Hydrargyrum; Metallic mercury; Quick silver; Liquid silver
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7439-97-6	Mercury	ca.100	231-106-7

Hazard Symbols: T N
Risk Phrases: 23 33

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: silver liquid. May cause central nervous system effects. May be absorbed through intact skin. This substance has caused adverse reproductive and fetal effects in animals. Inhalation of fumes may cause metal-fume fever. Harmful if inhaled. Possible sensitizer. May cause liver and kidney damage. **Danger!** Corrosive. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns. Causes eye and skin irritation and possible burns.
Target Organs: Blood, kidneys, central nervous system, liver, brain.

Potential Health Effects
Eye: Exposure to mercury or mercury compounds can cause discoloration on the front surface of the lens, which does not interfere with vision. Causes eye irritation and possible burns. Contact with mercury or mercury compounds can cause ulceration of the conjunctiva and cornea.
Skin: May be absorbed through the skin in harmful amounts. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Causes skin irritation and possible burns. May cause skin rash (in milder cases), and cold and clammy skin with cyanosis

or pale color.
Ingestion: May cause severe and permanent damage to the digestive tract. May cause perforation of the digestive tract. May cause effects similar to those for inhalation exposure. May cause systemic effects.
Inhalation: Causes chemical burns to the respiratory tract. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability. Aspiration may lead to pulmonary edema. May cause systemic effects. May cause respiratory sensitization.
Chronic: May cause liver and kidney damage. May cause reproductive and fetal effects. Effects may be delayed. Chronic exposure to mercury may cause permanent central nervous system damage, fatigue, weight loss, tremors, personality changes. Chronic ingestion may cause accumulation of mercury in body tissues. Prolonged or repeated exposure may cause inflammation of the mouth and gums, excessive salivation, and loosening of the teeth.

Section 4 - First Aid Measures

Eyes: Get medical aid immediately. Do NOT allow victim to rub eyes or keep eyes closed. Extensive irrigation with water is required (at least 30 minutes).
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. Wash mouth out with water.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: The concentration of mercury in whole blood is a reasonable measure of the body-burden of mercury and thus is used for monitoring purposes. Treat symptomatically and supportively. Persons with kidney disease, chronic respiratory disease, liver disease, or skin disease may be at increased risk from exposure to this substance.
Antidote: The use of d-Penicillamine as a chelating agent should be determined by qualified medical personnel. The use of Dimercaprol or BAL (British Anti-Lewisite) as a chelating agent should be determined by qualified medical personnel.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: Substance is nonflammable; use agent most appropriate to extinguish surrounding fire. Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Keep container tightly closed. Do not get on skin or in eyes. Do not ingest or inhale. Use only in a chemical fume hood. Discard contaminated shoes. Do not breathe vapor.
Storage: Keep container closed when not in use. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Keep away from metals. Store protected from azides.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Mercury	0.025 mg/m3 TWA; skin - potential for cutaneous absorption	0.05 mg/m3 TWA (vapor) 10 mg/m3 IDLH	1 mg/10m3 Ceiling (vapor)

OSHA Vacated PELs: Mercury: 0.05 mg/m3 TWA (vapor)
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: silver
Odor: odorless
pH: Not available.
Vapor Pressure: 0.002 mm Hg @ 25C
Vapor Density: 7.0

Evaporation Rate: Not available.
Viscosity: 15.5 mP @ 25 deg C
Boiling Point: 356.72 deg C
Freezing/Melting Point:-38.87 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:13.59 (water=1)
Molecular Formula: Hg
Molecular Weight:200.59

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: High temperatures, incompatible materials.
Incompatibilities with Other Materials: Metals, aluminum, ammonia, chlorates, copper, copper alloys, ethylene oxide, halogens, iron, nitrates, sulfur, sulfuric acid, oxygen, acetylene, lithium, rubidium, sodium carbide, lead, nitromethane, peroxyformic acid, calcium, chlorine dioxide, metal oxides, azides, 3-bromopropyne, alkynes + silver perchlorate, methylsilane + oxygen, tetracarbonylnickel + oxygen, boron diiodophosphide.
Hazardous Decomposition Products: Mercury/mercury oxides.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 7439-97-6: OV4550000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 7439-97-6:
IARC: IARC Group 3 - not classifiable
Epidemiology: Intraperitoneal, rat: TDLo = 400 mg/kg/14D-I (Tumorigenic - equivocal tumorigenic agent by RTECS criteria - tumors at si te of application).
Teratogenicity: Inhalation, rat: TCLo = 1 mg/m3/24H (female 1-20 day(s) after conception) Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus).
Reproductive Effects: Inhalation, rat: TCLo = 890 ng/m3/24H (male 16 week(s) pre-mating) Paternal Effects - spermatogenesis (incl. genetic material, sperm morphology, motility, and count).; Inhalation, rat: TCLo = 7440 ng/m3/24H (male 16 week(s) pre-mating) Fertility - post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants).
Neurotoxicity: The brain is the critical organ in humans for chronic vapor exposure; in severe cases, spontaneous degeneration of the b rain cortex can occur as a late sequela to past exposure .

Mutagenicity: Cytogenetic Analysis: Unreported, man = 150 ug/m3.
Other Studies: No information available.

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 0.16-0.90 mg/L; 96 Hr; UnspecifiedFish: Bluegill/Sunfish: LC50 = 0.16-0.90 mg/L; 96 Hr; UnspecifiedFish: Channel catfish: LC50 = 0.35 mg/L; 96 Hr; UnspecifiedWater flea Daphnia: EC50 = 0.01 mg/L; 48 Hr; Unspecified In aquatic systems, mercury appears to bind to dissolved matter or fine particulates, while the transport of mercury bound to dust particles in the atmosphere or bed sediment particles in rivers and lakes is generally less substantial. The conversion, in aquatic environments, of inorganic mercury cmpd to methyl mercury implies that recycling of mercury from sediment to water to air and back could be a rapid process.
Environmental: Mercury bioaccumulates and concentrates in food chain (concentration may be as much as 10,000 times that of water). Bioconcentration factors of 63,000 for freshwater fish and 10,000 for salt water fish have been found. Much of the mercury deposited on land, appears to revaporize within a day or two, at least in areas substantially heated by sunlight.
Physical: All forms of mercury (Hg) (metal, vapor, inorganic, or organic) are converted to methyl mercury. Inorganic forms are converted by microbial action in the atmosphere to methyl mercury.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 7439-97-6: waste number U151.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	MERCURY				MERCURY
Hazard Class:	8				8
UN Number:	UN2809				UN2809
Packing Group:	III				III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7439-97-6 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

CERCLA Hazardous Substances and corresponding RQs
CAS# 7439-97-6: 1 lb final RQ; 0.454 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 7439-97-6: acute, chronic.
Section 313
This chemical is not at a high enough concentration to be reportable under Section 313. No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. CAS# 7439-97-6 is listed as a Priority Pollutant under the Clean Water Act. CAS# 7439-97-6 is listed as a Toxic Pollutant under the Clean Water Act.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 7439-97-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
WARNING: This product contains Mercury, a chemical known to the state of California to cause birth defects or other reproductive harm. California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
T N
Risk Phrases:
R 23 Toxic by inhalation.
R 33 Danger of cumulative effects.
R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:
S 1/2 Keep locked up and out of reach of children.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 7 Keep container tightly closed.
S 60 This material and its container must be disposed of as hazardous waste.
S 61 Avoid release to the environment. Refer to special instructions/safety data sheets.

WGK (Water Danger/Protection)
CAS# 7439-97-6: 3
Canada - DSL/NDSL
CAS# 7439-97-6 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of D2A, E.
Canadian Ingredient Disclosure List
CAS# 7439-97-6 is listed on the Canadian Ingredient Disclosure List.
Exposure Limits

CAS# 7439-97-6: OEL-ARAB Republic of Egypt:TWA 0.05 mg/m3 OEL-AUSTR ALIA:TWA 0.1 mg/m3;Skin OEL-BELGIUM:TWA 0.1 mg/m3;Skin OEL-FINLAND:T WA 0.05 mg/m3 OEL-FRANCE:TWA 0.05 mg/m3;Skin (vapor) OEL-FRANCE:TWA 0.1 mg/m3;Skin OEL-HUNGARY:TWA 0.02 mg/m3;STEL 0.04 mg/m3 OEL-POLAND :TWA 0.05 mg/m3 OEL-SWEDEN:TWA 0.05 mg/m3 (vapor) OEL-SWITZERLAND:TW A 0.005 ppm (0.05 mg/m3);Skin (vapor) OEL-SWITZERLAND:TWA 0.01 mg/m3; Skin OEL-TURKEY:TWA 0.1 mg/m3;Skin OEL IN BULGARIA, COLOMBIA, JORDAN , KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV OEL-AUSTRALIA:TWA 0.05 mg(Hg)/m3;Skin JANUARY 1993 OEL-BEL GIUM:TWA 0.05 mg(Hg)/m3;Skin JANUARY 1993 OEL-CZECHOSLOVAKIA:TWA 0.0 5 mg(Hg)/m3;STEL 0.15 mg(Hg)/m3 OEL-DENMARK:TWA 0.05 mg(Hg)/m3 JANUA RY 1993 OEL-FINLAND:TWA 0.05 mg(Hg)/m3 JANUARY 1993 OEL-FRANCE:TWA 0.05 mg(Hg)/m3 JANUARY 1993 OEL-GERMANY:TWA 0.01 ppm (0.1 mg(Hg)/m3) JANUARY 1993 OEL-HUNGARY:TWA 0.02 mg(Hg)/m3;STEL 0.04 mg(Hg)/m JANU ARY 1993 OEL-JAPAN:TWA 0.05 mg(Hg)/m3 JANUARY 1993 OEL-THE NETHERLA NDS:TWA 0.05 mg(Hg)/m3;STEL 0.15 mg(Hg)/m3 OEL-THE PHILIPPINES:TWA 0. 05 mg(Hg)/m3 JANUARY 1993 OEL-POLAND:TWA 0.01 mg(Hg)/m3 JANUARY 199 3 OEL-RUSSIA:TWA 0.05 mg(Hg

Section 16 - Additional Information

MSDS Creation Date: 6/15/1999
Revision #6 Date: 2/05/2004

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

MSDS Number: **L2350** * * * * * *Effective Date: 08/10/04* * * * * * *Supercedes: 11/02/01*

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker®

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

LEAD ATOMIC ABSORPTION STANDARD

1. Product Identification

Synonyms: Lead AA Standard; Lead Atomic Absorption StandARd (1000 ppm); Lead, DILUT-IT® Analytical Conc., Std, 1g Pb2+
CAS No.: Not applicable to mixtures.
Molecular Weight: Not applicable to mixtures.
Chemical Formula: Not applicable. (ca. 99% water)
Product Codes: 4779

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	1 - 3%	Yes
Lead Nitrate	10099-74-8	1 - 4%	Yes
Water	7732-18-5	93 - 99%	No

3. Hazards Identification

Emergency Overview

DANGER! CORROSIVE! LIQUID AND MIST CAUSE SEVERE BURNS TO EVERY AREA OF CONTACT. VAPOR IRRITATING TO EYES AND RESPIRATORY TRACT. HARMFUL IF SWALLOWED OR INHALED. MAY AFFECT THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD, REPRODUCTIVE SYSTEM, AND RESPIRATORY TRACT (Lead component). INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. The following hazards are for concentrated solutions. Hazards of less concentrated solutions may be reduced. Degree of hazard for reduced concentrations is not currently addressed in the available literature.

Inhalation:
Corrosive. Effects should be less severe than from exposure to higher concentrations where symptoms may include irritation of the nose and throat, labored breathing, as well as lung edema, damage to the mucous membranes and upper respiratory tract.

Ingestion:
Corrosive. Effects should be less severe than from exposure to higher concentrations where symptoms may include severe burns of the mouth, throat, and stomach. May cause sore throat, vomiting, diarrhea. Symptoms from nitric acid exposure may include burning sensation, vomiting and diarrhea. The symptoms of lead poisoning include abdominal pain and spasms, nausea, vomiting, headache. Acute poisoning can lead to muscle weakness, "lead line" on the gums, metallic taste, definite loss of appetite, insomnia, dizziness, high lead levels in blood and urine with shock, coma and death in extreme cases.

Skin Contact:
Corrosive. Effects should be less severe than from exposure to higher concentrations where symptoms may include redness, pain, and burns to the skin.

Eye Contact:
Corrosive. Effects should be less severe than from exposure to higher concentrations where symptoms may include blurred vision, redness, pain, and burns to eye tissue and possible permanent eye damage.

Chronic Exposure:
Lead is a cumulative poison and exposure even to small amounts can raise the body's content to toxic levels. The symptoms of chronic exposure are like those of ingestion poisoning; restlessness, irritability, visual disturbances, hypertension and gray facial color may also be noted. Long-term exposure to concentrated vapors may cause erosion of teeth

and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

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4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Not combustible, but concentrated material is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition.

Explosion:
Concentrated material reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.

Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Neutralize spill with sodium bicarbonate or soda ash. Do not over neutralize. Ventilate area

of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Contain and recover liquid when possible. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer!

J. T. Baker NEUTRASORB® or TEAM® 'Low Na+' acid neutralizers are recommended for spills of this product.

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7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Protect from freezing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL) -
Nitric Acid: 2 ppm (TWA),
Lead: 0.05 mg/m3 (TWA), 0.03 mg/m3 (Action Level).

- ACGIH Threshold Limit Value (TLV) -
Nitric Acid: 2 ppm (TWA), 4 ppm (STEL),
Lead: 0.05 mg/m3 (TWA), A3 - Animal carcinogen.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
Not expected to require personal respirator usage. If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134).

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain

eye wash fountain and quick-drench facilities in work area.
Other Control Measures:
Eating, drinking, and smoking should not be permitted in areas where solids or liquids containing lead compounds are handled, processed, or stored. See OSHA substance-specific standard for more information on personal protective equipment, engineering and work practice controls, medical surveillance, record keeping, and reporting requirements. (29 CFR 1910.1025).

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9. Physical and Chemical Properties

Appearance:
Clear, colorless solution.
Odor:
Odorless.
Solubility:
Infinitely soluble.
Specific Gravity:
ca. 1.0
pH:
No information found.
% Volatiles by volume @ 21C (70F):
ca. 95
Boiling Point:
ca. 100C (ca. 212F)
Melting Point:
ca. 0C (ca. 32F)
Vapor Density (Air=1):
Essentially the same as water.
Vapor Pressure (mm Hg):
Essentially the same as water.
Evaporation Rate (BuAc=1):
Essentially the same as water.

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Toxic metal fumes may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:

Incompatibles.

---

11. Toxicological Information

Toxicological Data:
Nitric Acid: investigated as a mutagen, reproductive effector.
Lead Nitrate: investigated as a tumorigen, mutagen and reproductive effector.
Reproductive Toxicity:
Lead and other smelter emissions are human reproductive hazards. (Chemical Council on Environmental Quality; Chemical Hazards to Human Reproduction, 1981).
Carcinogenicity:
For lead and inorganic lead compounds:
EPA / IRIS classification: Group B2 - Probable human carcinogen, sufficient animal evidence.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Nitric Acid (7697-37-2)	No	No	None
Lead Nitrate (10099-74-8)	No	No	2B
Water (7732-18-5)	No	No	None

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12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Not regulated.

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes
Lead Nitrate (10099-74-8)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes
Lead Nitrate (10099-74-8)	Yes	Yes	No	No
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Nitric Acid (7697-37-2)	1000	1000	Yes	No
Lead Nitrate (10099-74-8)	No	No	No	Lead cmpd/ni
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Nitric Acid (7697-37-2)	1000	No	No
Lead Nitrate (10099-74-8)	10	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

WARNING:
THIS PRODUCT CONTAINS CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: 2R
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **2** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
DANGER! CORROSIVE! LIQUID AND MIST CAUSE SEVERE BURNS TO EVERY AREA OF CONTACT. VAPOR IRRITATING TO EYES AND RESPIRATORY TRACT. HARMFUL IF SWALLOWED OR INHALED. MAY AFFECT THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD, REPRODUCTIVE SYSTEM, AND RESPIRATORY TRACT (Lead component). INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
No Changes.
Disclaimer:
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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Material Safety Data Sheet
Silver

ACC# 20770

Section 1 - Chemical Product and Company Identification

MSDS Name: Silver
Catalog Numbers: S80162, S163 10, S163-10, S16310, ZZS166C17
Synonyms: Argentum.
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7440-22-4	Silver	100	231-131-3

Hazard Symbols: None listed.
Risk Phrases: 33

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white solid. **Caution!** May cause respiratory and digestive tract irritation. May cause eye and skin irritation. Danger of cumulative effects.
Target Organs: Kidneys.

Potential Health Effects
Eye: May cause eye irritation.
Skin: May cause skin irritation. May cause skin discoloration.
Ingestion: May cause irritation of the digestive tract. Effects may be cumulative. Ingestion of silver compounds may cause abdominal pain, rigidity, convulsions and shock.
Inhalation: May cause respiratory tract irritation. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count.
Chronic: Chronic inhalation or ingestion of silver salts may cause argyria characterized by a permanent blue-gray discoloration of the eyes, skin, mucous membranes, and internal organs. This malady results from the accumulation of silver in the body.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. If irritation develops, get medical aid.
Skin: Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists. Wash clothing before reuse.
Ingestion: Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water. Wash mouth out with water. Get medical aid if irritation or symptoms occur.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid if cough or other symptoms appear.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.
Extinguishing Media: Substance is noncombustible; use agent most appropriate to extinguish surrounding fire. Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 1; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Wash hands before eating. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation. Use with adequate ventilation.
Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. No special precautions indicated.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Silver	0.1 mg/m3 TWA	0.01 mg/m3 TWA (dust) 10 mg/m3 IDLH (dust)	0.01 mg/m3 TWA

OSHA Vacated PELs: Silver: 0.01 mg/m3 TWA

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to minimize contact with skin.

Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: white
Odor: none reported
pH: Not available.
Vapor Pressure: 100 mm Hg @ 1865 C
Vapor Density: Not available.
Evaporation Rate: Not applicable.
Viscosity: Not available.
Boiling Point: 2212 deg C
Freezing/Melting Point:961 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble in water.
Specific Gravity/Density:10.5
Molecular Formula: Ag
Molecular Weight:107.8682

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, exposure to air.
Incompatibilities with Other Materials: Strong acids, strong bases, ethyleneimine.
Hazardous Decomposition Products: Irritating and toxic fumes and gases, silver fumes.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 7440-22-4: VW3500000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 7440-22-4: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
Epidemiology: No data available.
Teratogenicity: No data available.
Reproductive Effects: No data available.
Neurotoxicity: No data available.
Mutagenicity: No data available.
Other Studies: See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.
Environmental: Aquatic Fate: Sorption and precipitation processes are effective in reducing the concn of dissolved silver and result in higher concn in the bed sediments than in the overlying waters. Sorption by manganese dioxide and precipitation with halides are probably the dominant controls on the mobility of silver in the aquatic environment.
Physical: Algae, daphnia, fresh water mussels, and fathead minnows were all found capable of accumulating silver; but the food chain was not an important route of silver accumulation for animals at higher tropic levels, suggesting no food chain magnification.
Other: For more information, see "HANDBOOK OF ENVIRONMENTAL FATE AND EXPOSURE DATA."

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	No information available.				No information available.
Hazard Class:					
UN Number:					
Packing Group:					

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7440-22-4 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

CERCLA Hazardous Substances and corresponding RQs
CAS# 7440-22-4: 1000 lb final RQ (no reporting of releases of this hazardous substance is r
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 7440-22-4: chronic, flammable.
Section 313
This material contains Silver (CAS# 7440-22-4, 100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. CAS# 7440-22-4 is listed as a Priority Pollutant under the Clean Water Act. CAS# 7440-22-4 is listed as a Toxic Pollutant under the Clean Water Act.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 7440-22-4 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
Not available.
Risk Phrases:
R 33 Danger of cumulative effects.

Safety Phrases:
S 37 Wear suitable gloves.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 28A After contact with skin, wash immediately with plenty of water.

WGK (Water Danger/Protection)
CAS# 7440-22-4: 0
Canada - DSL/NDSL
CAS# 7440-22-4 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of D2A.
Canadian Ingredient Disclosure List
CAS# 7440-22-4 is listed on the Canadian Ingredient Disclosure List.
Exposure Limits
CAS# 7440-22-4: OEL-AUSTRALIA:TWA 0.1 mg/m3 OEL-BELGIUM:TWA 0.1 mg/m3 OEL-DENMARK:TWA 0.01 mg/m3 OEL-FINLAND:TWA 0.1 mg/m3 OEL-FRANCE:TWA 0.1 mg/m3 OEL-GERMANY:TWA 0.01 mg/m3 OEL-RUSSIA:STEL 1 mg/m3 OEL-SWITZERLAND:TWA 0.01 mg/m3 OEL-UNITED KINGDOM:TWA 0.1 mg/m3 OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 12/12/1997
Revision #6 Date: 3/18/2003

MSDS Number: **S1106** * * * * * *Effective Date: 05/08/03* * * * * * *Supercedes: 08/02/00*

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

Selenium

1. Product Identification

Synonyms: Elemental Selenium; Selen; C.I. 77805
CAS No.: 7782-49-2
Molecular Weight: 78.96
Chemical Formula: Se
Product Codes: 3395

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Selenium	7782-49-2	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! CAUSES SEVERE IRRITATION TO EYES, SKIN AND RESPIRATORY TRACT. HARMFUL IF SWALLOWED OR INHALED. AFFECTS

LIVER, KIDNEYS, BLOOD, SPLEEN.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:
Severe irritant to the respiratory system. Soreness, coughing, labored breathing are symptoms which may subside and return. Lung edema may occur in acute cases. Cases with flu-like symptoms resembling metal fume fever within 24 hours of exposure have been reported.
Ingestion:
May cause severe irritation to the mouth and throat. Gastrointestinal disturbances may be expected with nausea, abdominal pain, and vomiting.
Skin Contact:
Causes severe irritation. Symptoms include redness, itching and pain.
Eye Contact:
May cause severe irritation, redness, pain.
Chronic Exposure:
Chronic exposure may cause odor of garlic on breath, fatigue, irritability, repsiratory tract irritation, gastrointestinal irritation, metallic taste, and allergic eye reaction. Based on animal studies, may cause blood, liver, kidney and spleen effects.
Aggravation of Pre-existing Conditions:
Person with a history of asthma, allergies, or known sensitization to selenium, or with a history of other chronic respiratory disease, gastrointestinal disturbances, disorders of the liver or kidneys, or recurrent dermatitis would be expected to be at increased risk from exposure.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Do NOT induce vomiting. Give large amounts of water. Never give anything by mouth to an unconscious person. Get medical attention.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean

shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

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7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
0.2 mg/m3, Selenium Compounds, as Se

-ACGIH Threshold Limit Value (TLV):
0.2 mg/m3, Selenium & Compounds, as Se

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Small blue-black metallic shot.

Odor:
Odorless.

Solubility:
Insoluble in water.

Specific Gravity:
4.26-4.81

pH:
No information found.

% Volatiles by volume @ 21C (70F):
0

Boiling Point:
690C (1274F)

Melting Point:
170 - 217C (338 - 423F)

Vapor Density (Air=1):
Not applicable.

Vapor Pressure (mm Hg):
Not applicable.

Evaporation Rate (BuAc=1):

Not applicable.

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10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Toxic oxides of selenium form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizers, strong acids, and a wide range of other materials.
Conditions to Avoid:
Moisture and incompatibles.

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11. Toxicological Information

Toxicological Data:
Oral Rat LD50: 6700 mg/kg. Investigated as a tumorigen and a reproductive effector.
Carcinogenicity:
EPA / IRIS classification: Group D1 - Not classifiable as a human carcinogen.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Selenium (7782-49-2)	No	No	3

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12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in

accordance with federal, state and local requirements.

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14. Transport Information

Not regulated.

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15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Selenium (7782-49-2)	Yes	Yes	No	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Selenium (7782-49-2)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Selenium (7782-49-2)	No	No	No	Selenium cmp

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Selenium (7782-49-2)	100	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: 2Z
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **2** Flammability: **0** Reactivity: **0**

Label Hazard Warning:
WARNING! CAUSES SEVERE IRRITATION TO EYES, SKIN AND RESPIRATORY TRACT. HARMFUL IF SWALLOWED OR INHALED. AFFECTS LIVER, KIDNEYS, BLOOD, SPLEEN.
Label Precautions:
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.
Avoid breathing dust.
Do not breathe mist.
Use only with adequate ventilation.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:
No Changes.
Disclaimer:
****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

International Chemical Safety Cards

POLYCHLORINATED BIPHENYL (AROCLOR 1254)

ICSC: 0939

POLYCHLORINATED BIPHENYL (AROCLOR 1254)
Chlorobiphenyl (54% chlorine)
Chlorodiphenyl (54% chlorine)
PCB
Molecular mass: 327 (average)

CAS # 11097-69-1
RTECS # TQ1360000
ICSC # 0939
UN # 2315
EC # 602-039-00-4

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Irritating and toxic gases may be generated in a fire.		Powder, carbon dioxide.
EXPLOSION			
EXPOSURE		PREVENT GENERATION OF MISTS! STRICT HYGIENE!	
• **INHALATION**		Ventilation.	Fresh air, rest. Refer for medical attention.
• **SKIN**	MAY BE ABSORBED! Dry skin. Redness. Chloracne (further see Inhalation).	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
• **EYES**	Redness. Pain.	Safety goggles, face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**	Headache. Numbness. Fever.	Do not eat, drink, or smoke during work.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Consult an expert! Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Separated from food and feedstuffs. Cool. Dry. Keep in a well-ventilated room.	Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. Xn symbol R: 33 S: 35 Note: C UN Hazard Class: 9

		UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0939 Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

POLYCHLORINATED BIPHENYL (AROCLOR 1254)

ICSC: 0939

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** LIGHT YELLOW VISCOUS LIQUID. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance decomposes in a fire producing irritating and toxic gases. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: ppm; 0.5 mg/m^3 (skin) (ACGIH 1991-1992).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance irritates the eyes (see Notes). **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis chloracne. The substance may have effects on the liver. Animal tests show that this substance possibly causes toxic effects upon human reproduction.
PHYSICAL PROPERTIES	Relative density (water = 1): 1.5 Solubility in water: none	Vapour pressure, Pa at 25°C: 0.01 Octanol/water partition coefficient as log Pow: 6.30 (estimated)
ENVIRONMENTAL DATA	In the food chain important to humans, bioaccumulation takes place, specifically in water organisms. It is strongly advised not to let the chemical enter into the environment.	

NOTES

Changes into a resinous state (pour point) at 10°C. Distillation range: 365°-390°C. No open cup flash point to boiling. The symptoms other than the chloracne and liver effects may be in part due to contaminants of the PCB.

Transport Emergency Card: TEC (R)-914

ADDITIONAL INFORMATION

IMPORTANT LEGAL NOTICE:	Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

International Chemical Safety Cards

BENZENE

ICSC: 0015

Cyclohexatriene
Benzol
C_6H_6
Molecular mass: 78.1

ICSC # 0015
CAS # 71-43-2
RTECS # CY1400000
UN # 1114
EC # 601-020-00-8
June 05, 2003 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive. Risk of fire and explosion: see Chemical Dangers.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		AVOID ALL CONTACT!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea. Shortness of breath. Convulsions. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! Dry skin. Redness. Pain. (Further see Inhalation).	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention.
•EYES	Redness. Pain.	Face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Sore throat. Vomiting. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING

Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: complete protective clothing including self-contained breathing apparatus.	Fireproof. Separated from food and feedstuffs oxidants and halogens .	Do not transport with food and feedstuffs. Note: E F symbol T symbol R: 45-46-11-36/38-48/23/24/25-65 S: 53-45 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0015

International Chemical Safety Cards

BENZENE

ICSC: 0015

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
Reacts violently with oxidants, nitric acid, sulfuric acid and halogens causing fire and explosion hazard. Attacks plastic and rubber.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 0.5 ppm as TWA; 2.5 ppm as STEL; (skin); A1; BEI issued; (ACGIH 2004).
MAK: H;
Carcinogen category: 1; Germ cell mutagen group: 3A;
(DFG 2004).
OSHA PEL: 1910.1028 TWA 1 ppm ST 5 ppm See Appendix F
NIOSH REL: Ca TWA 0.1 ppm ST 1 ppm See Appendix A
NIOSH IDLH: Ca 500 ppm See: 71432

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation , through the skin and by ingestion .

INHALATION RISK:
A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes , the skin and the respiratory tract . Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system , resulting in lowering of consciousness . Exposure far above the occupational exposure limit value may result in unconsciousness and death .

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the bone marrow and immune system , resulting in a decrease of blood cells. This substance is carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 80°C
Melting point: 6°C
Relative density (water = 1): 0.88
Solubility in water, g/100 ml at 25°C: 0.18
Vapour pressure, kPa at 20°C: 10
Relative vapour density (air = 1): 2.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.2
Flash point:
-11°C c.c.
Auto-ignition temperature: 498°C
Explosive limits, vol% in air: 1.2-8.0
Octanol/water partition coefficient as log Pow: 2.13

ENVIRONMENTAL DATA	The substance is very toxic to aquatic organisms. 

N O T E S

Use of alcoholic beverages enhances the harmful effect. Depending on the degree of exposure, periodic medical examination is indicated. The odour warning when the exposure limit value is exceeded is insufficient. Card has been partly updated in October 2004. See sections Occupational Exposure Limits, EU classification, Emergency Response.

Transport Emergency Card: TEC (R)-30S1114 / 30GF1-II

NFPA Code: H2; F3; R0

ADDITIONAL INFORMATION

ICSC: 0015 **BENZENE**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

TOLUENE

ICSC: 0078

Methylbenzene
Toluol
Phenylmethane
$C_6H_5CH_3$ / C_7H_8
Molecular mass: 92.1

ICSC # 0078
CAS # 108-88-3
RTECS # XS5250000
UN # 1294
EC # 601-021-00-3
October 10, 2002 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION	Cough. Sore throat. Dizziness. Drowsiness. Headache. Nausea. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•EYES	Redness. Pain.	Safety goggles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area in large spill! Consult an expert in large spill! Remove all ignition sources. Ventilation. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: self-contained breathing apparatus in large spill.	Fireproof. Separated from strong oxidants.	F symbol Xn symbol R: 11-38-48/20-63-65-67 S: 2-36/37-46-62 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0078

International Chemical Safety Cards

TOLUENE

ICSC: 0078

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour mixes well with air, explosive mixtures are formed easily. As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
Reacts violently with strong oxidants causing fire and explosion hazard.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 50 ppm as TWA; (skin); A4; BEI issued; (ACGIH 2004).
MAK:
Pregnancy risk group: C;
(DFG 2004).
EU OEL: 192 mg/m³ 50 ppm as TWA 384 mg/m³ 100 ppm as STEL (skin) (EU 2006).
OSHA PEL†: TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)
NIOSH REL: TWA 100 ppm (375 mg/m^3) ST 150 ppm (560 mg/m^3)
NIOSH IDLH: 500 ppm See: 108883

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes and the respiratory tract . The substance may cause effects on the central nervous system . If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure at high levels may result in cardiac dysrhythmia and unconsciousness.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the central nervous system . Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL

Boiling point: 111°C
Melting point: -95°C
Relative density (water = 1): 0.87

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.01
Flash point: 4°C c.c.

PROPERTIES	Solubility in water: none Vapour pressure, kPa at 25°C: 3.8 Relative vapour density (air = 1): 3.1	Auto-ignition temperature: 480°C Explosive limits, vol% in air: 1.1-7.1 Octanol/water partition coefficient as log Pow: 2.69
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms. 	

N O T E S

Depending on the degree of exposure, periodic medical examination is suggested. Use of alcoholic beverages enhances the harmful effect. Card has been partly updated in October 2006: see section Occupational Exposure Limits.

Transport Emergency Card: TEC (R)-30S1294

NFPA Code: H 2; F 3; R 0;

ADDITIONAL INFORMATION

ICSC: 0078 **TOLUENE**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

ETHYLBENZENE

ICSC: 0268

Ethylbenzol
Phenylethane
EB
$C_8H_{10}/C_6H_5C_2H_5$
Molecular mass: 106.2

ICSC # 0268
CAS # 100-41-4
RTECS # DA0700000
UN # 1175
EC # 601-023-00-4
November 23, 2007 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Dry powder. Foam. Carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging or handling.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
•INHALATION	Cough. Sore throat. Dizziness. Drowsiness. Headache.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain. crimation; deleted at update Nov 07 - only at very high levels.	Safety goggles	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation in the throat and chest. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the	Fireproof. Separated from strong oxidants. Provision to contain effluent from fire extinguishing. Store in an	F symbol Xn symbol

substance. Ventilation. Collect leaking liquid in covered containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer Do NOT let this chemical enter the environment.	area without drain or sewer access.	R: 11-20 S: 2-16-24/25-29 UN Hazard Class: 3 UN Packing Group: II Signal: Danger Flame-Excl mark-Health haz Highly flammable liquid and vapour May be harmful if swallowed Harmful if inhaled vapour Causes mild skin irritation Causes eye irritation Suspected of causing cancer May cause respiratory irritation May cause drowsiness or dizziness May be harmful if swallowed and enters airways Toxic to aquatic life

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0268

International Chemical Safety Cards

ETHYLBENZENE

ICSC: 0268

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH AROMATIC ODOUR. **PHYSICAL DANGERS:** The vapour mixes well with air, explosive mixtures are easily formed. **CHEMICAL DANGERS:** Reacts with strong oxidants. Attacks plastic and rubber. **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 100 ppm as TWA, 125 ppm as STEL; A3 (confirmed animal carcinogen with unknown relevance to humans); BEI issued, (ACGIH 2007). EU OEL: 442 mg/m³ 100 ppm as TWA 884 mg/m³ 200 ppm as STEL (skin) (EU 2006). OSHA PEL†: TWA 100 ppm (435 mg/m^3) NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 125 ppm (545 mg/m^3) NIOSH IDLH: 800 ppm 10%LEL See: 100414	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its vapour, and by ingestion. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes , the skin and the respiratory tract Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure above the OEL could cause lowering of consciousness. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans. The substance may have effects on the kidneys and liver , resulting in impaired functions Repeated contact with skin may cause dryness and cracking.
PHYSICAL	Boiling point: 136°C Melting point: -95°C Relative density (water = 1): 0.9 Solubility in water, g/100 ml at 20°C: 0.015	Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 18°C c.c. Auto-ignition temperature: 432°C

PROPERTIES	Vapour pressure, kPa at 20°C: 0.9 Relative vapour density (air = 1): 3.7	Explosive limits, vol% in air: 1.0-6.7 Octanol/water partition coefficient as log Pow: 3.1 Viscosity, mm²/s at 25 °C: 0.6
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms. It is strongly advised that this substance does not enter the environment. 	

N O T E S

The odour warning when the exposure limit value is exceeded is insufficient.

Transport Emergency Card: TEC (R)-305 1135 or 30GF1- I+II

NFPA Code: H2; F3; R0

ADDITIONAL INFORMATION

ICSC: 0268 **ETHYLBENZENE**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

m-XYLENE

ICSC: 0085

meta-Xylene
1,3-Dimethylbenzene
m-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

ICSC # 0085
CAS # 108-38-3
RTECS # ZE2275000
UN # 1307
EC # 601-022-00-9
August 03, 2002 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 27°C explosive vapour/air mixtures may be formed.	Above 27°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in	Fireproof. Separated from strong oxidants and strong acids .	Note: C Xn symbol R: 10-20/21-38

sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)		S: 2-25 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0085

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

m-XYLENE

ICSC: 0085

I M P O R T A N T D A T A	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** As a result of flow, agitation, etc., electrostatic charges can be generated. **CHEMICAL DANGERS:** Reacts with strong acids and strong oxidants . **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 100 ppm as TWA; 150 ppm as STEL A4 (ACGIH 2001). BEI specified by (ACGIH 2001). EU OEL: 50 ppm as TWA; 100 ppm as STEL (skin) (EU 2000). OSHA PEL†: TWA 100 ppm (435 mg/m^3) NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3) NIOSH IDLH: 900 ppm See: 95476	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation, through the skin and by ingestion. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes and the skin . The substance may cause effects on the central nervous system . If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The liquid defats the skin. The substance may have effects on the central nervous system .Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.
PHYSICAL PROPERTIES	Boiling point: 139°C Melting point: -48°C Relative density (water = 1): 0.86 Solubility in water: none Vapour pressure, kPa at 20°C: 0.8	Relative vapour density (air = 1): 3.7 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 27°C c.c. Auto-ignition temperature: 527°C Explosive limits, vol% in air: 1.1-7.0 Octanol/water partition coefficient as log Pow: 3.20
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms.	

N O T E S

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also apply to technical xylene. See ICSC 0084 o-Xylene and 0086 p-Xylene.

NFPA Code: H 2; F 3; R 0;

Transport Emergency Card: TEC (R)-30S1307-III
Card has been partially updated in January 2008: see Occupational Exposure Limits.

ADDITIONAL INFORMATION

ICSC: 0085 **m-XYLENE**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

o-XYLENE

ICSC: 0084

ortho-Xylene
1,2-Dimethylbenzene
o-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

ICSC # 0084
CAS # 95-47-6
RTECS # ZE2450000
UN # 1307
EC # 601-022-00-9
August 03, 2002 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 32°C explosive vapour/air mixtures may be formed.	Above 32°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled	Fireproof. Separated from strong oxidants and strong acids .	Note: C

liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)		Xn symbol R: 10-20/21-38 S: 2-25 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0084

International Chemical Safety Cards

o-XYLENE

ICSC: 0084

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** As a result of flow, agitation, etc., electrostatic charges can be generated. **CHEMICAL DANGERS:** Reacts with strong acids and strong oxidants . **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 100 ppm as TWA; 150 ppm as STEL A4 (ACGIH 2001). BEI specified by (ACGIH 2001). EU OEL: 50 ppm as TWA; 100 ppm as STEL (skin) (EU 2000). OSHA PEL†: TWA 100 ppm (435 mg/m^3) NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3) NIOSH IDLH: 900 ppm See: 95476	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation, through the skin and by ingestion. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes and the skin . The substance may cause effects on the central nervous system . If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The liquid defats the skin. The substance may have effects on the central nervous system. Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.
PHYSICAL PROPERTIES	Boiling point: 144°C Melting point: -25°C Relative density (water = 1): 0.88 Solubility in water: none Vapour pressure, kPa at 20°C: 0.7	Relative vapour density (air = 1): 3.7 Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02 Flash point: 32°C c.c. Auto-ignition temperature: 463°C Explosive limits, vol% in air: 0.9-6.7 Octanol/water partition coefficient as log Pow: 3.12
ENVIRONMENTAL DATA	The substance is toxic to aquatic organisms.	

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also

apply to technical xylene. See ICSC 0086 p-Xylene and 0085 m-Xylene.

Transport Emergency Card: TEC (R)-30S1307-III

NFPA Code: H 2; F 3; R 0;
Card has been partially updated in January 2008: see Occupational Exposure Limits.

ADDITIONAL INFORMATION

ICSC: 0084 **o-XYLENE**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

p-XYLENE

ICSC: 0086

UNEP

National Institute for Occupational Safety and Health NIOSH

para-Xylene
1,4-Dimethylbenzene
p-Xylol
$C_6H_4(CH_3)_2$ / C_8H_{10}
Molecular mass: 106.2

ICSC # 0086
CAS # 106-42-3
RTECS # ZE2625000
UN # 1307
EC # 601-022-00-9
August 03, 2002 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 27°C explosive vapour/air mixtures may be formed.	Above 27°C use a closed system, ventilation, and explosion-proof electrical equipment. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
•INHALATION	Dizziness. Drowsiness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Burning sensation. Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Remove all ignition sources. Collect leaking and spilled	Fireproof. Separated from strong oxidants and strong acids .	Note: C

liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment. (Extra personal protection: filter respirator for organic gases and vapours.)		Xn symbol R: 10-20/21-38 S: 2-25 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0086

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

p-XYLENE

ICSC: 0086

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
Reacts with strong acids and strong oxidants .

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 100 ppm as TWA; 150 ppm as STEL A4 (ACGIH 2001). BEI specified by (ACGIH 2001).
EU OEL: 50 ppm as TWA; 100 ppm as STEL (skin) (EU 2000).
OSHA PEL†: TWA 100 ppm (435 mg/m^3)
NIOSH REL: TWA 100 ppm (435 mg/m^3) ST 150 ppm (655 mg/m^3)
NIOSH IDLH: 900 ppm See: 95476

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the eyes and the skin . The substance may cause effects on the central nervous system . If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the central nervous system. Exposure to the substance may enhance hearing damage caused by exposure to noise. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

PHYSICAL PROPERTIES

Boiling point: 138°C
Melting point: 13°C
Relative density (water = 1): 0.86
Solubility in water:
none
Vapour pressure, kPa at 20°C: 0.9

Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 27°C c.c.
Auto-ignition temperature: 528°C
Explosive limits, vol% in air: 1.1-7.0
Octanol/water partition coefficient as log Pow: 3.15

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also

apply to technical xylene. See ICSC 0084 o-Xylene and 0085 m-Xylene.

Transport Emergency Card: TEC (R)-30S1307-III

NFPA Code: H 2; F 3; R 0;
Card has been partially updated in January 2008: see Occupational Exposure Limits.

ADDITIONAL INFORMATION	

ICSC: 0086 **p-XYLENE**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

METHYL TERT-BUTYL ETHER

ICSC: 1164

tert-Butyl methyl ether
MTBE
Methyl-1,1-dimethylethyl ether
2-Methoxy-2-methyl propane
$(CH_3)_3COCH_3$ / $C_5H_{12}O$
Molecular mass: 88.2

ICSC # 1164
CAS # 1634-04-4
RTECS # KN5250000
UN # 2398
EC # 603-181-00-X
November 04, 2000 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking. NO contact with oxidants.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE			
•INHALATION	Drowsiness. Dizziness. Headache. Weakness. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness.	Safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Nausea. Vomiting. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING

Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Personal protection: filter respirator for organic gases and vapours.	Fireproof. Separated from strong oxidants, strong acids.	F symbol Xi symbol R: 11-38 S: 2-9-16-24 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 1164

International Chemical Safety Cards

METHYL TERT-BUTYL ETHER

ICSC: 1164

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour is heavier than air and may travel along the ground; distant ignition possible.

CHEMICAL DANGERS:
Reacts violently with strong oxidants causing fire hazard. The substance decomposes on contact with acids.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 50 ppm as TWA; A3; (ACGIH 2004).
MAK: 50 ppm, 180 mg/m³;
Peak limitation category: I(1.5); Carcinogen category: 3B; Pregnancy risk group: C; (DFG 2004).

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation and by ingestion.

INHALATION RISK:
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is irritating to the skin. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure far above the OEL could cause lowering of consciousness.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:

PHYSICAL PROPERTIES

Boiling point: 55°C
Melting point: -109°C
Relative density (water = 1): 0.7
Solubility in water, g/100 ml at 20°C: 4.2
Vapour pressure, kPa at 20°C: 27
Relative vapour density (air = 1): 3.0

Relative density of the vapour/air-mixture at 20°C (air = 1): 1.5
Flash point:
-28°C c.c.
Auto-ignition temperature: 375°C
Explosive limits, vol% in air: 1.6-15.1
Octanol/water partition coefficient as log Pow: 1.06

ENVIRONMENTAL DATA

It is strongly advised not to let the chemical enter into the environment because it persists in the environment.

NOTES

Much less likely to form peroxides than other ethers. Card has been partly updated in October 2004. See sections Occupational Exposure Limits, EU classification, Emergency Response.

Transport Emergency Card: TEC (R)-30GF1-I+II

ADDITIONAL INFORMATION

ICSC: 1164 **METHYL TERT-BUTYL ETHER**

International Chemical Safety Cards

NAPHTHALENE

ICSC: 0667

Naphthene
$C_{10}H_8$
Molecular mass: 128.18

ICSC # 0667
CAS # 91-20-3
RTECS # QJ0525000
UN # 1334 (solid); 2304 (molten)
EC # 601-052-00-2
April 21, 2005 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Above 80°C explosive vapour/air mixtures may be formed. Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		PREVENT DISPERSION OF DUST!	
•INHALATION	Headache. Weakness. Nausea. Vomiting. Sweating. Confusion. Jaundice. Dark urine.	Ventilation (not if powder), local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! (Further see Inhalation).	Protective gloves.	Rinse skin with plenty of water or shower.
•EYES		Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. Diarrhoea. Convulsions. Unconsciousness. (Further see Inhalation).	Do not eat, drink, or smoke during work. Wash hands before eating.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Personal protection: filter respirator for organic gases and vapours. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place.	Separated from strong oxidants, food and feedstuffs . Store in an area without drain or sewer access.	Do not transport with food and feedstuffs. Marine pollutant. Xn symbol N symbol R: 22-40-50/53 S: 2-36/37-46-60-61

		UN Hazard Class: 4.1 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0667

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

NAPHTHALENE

ICSC: 0667

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
WHITE SOLID IN VARIOUS FORMS , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:
On combustion, forms irritating and toxic gases. Reacts with strong oxidants .

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 10 ppm as TWA; 15 ppm as STEL; (skin); A4 (not classifiable as a human carcinogen); (ACGIH 2005).
MAK: skin absorption (H); Carcinogen category: 2; Germ cell mutagen group: 3B; (DFG 2004).
OSHA PEL†: TWA 10 ppm (50 mg/m^3)
NIOSH REL: TWA 10 ppm (50 mg/m^3) ST 15 ppm (75 mg/m^3)
NIOSH IDLH: 250 ppm See: 91203

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. See Notes.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance may cause effects on the blood , resulting in lesions of blood cells (haemolysis) . See Notes. The effects may be delayed. Exposure by ingestion may result in death. Medical observation is indicated.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The substance may have effects on the blood , resulting in chronic haemolytic anaemia. The substance may have effects on the eyes , resulting in the development of cataract. This substance is possibly carcinogenic to humans.

PHYSICAL PROPERTIES

Boiling point: 218°C

Sublimation slowly at room temperature
Melting point: 80°C
Density: 1.16 g/cm³
Solubility in water, g/100 ml at 25°C: none

Vapour pressure, Pa at 25°C: 11
Relative vapour density (air = 1): 4.42
Flash point: 80°C c.c.
Auto-ignition temperature: 540°C
Explosive limits, vol% in air: 0.9-5.9
Octanol/water partition coefficient as log Pow: 3.3

ENVIRONMENTAL DATA

The substance is very toxic to aquatic organisms. The substance may cause long-term effects in the aquatic environment.

NOTES

Some individuals may be more sensitive to the effect of naphthalene on blood cells.

Transport Emergency Card: TEC (R)-41S1334 (solid); 41GF1-II+III (solid); 41S2304 (molten)

NFPA Code: H2; F2; R0;

ADDITIONAL INFORMATION

ICSC: 0667 **NAPHTHALENE**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

n-HEXANE

ICSC: 0279

Hexyl hydride
C_6H_{14}
Molecular mass: 86.2

ICSC # 0279
CAS # 110-54-3
RTECS # MN9275000
UN # 1208
EC # 601-037-00-0
April 13, 2000 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling. Use non-sparking handtools.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE			
•INHALATION	Dizziness. Drowsiness. Dullness. Headache. Nausea. Weakness. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Redness. Pain.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
•EYES	Redness. Pain.	Safety goggles , face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Abdominal pain. (Further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Consult an expert! Remove all ignition sources. Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in	Fireproof. Separated from strong oxidants. Well closed.	F symbol Xn symbol N symbol

sand or inert absorbent and remove to safe place. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection: filter respirator for organic gases and vapours.		R: 11-38-48/20-62-65-67-51/53 S: 2-9-16-29-33-36/37-61-62 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0279

International Chemical Safety Cards

n-HEXANE

ICSC: 0279

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
VOLATILE COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour is heavier than air and may travel along the ground; distant ignition possible.

CHEMICAL DANGERS:
Reacts with strong oxidants causing fire and explosion hazard. Attacks some plastics, rubber and coatings.

OCCUPATIONAL EXPOSURE LIMITS:
OSHA PEL†: TWA 500 ppm (1800 mg/m^3)
NIOSH REL: TWA 50 ppm (180 mg/m^3)
NIOSH IDLH: 1100 ppm 10%LEL See: 110543
TLV: 50 ppm, 176 mg/m³ as TWA; (skin); BEI issued; (ACGIH 2004).
EU OEL: 72 mg/m³ 20 ppm as TWA (EU 2006).
MAK:
Pregnancy risk group: C;
(DFG 2004).

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its vapour and by ingestion.

INHALATION RISK:
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance irritates the skin. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. Exposure at high levels could cause lowering of consciousness.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the central nervous system and especially peripheral nervous system , resulting in polyneuropathy. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

PHYSICAL PROPERTIES

Boiling point: 69°C
Melting point: -95°C
Relative density (water = 1): 0.7
Solubility in water, g/100 ml at 20°C: 0.0013
Vapour pressure, kPa at 20°C: 17
Relative vapour density (air = 1): 3.0
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.3
Flash point: -22°C c.c.
Auto-ignition temperature: 225°C
Explosive limits, vol% in air: 1.1-7.5
Octanol/water partition coefficient as log Pow: 3.9

ENVIRONMENTAL DATA

The substance is toxic to aquatic organisms.

NOTES

Depending on the degree of exposure, periodic medical examination is suggested. Card has been partly updated in

October 2004. See sections Occupational Exposure Limits, EU classification, Emergency Response. Card has been partly updated in October 2006. See sections Occupational Exposure Limits.

Transport Emergency Card: TEC (R)-30S1208

NFPA Code: H 1; F 3; R 0;

ADDITIONAL INFORMATION

ICSC: 0279 **n-HEXANE**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

GASOLINE

ICSC: 1400

Benzin

ICSC # 1400
CAS # 86290-81-5
RTECS # DE3550000
UN # 1203
EC # 649-378-00-4
October 18, 2001 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding).	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE			
•INHALATION	Confusion. Cough. Dizziness. Drowsiness. Dullness. Headache.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	MAY BE ABSORBED! Dry skin. Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety spectacles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	Nausea. Vomiting. (See Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Give plenty of water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Evacuate danger area! Consult an expert! Remove all ignition sources. Cover the spilled material with dry earth, sand or non-combustible material. Do NOT wash away into sewer. Do NOT let this chemical enter the environment. Personal protection:	Fireproof.	Marine pollutant. Note: H, P T symbol R: 45-65 S: 53-45 UN Hazard Class: 3

self-contained breathing apparatus.		UN Packing Group: I

SEE IMPORTANT INFORMATION ON BACK

ICSC: 1400	Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 1994. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

GASOLINE

ICSC: 1400

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** MOBILE LIQUID **PHYSICAL DANGERS:** The vapour is heavier than air and may travel along the ground; distant ignition possible. The vapour mixes well with air, explosive mixtures are easily formed. As a result of flow, agitation, etc., electrostatic charges can be generated. **CHEMICAL DANGERS:** **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 300 ppm as TWA, 500 ppm as STEL; A3 (confirmed animal carcinogen with unknown relevance to humans); (ACGIH 2004).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion. **INHALATION RISK:** A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes , the skin and the respiratory tract . If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system . **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The liquid defats the skin. The substance may have effects on the central nervous system and liver . This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 20-200°C Relative density (water = 1): 0.70 - 0.80 Solubility in water, g/100 ml: none Relative vapour density (air = 1): 3 - 4	Flash point: <-21°C Auto-ignition temperature: about 250°C Explosive limits, vol% in air: 1.3-7.1 Octanol/water partition coefficient as log Pow: 2-7
ENVIRONMENTAL DATA	The substance is harmful to aquatic organisms.	

N O T E S

Depending on the degree of exposure, periodic medical examination is suggested. The product may contain additives which may alter the health and environmental effects.Card has been partly updated in April 2005. See section Physical properties.

NFPA Code: H1; F3; R0;
Transport Emergency Card: TEC (R)-30S1203

ADDITIONAL INFORMATION

ICSC: 1400	**GASOLINE**

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

International Chemical Safety Cards

DIESEL FUEL No. 2

ICSC: 1561

Fuels, Diesel, No. 2
Diesel oil No. 2
Gasoil - unspecified

ICSC # 1561
CAS # 68476-34-6
RTECS # LS9142500
UN # 1202
EC # 649-227-00-2
October 26, 2004 Validated

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable. Gives off irritating or toxic fumes (or gases) in a fire.	NO open flames.	Water spray, alcohol-resistant foam, dry powder, carbon dioxide.
EXPLOSION	Above 52°C explosive vapour/air mixtures may be formed.	Above 52°C use a closed system, ventilation, and explosion-proof electrical equipment.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE			
•INHALATION	Dizziness. Headache. Nausea.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
•SKIN	Dry skin. Redness.	Protective gloves.	Rinse and then wash skin with water and soap.
•EYES	Redness. Pain.	Safety goggles, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
•INGESTION	(See Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Personal protection: filter respirator for organic gases and vapours.	Well closed.	Note: H Xn symbol R: 40 S: 2-36/37 UN Hazard Class: 3 UN Packing Group: III

SEE IMPORTANT INFORMATION ON BACK

ICSC: 1561

International Chemical Safety Cards

DIESEL FUEL No. 2

ICSC: 1561

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** BROWN SLIGHTLY VISCOUS LIQUID , WITH CHARACTERISTIC ODOUR. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** **OCCUPATIONAL EXPOSURE LIMITS:** TLV: 100 ppm as TWA; (skin); A3; (ACGIH 2004).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol. **INHALATION RISK:** A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance is irritating to the eyes , the skin and the respiratory tract . The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** The liquid defats the skin.
PHYSICAL PROPERTIES	Boiling point: 282-338°C Melting point: -30 - -18°C Density: 0.87 - 0.95 g/cm³ Solubility in water, g/100 ml at 20°C: 0.0005 Flash point: 52°C c.c.	Auto-ignition temperature: 254-285°C Explosive limits, vol% in air: 0.6 - 6.5 Octanol/water partition coefficient as log Pow: > 3.3
ENVIRONMENTAL DATA	The substance is harmful to aquatic organisms.	

N O T E S

Additives to Diesel fuel in winter may change physical and toxicological properties of the substance. This card does not address Diesel exhaust.

Transport Emergency Card: TEC (R)-30S1202

NFPA Code: H0; F2; R0;

ADDITIONAL INFORMATION

IMPORTANT LEGAL NOTICE:	Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

APPENDIX C
List of Approved Amendments/changes
HASP Acknowledgement/Agreement Form
Visitors Log
Tailgate Safety Meeting Form
Air Quality Monitoring Record
Equipment Calibration Log
Checklist for Subsurface Investigation
Monthly Heavy Equipment Safety Inspection Checklist

HEALTH AND SAFETY PLAN (HASP)
List of Approved Amendments/Changes

Date	Name	Signature	Changes/Comments	Section Added

HEALTH AND SAFETY PLAN (HASP)
Acknowledgement/Agreement Form

(All ATC, Subcontractor & Client Personnel Must Sign)

Client Site Name: Former RJ Refinery
Project Site No. 170IFA0010

I acknowledge I have reviewed a copy of the Health and Safety Plan for this project, understand it, and agree to comply with all of its provisions. I also understand I could be prohibited by the Site Health and Safety Coordinator or other ATC personnel from working on this project for not complying with any aspect of this Health and Safety Plan:

PRINT NAME	SIGNATURE	COMPANY	DATE

HEALTH AND SAFETY PLAN (HASP)
Acknowledgement/Agreement Form

(All ATC, Subcontractor & Client Personnel Must Sign)

Client Site Name: Former RJ Refinery
Project Site No. 170IFA0010

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Acknowledgement/Agreement Form

(All ATC, Subcontractor & Client Personnel Must Sign)

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Project Site No. 170IFA0010

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PRINT NAME	SIGNATURE	COMPANY	DATE

HEALTH AND SAFETY PLAN (HASP)
Visitors Log

Client Site Name: Former RJ Refinery
Project Site No. 170IFA0010

PRINT NAME	SIGNATURE	COMPANY	DATE

HEALTH AND SAFETY PLAN (HASP)
Tailgate Safety Meeting Form

Site Name & Number:	**Former RJ Refinery**
ATC Project No:	**170IFA0010**
Work Being Performed:	
Date & Time of Meeting:	
Name of Presenter:	

NOTE: On the initial day of the project, the Project Manager or designee should conduct a visual inspection of the project site (using the Site Safety Checklist) prior to the Tailgate Safety Meeting. This inspection should include a review of project site equipment, hazards, and specific job tasks, activities or operations to be performed for that day. These specific items must be covered during the Tailgate Safety Meeting. For subsequent days, any changes to the site or operations must be covered in the Tailgate Safety Meeting. In addition, "Task-Specific" Job Safety Analysis (JSA) for the tasks/activities at the project site must be integrated into the HASP and Tailgate discussions.

Itemize the Specific Topics Discussed (if more space is needed use the back of this page):

❑ Are all employees okay? ❑ Are all employees physically able to perform their job duties? ❑ "Shared Learning" items?
❑ Has PPE been checked? ❑Emergency evacuation area identified? ❑ Asked for Sub interactions or questions?

❑ **Client Requirements** - By checking the box to the left, the Presenter of the Tailgate Meeting acknowledges that all Client-specific requirements have been completed for both ATC and Subcontractor employees.

Participants (if needed, list additional participants on back of this page):

Print Name	Signature	Company	Date

A Tailgate Safety Meeting must be conducted and documented at the beginning of each workday when two or more ATC employees and/or Subcontractor representatives are present on site. Employees, client representatives and subcontractors who arrive at the site after the Tailgate Safety Meeting has been conducted must be briefed on the topics and acknowledge by signing this form. The JSA must be completed at the beginning of each day when one or more ATC employees and/or subcontractor representatives are present on a site.

HEALTH AND SAFETY PLAN (HASP)
Tailgate Safety Meeting Form

Site Name & Number:	**Former RJ Refinery**
ATC Project No:	**170IFA0010**
Work Being Performed:	
Date & Time of Meeting:	
Name of Presenter:	

NOTE: On the initial day of the project, the Project Manager or designee should conduct a visual inspection of the project site (using the Site Safety Checklist) prior to the Tailgate Safety Meeting. This inspection should include a review of project site equipment, hazards, and specific job tasks, activities or operations to be performed for that day. These specific items must be covered during the Tailgate Safety Meeting. For subsequent days, any changes to the site or operations must be covered in the Tailgate Safety Meeting. In addition, "Task-Specific" Job Safety Analysis (JSA) for the tasks/activities at the project site must be integrated into the HASP and Tailgate discussions.

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HEALTH AND SAFETY PLAN (HASP)
Tailgate Safety Meeting Form

Site Name & Number:	**Former RJ Refinery**
ATC Project No:	**170IFA0010**
Work Being Performed:	
Date & Time of Meeting:	
Name of Presenter:	

NOTE: On the initial day of the project, the Project Manager or designee should conduct a visual inspection of the project site (using the Site Safety Checklist) prior to the Tailgate Safety Meeting. This inspection should include a review of project site equipment, hazards, and specific job tasks, activities or operations to be performed for that day. These specific items must be covered during the Tailgate Safety Meeting. For subsequent days, any changes to the site or operations must be covered in the Tailgate Safety Meeting. In addition, "Task-Specific" Job Safety Analysis (JSA) for the tasks/activities at the project site must be integrated into the HASP and Tailgate discussions.

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❑ Has PPE been checked? ❑Emergency evacuation area identified? ❑ Asked for Sub interactions or questions?

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HEALTH AND SAFETY PLAN (HASP)
Tailgate Safety Meeting Form

Site Name & Number:	**Former RJ Refinery**
ATC Project No:	**170IFA0010**
Work Being Performed:	
Date & Time of Meeting:	
Name of Presenter:	

NOTE: On the initial day of the project, the Project Manager or designee should conduct a visual inspection of the project site (using the Site Safety Checklist) prior to the Tailgate Safety Meeting. This inspection should include a review of project site equipment, hazards, and specific job tasks, activities or operations to be performed for that day. These specific items must be covered during the Tailgate Safety Meeting. For subsequent days, any changes to the site or operations must be covered in the Tailgate Safety Meeting. In addition, "Task-Specific" Job Safety Analysis (JSA) for the tasks/activities at the project site must be integrated into the HASP and Tailgate discussions.

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HEALTH AND SAFETY PLAN (HASP)
Tailgate Safety Meeting Form

Site Name & Number:	**Former RJ Refinery**
ATC Project No:	**170IFA0010**
Work Being Performed:	
Date & Time of Meeting:	
Name of Presenter:	

NOTE: On the initial day of the project, the Project Manager or designee should conduct a visual inspection of the project site (using the Site Safety Checklist) prior to the Tailgate Safety Meeting. This inspection should include a review of project site equipment, hazards, and specific job tasks, activities or operations to be performed for that day. These specific items must be covered during the Tailgate Safety Meeting. For subsequent days, any changes to the site or operations must be covered in the Tailgate Safety Meeting. In addition, "Task-Specific" Job Safety Analysis (JSA) for the tasks/activities at the project site must be integrated into the HASP and Tailgate discussions.

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❑ Has PPE been checked? ❑Emergency evacuation area identified? ❑ Asked for Sub interactions or questions?

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Participants (if needed, list additional participants on back of this page):

Print Name	Signature	Company	Date

A Tailgate Safety Meeting must be conducted and documented at the beginning of each workday when two or more ATC employees and/or Subcontractor representatives are present on site. Employees, client representatives and subcontractors who arrive at the site after the Tailgate Safety Meeting has been conducted must be briefed on the topics and acknowledge by signing this form. The JSA must be completed at the beginning of each day when one or more ATC employees and/or subcontractor representatives are present on a site.

Air Quality Monitoring Record

DATE	TIME	LOCATION	INSTRUMENT	CONCENTRATION (UNITS)	SAMPLED BY

HEALTH AND SAFETY PLAN (HASP)
Equipment Calibration Log

DATE	INSTRUMENT/ MODEL NO.	ZERO ADJUST OK?	CALIBRATION GAS (PPM)	READING (PPM)	LEAK CHECK	PERFORMED BY	COMMENTS

CHECKLIST FOR SUBSURFACE CLEARANCE

MUST be filled out PRIOR to the Start of Field Activities
NO subsurface work in road Right of Ways or Off-Site (property boundary) without Written Authorization

Site Name **Former RJ Refinery**

Site Address: **Princeton, IN**

Project No.: **170IFA0010**

To understand and use this checklist correctly you must refer to and follow ATC's Subsurface Investigation Procedures.

	Person Verifying Each Item to Place Initials On Lines Below and Sign Bottom of Page	Comments
PRE-DRILLING PREPARATION		
Review definition of "Critical" and "Non-Critical" areas.		
Request as-built drawings, and/or approval to use private utility locator service and/or air knife to locate/protect subsurface utilities.		
Obtain Site access agreement.		
Pre-plan boring locations.		
Establish surface boring method.		If not using Air Knife-type technology, why?
Obtain permits and clearances.		
Do borehole and utility markouts.		
Establish Site-specific Health and Safety Plan		
Notify Client, owner, operator prior to mobilization.		
ON-SITE PROCEDURES		
Conduct tailgate safety meeting with topics as indicated in procedure.		
Read and follow Drilling/Probing procedures		
--1. Do Site walk and verify that utility location checklist is complete.		
--2. Locate all markouts and planned borehole locations. Start intrusive procedures at least 5 feet away from and perpendicular to utility markouts.		
--3. Break surface cover.		
--4. Do surface boring to required depth using hand auger, post-hole digger, shovel or "air knife".		
--5. If necessary, use alternate procedure for surface boring.		
--6. Collect soil samples by hand augering to required depth.		
--7. Protect the borehole from pedestrian and vehicular traffic.		

*Buried utilities can be found at any depth, but are most often found within the first 5 feet below the ground surface. Proceed slowly and with extra caution when working within 5 feet of the ground surface.
NOTES:

SIGNATURE DATE

MUST be filled out PRIOR to the Start of Field Activities

NO subsurface work in road Right of Ways or Off-Site (property boundary) without Written Authorization

Site Address: **Princeton, IN** **If Present --**

Site Safety Documents (on-site during activities)	**"Yes or No" Fill Out, as applicable**	
Utility Staking Request Form (properly completed for current scope of work)?	**Yes** **No**	Ticket # and Expir. Date: # / /
Site Health and Safety Plan?	**Yes** **No**	Hospital Location Map Available **Yes** **No**

Utility Identification "color" Above Ground (AG) / Buried (B)			**Identify on a Site Map the Location of ALL Lines & Meters (or actual utility) and Indicate Nearest Building Quadrant (NE, SE, SW, or NW)**
Natural Gas (Yellow) / Staked?	AG / B	**Yes** **No**	NW NE SE SW
Electrical (Red) / Staked?	AG / B	**Yes** **No**	NW NE SE SW
Telephone/Fiber Optic (Orange) / Staked?	AG / B	**Yes** **No**	NW NE SE SW
Cable TV (Orange) / Staked?	AG / B	**Yes** **No**	NW NE SE SW
Water (Blue) / Staked?	AG / B	**Yes** **No**	NW NE SE SW
Sewer (Green) / Staked?	AG / B	**Yes** **No**	SW

Note: If any of the above listed utilities are not marked, contact the Project Manager immediately to discuss.

Significant Site Features		**Site Feature Located in Closest Property Quadrant (NE, SE, SW, or NW). Also Identify on Site Map.**
UST system (UST cavity, dispenser islands, piping runs, vent pipes etc.)?	**Yes** **No**	
Above Ground Storage Tanks – ASTs (dispenser islands, piping runs)?	**Yes** **No**	
Electrical Transformers?	**Yes** **No**	
Area Lighting (Pole mounted lighting, etc.)?	**Yes** **No**	
Signage with electrical power (Business/Company signs, etc.)?	**Yes** **No**	
Underground lawn/landscaping sprinkler system?	**Yes** **No**	
Storm drain catch basins / man-ways and potential connecting conduits/lines?	**Yes** **No**	

Other		**"Other" Concerns Located in Closest Property Quadrant (NE, SE, SW, or NW). Identify on Site Map.**
Pavement distress (Cracked pavement, "buckled" asphalt, etc.)?	**Yes** **No**	

*Buried utilities can be found at any depth, but are most often found within the first 5 feet below the ground surface. Proceed slowly and with extra caution when working within 5 feet of the ground surface.

SIGNATURE DATE

Monthly Mobile/Heavy Equipment Safety Inspection Checklist

This form is to be completed by the qualified operator of the equipment

Date:		Project No.:		Site/Location:	
Equipment Type:		Model No.:		Odometer:	
Operator/Inspector Name:				Machine Hours:	

Warning: Do not operate a malfunctioning machine until corrective measures have been taken and all discrepancies have been cleared by a qualified operator/mechanic. In addition to elements on this checklist, the owner's manual for the specific piece of equipment being operated may contain other daily inspection checks and/or preventative maintenance procedures.

General Safety	☐	Operator Qualification	☐	PPE Supplies	☐	Fire Extinguisher (ready-to-use)
	☐	Owner's Manual (present)	☐	DriverCheck (decal in place)	☐	First-Aid Kit (present & stocked)
	☐	Manufacturer Specs Followed	☐	Access Ladder (secure and ok)	☐	Housekeeping (clean)
	☐	Emergency Kit (signs, flares)	☐	Flashlight	☐	Markers (cones, barricades, etc.)
Vehicle, Engine, and Hydraulic Systems (note any added fluid)	☐	Engine Oil (fluid level, condition)	☐	Fuel Level	☐	Other Fluid
	☐	Transmission (fluid level, fluid condition, unit operation)	☐	Brake Fluid	☐	Steering (power steering fluid level, no play in steering)
	☐	Radiator (coolant level, hose condition)	☐	Fan Belts (tension/condition)	☐	Brakes (vehicle, parking)
	☐	Hydraulic System (fluid level, fluid condition, hose condition, cylinders, leakage)	☐	Chassis (proper lubrication)	☐	Tires (condition, inflation)
	☐	Outriggers (operational, if equipped)	☐		☐	
Tracked Vehicles	☐	Track Tension (proper tension)	☐	Plates and/or Shoes	☐	Grouser Plates
	☐	Rollers	☐	Drive Sprockets		
Lights and alarms (clean and functional)	☐	Headlights (hi, low, run beams)	☐	Parking Lights	☐	Revolving Flashing Lights (if required)
	☐	Reverse Lights (backup)	☐	Equipment Work Lights	☐	Horn
	☐	Brake/Tail Lights	☐	Turn Signals/Hazard Flashers	☐	Reverse Alarms (backup)
Vehicle cab (clean and functional)	☐	Seatbelts (if required)	☐	Windshield Wipers	☐	Body Damage
	☐	Housekeeping	☐	2 Way Communication	☐	Speed/Hour Meter
	☐	Fuel Gauge	☐	Horn (operational)	☐	Windshield (glass ok, clean)
	☐	Controls Operational	☐	Mirrors (rear view, side)		

Maintenance/ Equipment Request	Corrected By:	Date:

Inspectors Signature:		

		Date

APPENDIX D
Excavating & Trenching

All ATC employees and subcontractors shall be trained and be familiar with the OSHA Excavation Standard and the ATC Employee Health and Safety Policy Manual, Policy No. 16 (Excavation and Trenching) and Policy No. 33 (Subsurface Investigation).

1.0 UNDERGROUND UTILITIES

Prior to any work beginning, the estimated location of utility installations (such as sewer, telephone, fuel, electric, water lines, or any other underground installation) that reasonably may be expected to be encountered during excavation work must be determined prior to opening an excavation. Utility companies or owners shall be contacted and advised of the proposed work and asked to establish the location of the utility underground installations. When utility companies or owners cannot respond to a request to locate underground utilities within 24-48 hours (unless a longer period is required by State or local law), or cannot establish the exact location of these installations, the work may proceed, provided that the work is conducted with caution, and provided detection equipment or other acceptable means to located utilities are used.

When excavation operations approach the estimated location of underground installations (approximately 18 inches from the installation), the exact location of the installations shall be determined by a safe and acceptable means. While the excavation is open, underground installations shall be protected, supported, or removed to safeguard employees.

2.0 ENTERING EXCAVATIONS OR TRENCHES

Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a "*Competent Person"* for evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the Competent Person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard-increasing occurrence. All inspections made by the Competent Person should be recorded in the field log book.

No person(s) shall perform work in a trench or excavation that contains accumulated water.

2.1.1 Access/Egress

A stairway, ladder, ramp, or other safe means of egress shall be located in trench excavations that are 4 feet or more in depth so as to require no more than 25 feet of lateral travel distance in any direction.

2.1.2 Exposure to Falling Loads

No employee or subcontractor is permitted underneath loads handled by lifting or digging equipment. All personnel shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by spilling or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the equipment is provided with a cab shield and/or canopy adequate to protect the operator from falling materials.

2.1.3 Warning Systems

When mobile equipment is operated adjacent to an excavation and the operators/drivers do not have a clear and direct view of the edge of the excavation, a warning system such as barricades, hand or mechanical signals, or stop logs are required.

2.1.4 Protection from Loose Rock or Soil

Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard to personnel in the excavation. All temporary spoil piles shall be kept at least 2 feet away from the edge of the excavation. Spoil piles should be placed to channel rainwater or other run-off water away from the excavation.

2.1.5 Hazardous Atmospheres

All excavations deeper than 4 feet deep and which have the potential to have a hazardous atmosphere or oxygen deficient atmospheres (Less than 19.5% oxygen) must be tested to ensure safe working conditions, prior to entry. Air monitoring shall be conducted in accordance with Section 4.0 of the HASP.

2.1.6 Protective Systems

Each employee in an excavation shall be protected from cave-ins by an adequate protective system except when excavations are made entirely in stable rock or the excavation is less than 5 feet in depth and examination by the Competent Person provides no indication of a potential cave-in. Protective systems consist of sloping or benching, use of trench boxes or other shielding mechanisms, or the use of a shoring system in accordance with the regulations.

APPENDIX E
Lockout/Tagout Requirements & Procedures

1.0 DEFINITIONS

1. Lockout – Involves using a device such as a padlock, blank pipe flange, chain key block, etc. to isolate energy from employee exposure.
2. Tagout – Involves applying a tag to the energy isolating device with written information concerning the date and name of person who applied the lock and tag.

2.0 LOCKOUT/TAGOUT POLICY

This procedure establishes the minimum requirements for lockout/tagout of electrical energy sources, mechanical, hydraulic, pneumatic, thermal or chemical process energy. It is to be used to ensure that conductors and circuit parts are disconnected from sources of electrical energy, locked (tagged), and tested before work begins where employees or subcontractor could be exposed to dangerous conditions. Sources of stored energy, such as capacitors or springs, shall be relieved of their energy, and a mechanism shall be engaged to prevent the re-accumulation of energy.

Lockout/tagout procedures shall be used prior to performing tie-in operations, maintenance, repair or adjustment of any device where exposure to hazardous energy sources may occur.

3.0 RESPONSIBILITY

All effected employees and subcontractors shall be instructed in the safety significance of the lockout/tagout procedure. All new or transferred employees and all other persons whose work operations are or might be in the area shall be instructed in the purpose and use of this procedure. The ATC Project Manager shall ensure that appropriate personnel receive instructions on their roles and responsibilities. All persons installing a lockout/tagout device shall sign their names and the date on the tag and on the Lockout/Tagout Isolation Record (see Appendix E.1).

4.0 PREPARATION FOR LOCKOUT/TAGOUT

1. Review current diagrammatic drawings (or other equally effective means), tags, labels, and signs to identify and locate all disconnecting means to determine that the source of energy is interrupted by a physical break and not deenergized by a circuit interlock. Make a list of disconnecting means to be locked/tagged.
2. Review other work activities to identify where and how other personnel might be exposed to sources of energy. Establish energy control methods for control of other hazardous energy sources in the area.
3. Provide an adequately rated voltage detector to test each electrical phase conductor or circuit part to verify that they are deenergized. Test the voltage detector to make sure that it is working properly.

5.0 LOCKOUT PROCEDURE

1. Complete the Lockout/Tagout Isolation Record (see Appendix E.1).
2. All affected employees in the area shall be notified that a lockout is being performed.
3. The equipment being locked out shall be shut down using normal shutdown procedures. (i.e. operator's control station, stop button, etc.).
4. Any residual energy shall be identified and dissipated at this time.

5. All equipment energy sources shall be neutralized. (i.e. electrical disconnects shall be opened, valves closed, blanks inserted in piping, springs returned to neutral position, other energy sources as required)

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6. The qualified employee performing the lockout shall place his/her personal lock and tag on EACH energy isolation point isolated in Step 4. If more than two (2) isolation points are required to lockout the device, a group lockbox may be used. A tag indicating all persons who applied a lock, date, time, equipment type, and number and duration of lockout shall also be applied at this time. A subcontractor representative and an ATC employee shall also apply a lock at this time.
7. Test the lockout by clearing the area and attempting to operate the machine or attempting to operate disconnecting means to determine that the operation is prohibited. A voltage-detecting instrument should be used for electrical components. Inspect the instrument prior to use for physical damage and operation.

6.0 REMOVAL OF LOCKOUT/TAGOUT

1. Upon completion of the lockout an authorized employee must check the area for completeness of work. If the employee who initiated the lockout is available, he/she should conduct this inspection.
2. Remove all tools and nonessential items from the area.
3. Replace all guards.
4. Ensure all employees are clear of the equipment/process.
5. Notify all affected employees in the area that the lockout device(s) are being removed.
6. Remove lockout device(s).
7. Restart the machine to insure proper operation.

7.0 GROUP LOCKOUT

1. When multiple isolation points, three (3) or more, must be controlled during a lockout, or when multiple persons (craft) are involved, a group lockout shall be used.
2. Follow the steps for a normal lockout as documented in steps 1-6 above.
3. Each key for the locks used shall be placed in a group lockout box. The group lockbox shall be kept in view of the work being performed when practical.
4. A Job Control Lock shall be installed on the group lockbox by an ATC Employee. This lock shall remain in place until the lockout has been completed.
5. Each employee shall remove their own lock when their portion of the work is completed or at the end of each shift.
6. Upon completion of the work, the ATC employee shall inspect the work area for completeness.
7. When all of the conditions of the lockout termination procedures have been satisfied, the Job Control Lock shall be removed from the group lockbox.

8.0 EMERGENCY REMOVAL LOCKOUT/TAGOUT DEVICE

1. If an employee leaves the facility without removing his/her lock and tag, an effort shall be made to notify the employee that the supervisor in charge will authorize the removal of their lock. It must be deemed necessary that removal of the lock is required by at least two supervisory personnel, but only after confirming beyond any doubt it is safe to do so.
2. Verify the employee has left the Site.
3. Check with co-workers.

4. Check the employee's time card.
5. Attempt to reach him/her at home.

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6. Verify the employee is not in the equipment.
7. Visually confirm the completeness of work.
8. Contact the Regional Safety Coordinator and the Project Manager.
9. An authorized employee, under the direct supervision of an ATC Supervisor shall remove the lock.
10. Upon return to the Site by the employee involved, he/she shall be informed of the removal.
11. A review of the incident may be conducted by the ATC RSC Coordinator to determine any disciplinary actions necessary.

APPENDIX E-1
Lockout/Tagout Isolation Record

System:		Isolation Record	Status	Tagging Authority
Equipment Tag:		Equipment Description:	☐ Construction	
			☐ Startup	
			☐ Operations	

LOTO No.	DNO Tag No.	Equipment Tag No.	Equipment Description	Pos.	LOTO Placed By:	Date	LOTO Removed BY:	Date

Tagging Authority Approval:		
	Signature	Date

Holder List:

PTW No.	Signed Onto LOTO Name	Date / Time	Signed Off LOTO Name	Date / Time