

**Final  
Interim Action Work Plan – Roadway Project  
Closed City of Yakima Landfill Site  
Yakima, Washington**

May 2, 2019


Prepared for  
City of Yakima



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## LIST OF ABBREVIATIONS AND ACRONYMS

µg/m <sup>3</sup>	micrograms per cubic meter
AO	agreed order
CFR	Code of Federal Regulations
City	City of Yakima
COCs	contaminants of concern
County	Yakima County
CQA	construction quality assurance
CY	cubic yards
DAHP	Department of Archaeology and Historic Preservation
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management
EMMP	excavated materials management plan
EPA	US Environmental Protection Agency
ft.	feet, foot
GAC	granular activated carbon
HASP	health and safety plan
HLA	HLA Engineering & Land Surveying, Inc.
H:V	horizontal to vertical
I-82	Interstate 82
IA	interim action
IAWP	interim action work plan
LAI	Landau Associates, Inc.
Landfill Site	closed City of Yakima Landfill Site
LFG	landfill gas
LIFT	Local Infrastructure Financing Tool
Lochner	H.W. Lochner, Inc.
mg/kg	milligrams per kilogram
Mill Site	Boise Cascade Mill Site excluding Landfill Site
MSW	municipal solid waste
MTCA	Model Toxics Control Act
NHPA	National Historic Preservation Act of 1966
pbv	percent by volume
PID	photoionization detector
PPE	personal protective equipment
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
ROW	right-of-way

**LIST OF ABBREVIATIONS AND ACRONYMS (con't)**

SAP..... sampling and analysis plan  
SEPA..... State Environmental Policy Act  
TPH..... total petroleum hydrocarbons  
TPH D/O ..... TPH diesel range/oil range  
VOC ..... volatile organic compound  
WAC ..... Washington Administrative Code  
WSDOT ..... Washington State Department of Transportation  
Yakima Resources..... Yakima Resources, LLC

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## 1.0 INTRODUCTION

This document is an interim action work plan (IAWP) for a roadway project at the closed City of Yakima Landfill Site (Landfill Site) located in Yakima, Washington. This interim action (IA) is being conducted (Figure 1) pursuant to Section VII of Agreed Order (AO) No. 15861. The Landfill Site is located at the southern end of the Boise Cascade Mill Site. The area of the Boise Cascade Mill Site excluding and generally north of the Landfill Site is referred to herein as the “Mill Site.” The purpose of this IAWP is to ensure the construction of roadways over the Landfill Site (and a portion of the Mill Site adjacent to the north) will not exacerbate existing site conditions and will not interfere with any potential cleanup alternatives at the Landfill Site (or Mill Site). To this end, this work plan presents:

- Existing site conditions for the roadway prism over which the City of Yakima (City) and Yakima County (County) plan to construct the roadway alignment (Section 3)
- Design and construction information for the roadway alignment construction project, including landfill gas (LFG) mitigation measures (Section 5)
- Contingency plans should unexpected contamination be encountered in the roadway prism during construction (Section 7).

### 1.1 Assumptions and Definitions

The City adopts the following assumptions for the purposes of this IAWP:

- The IA work described herein is being performed solely as a result of the roadway construction project. The AO authorizes, but does not require, the City to execute the elements of the IAWP.
- Materials excavated from the site as part of the roadway project will be managed in accordance with Model Toxics Control Act (MTCA; Washington Administrative Code [WAC] 173-340) and other applicable regulatory requirements.
- The term “wood debris” used in this report includes wood chips, bark, logs, saw dust, whole or scrap milled or unmilled wood and lumber, and other general log yard material that has not been chemically treated or preserved. Wood debris is not a solid waste, hazardous waste, or dangerous waste. So long as any wood debris excavated from the roadway project site is not impacted by other hazardous substances or petroleum products, wood debris may be disposed or beneficially recycled, composted, or reused without restriction, consistent with Washington State Department of Ecology (Ecology) disposal guidance.
- The term “municipal solid waste” or “MSW” used in this report includes typical household waste materials such as product packaging, grass clippings, furniture, clothing, bottles, cans, food scraps, newspapers, appliances, consumer electronics, and batteries; as well as non-hazardous building materials/construction debris such as bricks, concrete and mortar rubble, roofing and siding materials, flooring materials, painted wood/lumber scraps, glass, sheetrock and wall board, and scrap metal. So long as any MSW excavated from the Landfill Site is not impacted by other hazardous substances, petroleum products, or hazardous or dangerous wastes, MSW will be managed and disposed as a solid waste at an appropriately permitted Subtitle D landfill.



- The terms “hazardous waste” or “dangerous waste” used in this report are waste materials that are listed or characteristic wastes as defined under Resource Conservation and Recovery Act (RCRA; 40 Code of Federal Regulations [CFR] 260/261) or Washington State Dangerous Waste (WAC 173-303) regulations. There are no known hazardous or dangerous wastes present in the roadway prism; however, there is a possibility that hazardous or dangerous waste could be present and encountered during roadway construction. If encountered, hazardous/dangerous wastes will be managed in accordance with MTCA and characterized and disposed of at an appropriately permitted Subtitle C landfill.
- Landfill gas is a complex mixture of gases generated by the microbial biodegradation of organic material within a landfill. LFG typically consists of approximately 40–60 percent methane, with the majority of the remainder being mostly carbon dioxide. LFG also includes a range of other trace gasses including vinyl chloride and other volatile organic compounds (VOCs). Because it is impracticable to distinguish methane generated from decaying wood debris from methane generated by MSW, the term “landfill gas” or “LFG” used in this report includes both the methane (and any other gaseous decay products) generated by the MSW and the methane generated by biodegradation of wood debris.
- Any soil, wood debris, or MSW that is determined to contain petroleum or other contaminants at concentrations above applicable regulatory limits will be managed in accordance with MTCA and disposed of at an appropriately permitted Subtitle D or C landfill based on applicable waste characterization.

## 1.2 Mill Site and Landfill Site Description and Background

The IAWP is submitted as part of the City’s roadway infrastructure project. The project includes construction of a new roadway that will cross portions of the Boise Cascade Mill Site. The facility has been divided into two cleanup areas, the “Landfill Site” and the “Mill Site”:

- The Landfill Site is defined by the extent of the MSW, including the extent of contamination associated with potential releases from the former landfill. The former landfill covers an area of approximately 33 acres and is located across portions of three parcels, including most of the approximately 38-acre landfill parcel (19131841001; owned by the Boise Cascade Corporation),<sup>1</sup> the southeast corner of the approximately 15.5-acre plywood mill parcel (19131842001; owned by the LeeLynn, Inc. and Wiley Mt., Inc.), and an area adjacent to Interstate 82 (I-82) that is owned and maintained by the Washington State Department of Transportation. The IA described herein and other cleanup activities on the Landfill Site are currently being conducted under AO No. DE 15861, executed between Ecology and the City, and effective on July 9, 2018.
- The Mill Site consists of the remainder of the Boise Cascade Mill Site, primarily located north of the railroad tracks, but also includes most of the former plywood mill parcel to the south of the tracks (northwest of the Landfill Site). A remedial investigation (RI) and other cleanup activities on the Mill Site are currently being conducted under AO No. DE 13959, executed between Ecology; OfficeMax Corporation; Dunollie Enterprises, LLC; LeeLynn, Inc.; Wiley Mt., Inc.; and Yakima Resources, LLC (Yakima Resources), and effective on February 17, 2017.

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<sup>1</sup> The Yakima County Assessor’s website lists Boise Cascade Corporation as the current property owner. The City understands that the Boise Cascade Corporation changed its name to OfficeMax Incorporated and is currently operating as OfficeMax, Inc.

The roadway project includes a segment that extends north from the Landfill Site then turns and continues along an east-west corridor that crosses a portion of the former Mill Site operations area to the north of the Landfill Site.

The Boise Cascade Mill Site (Figure 2) includes 21 parcels, totaling approximately 207 acres in size, adjacent to the west of I-82. BNSF Railway railroad tracks run east-west bisecting the Boise Cascade Mill Site. Leelynn, Inc. and Wiley Mt., Inc. own 19 of the parcels. Two parcels are owned by OfficeMax Corporation (Office Depot)—the landfill parcel located south of the railroad tracks and a triangular-shaped parcel (known as the “Triangle Parcel”) located immediately north of the railroad tracks. The former City Landfill Site is located to the south of the railroad tracks at the south end of the former Boise Cascade Mill Site.

The City operated a municipal landfill between approximately 1963 and 1970 within the footprint of the Boise Cascade Mill Site. As part of landfill operations, MSW was placed in a former log pond that originally occupied the sound end of the Boise Cascade Mill Site. (City of Yakima 1996). When landfill operations ceased, the MSW was covered and the area brought to grade with a mixture of fill soil and wood debris (bark, wood chips, discarded logs, and other log yard material). The landfill parcel area was then used until 2010 for log storage, including temporary log storage and log-chipping operations by the tenant of the landfill parcel, Yakima Resources.

### **1.3 Roadway Project Background**

In 2008, the City received a Local Infrastructure Financing Tool (LIFT) award from Washington State for redevelopment of the area in the vicinity of the Boise Cascade Mill Site (City of Yakima 2018). The redevelopment project is known as the “Cascade Mill District Development Project” or the “Cascade Mill Site.” The project objective is redevelopment of the Boise Cascade Mill Site with mixed use, commercial, and light industrial properties. The project includes access from I-82 to the properties as well as a new roadway corridor and bridge across the Yakima River that will connect Terrace Heights to Yakima (which is being designed in coordination with the County and Washington State Department of Transportation [WSDOT]), and east-west and north-south corridors through the Landfill Site and south end of the Mill Site. The proposed roadway alignment is shown on Figure 3.

The planned transportation corridors that will extend across the Landfill Site include the northern extension of Bravo Boulevard and the east-west corridor from East H Street to a new bridge crossing over I-82 and the Yakima River (Figure 3). The transportation planning, civil engineering, and design team (design team) of H.W. Lochner, Inc. (Lochner) and HLA Engineering & Land Surveying, Inc. (HLA) and their subconsultants, in consultation with the City and Yakima County, are designing the transportation corridor. Landau Associates, Inc. (LAI) is providing environmental engineering, design, support, and consultation to the City and the design team for supplemental elements of the roadway project associated with the IA.

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## 1.4 Purpose/Reason for Interim Action

The IA is necessary because the proposed transportation corridor will require construction activities in many areas of the Landfill Site and a portion of the Mill Site known to contain wood debris and MSW.

The IAWP will:

- comply with the Landfill Site AO;
- prevent health and safety risks for roadway construction and maintenance workers or the general public from LFG;
- prevent potential exacerbation of contamination in groundwater;
- prevent unintentional or unauthorized release or disposal of dangerous or solid waste; and
- not foreclose the viable implementation of reasonable alternatives for a final cleanup action at the Landfill Site or Mill Site.

To fulfill these objectives, the transportation corridor plans will include designs, procedures, or allowances to:

- mitigate and manage potential accumulation of LFG beneath low-permeability surfaces that could inhibit natural ventilation and could result in uncontrolled lateral migration;
- collect, manage, and transport offsite precipitation that falls on the low-permeability roadway surface to prevent the concentration and/or infiltration of stormwater through wood debris and landfill material;
- properly observe and perform cutting and filling (excavation and grading) in areas of accumulated wood debris and MSW such that known solid waste or previously unidentified dangerous waste or other dangerous materials that may be encountered during construction (including potentially impacted groundwater) are properly identified, characterized, managed, and disposed of in accordance with applicable, relevant, and appropriate requirements, including local, state, and federal health and safety, disposal, and cleanup laws and regulations; and
- complement or supplement the final cleanup work, should any be required, and will not foreclose the possibility of any reasonable alternative for final cleanup of the site pursuant to WAC 173-340-430(3)(b).

This IAWP complies with WAC 173-340-430 and the Landfill Site AO. It documents the features of the roadway design and construction procedures that address or account for the items listed above.

While these design and construction requirements are not required by MTCA, they will provide Ecology with necessary information to ensure that the MTCA cleanup and contamination, to the extent any exists in the Landfill and Mill Sites, will not be exacerbated by the roadway construction.

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## 2.0 DESCRIPTION OF INTERIM ACTION

The Landfill Site IA includes construction of a roadway extension and associated utilities for the Mill Site development between Martin Luther King, Jr. Boulevard to the existing street system at East H Street and 7<sup>th</sup> Avenue with a roundabout connection to the proposed east-west corridor. The street improvements consist of a boulevard-style four-lane arterial with roundabouts at the south and north intersections, as well as a midpoint roundabout and extensive landscaping elements. The project improvements include hot-mix asphalt pavement, curb and gutter, sidewalks, illumination, railroad crossing, pavement markings, storm drainage, sanitary and industrial sewer mains, potable water mains, and landscaping.

Based on current construction design drawings, the roadway construction will include removal of all wood debris and MSW within the roadway prism down to the underlying native soil and replacement with clean structural fill. The City and its design team determined that this construction method was required for geotechnical purposes. Complete removal will minimize the potential for roadway settlement due to natural biodegradation of the wood debris and MSW, and facilitate installation of utilities located beneath the roadway that may be installed as deep as 20 feet (ft) below the existing grounds surface.

The excavation of the MSW/wood debris will generally be sloped at a maximum 2:1 incline starting as much as 20 to 60 ft outside the roadway/sidewalk extents to allow for a maximum 20-ft excavation beneath the entire width of the roadway. The excavation will be backfilled with clean imported fill following utility installation and placement of an LFG barrier membrane along the sloped faces of the roadway fill prism. Following excavation backfill and surface grading, the paved infrastructure of the roadway alignment will be constructed as shown on Figures 4 and 5.

Because construction of the roadway corridor (low-permeability cap) will potentially affect LFG ventilation, migration, or exposure, a LFG migration barrier will be included in the roadway construction to protect public health and safety. The LFG control system will consist of:

- A low-permeability geosynthetic membrane which is a roll-out material placed over the roadway fill prism faces to reduce LFG migration below the roadway
- Sealed boots around utility laterals to prevent LFG migration along utility corridors/lines that intersect/penetrate the membrane
- Trench dams to reduce lateral LFG migration through the high-permeability utility corridor backfill.

Details of the LFG mitigation system are provided in Section 5.1 and on Figure 6. This LFG mitigation is required under worker health and safety requirements. Although LFG may be a MTCA-regulated media, this work is not being conducted pursuant to MTCA but is documented here as part of this IAWP.

The complete removal of wood debris and MSW is a geotechnical issue at the Landfill and Mill Sites. The removal shall not act as precedent for later feasibility study remediation options. Further, the LFG migration barrier shall not act as precedent for final cleanup options at the Landfill Site. Finally, the wood debris and MSW removal and LFG migration barrier will not exacerbate conditions and will not interfere with potential final remedies at the Landfill Site.

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## 3.0 EXISTING SITE CONDITIONS

The following summarizes known existing conditions at the Landfill Site and the portion of the Mill Site within the roadway right-of-way (ROW).

### 3.1 Existing Conditions – Landfill Site

Based on prior investigations, including the interim RI (LAI 2015a) and supplemental RI investigations (LAI 2015b), the subsurface conditions at the Landfill Site are generally characterized by the presence of buried wood debris associated with the historical mill activities, and MSW deposited at the site during the landfill's active operational years. Extensive soil and groundwater investigations have been conducted to evaluate the presence (or absence), magnitude, and extent of a wide variety of contaminants of concern (COCs). After evaluation of the results of the RI activities, the indicator hazardous substances at the Landfill Site have been determined to be:

- Methane and vinyl chloride in LFG
- Dissolved metals in groundwater including:
  - Arsenic
  - Iron
  - Manganese.

It is assumed that these dissolved metals are present in groundwater due to reducing conditions associated with groundwater contact with and leaching of organic materials from the landfill and wood debris from both the Landfill and Mill Sites, and the high natural oxygen demand associated with the biologic degradation of these organic materials. The MSW and wood debris excavation that will be performed as part of roadway construction will likely mitigate or reduce these impacts to site groundwater through large-scale removal of organic and putrescible materials above or in contact with the groundwater in the roadway prism. Additionally, the road construction will aid in the control of stormwater that would otherwise infiltrate through the MSW and wood debris within the roadway prism.

LAI conducted additional investigations related to characterizing LFG and the volume of wood debris present on the Landfill Site in 2016 to aid in the design of the transportation corridor, attached as Appendix A (LAI 2018). This work included conducting test pit exploration to further evaluate and document the lateral and vertical extent, occurrence, and physical characteristics of the wood debris present along the proposed roadway alignments. LAI also installed and sampled additional LFG monitoring probes along the roadway alignment. LAI submitted all data from these activities to Ecology's Environmental Information Management (EIM) system pursuant to the Landfill Site AO.

The LFG and wood debris investigations included the following findings:

- Wood debris is present at various thicknesses below the majority of the proposed roadway alignment south of the railroad track.
- The volume of in-place wood debris within 10 ft of the ground surface under the proposed roadway prism (on both the Landfill Site and Mill Site) was estimated at 46,900 cubic yards (CY).
- It is estimated that approximately 117,500 in-place CY of MSW (and comingled wood debris) is present below the proposed roadway alignment.
- MSW and wood debris continue to generate LFG. The highest concentrations of methane, ranging from approximately 48 to 72 percent by volume (pbv), were detected in areas of buried MSW. Lower methane concentrations were detected outside the landfill boundaries where only buried wood debris is present, ranging from approximately 1 to 30 pbv. Methane was not detected at monitoring points where MSW or wood debris is not present, except at locations in close proximity to MSW or wood debris deposits.
- VOCs typically associated with LFG were detected in samples collected from sample points within the boundaries of the landfill. However, they are present at low concentrations when compared against landfills with more recent deposits. The highest observed total VOC concentration was approximately 76,500 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ). This is less than 3 percent of the concentration typically present in LFG (US Environmental Protection Agency [EPA] 2008). Vinyl chloride was detected in LFG samples at concentrations that may exceed regulatory criteria at the point of discharge and trigger the need for treatment prior to discharge.

### 3.2 Existing Conditions – Mill Site (Roadway Alignment)

Numerous previous investigations have been conducted at the Mill Site, including in the southern end (within and proximate to the roadway alignment), much of which is summarized in the Supplemental RI investigation Report (LAI 2015b) or the Revised Final Remedial Investigation Work Plan for the Mill Site (Barr/Fulcrum 2019). LFG and wood debris evaluation conducted by LAI in 2006 (Appendix A) also included investigation activities in the southern end of the Mill Site. Based on these investigations, the subsurface conditions at the Mill Site are generally characterized by the presence of buried wood debris along the eastern end of the portion of the roadway alignment located on the Mill Site in the historical log pond areas. The western portion of the roadway alignment passes through areas of historical wood mill buildings, where some suspected areas of contamination exist related to historical site operations. Additionally, investigations have been performed and data collected at the former Plywood Mill area of the Mill Site located adjacent to the northwest of the Landfill Site (south of the railroad tracks), which have identified groundwater contamination that may have migrated beneath portions of the roadway alignment.

Known contaminants of concern for various site media that have been identified by these various investigations include:

- Based on two shallow test pit soil samples from an area of the roadway alignment proximate to the north of the railroad tracks, total petroleum hydrocarbons (TPH) were detected in the oil

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range at concentrations as high as 14,000 milligrams per kilogram (mg/kg) within approximately two feet of ground surface. Based on observations from these two test pits and other nearby test pits with no evidence of petroleum contamination, there may be as much as 2,800 CY of TPH-contaminated soil in this area of the proposed roadway alignment.

- Decomposing wood debris on the Mill Site is generating methane. Methane detected in soil gas monitoring wells where only buried wood debris is located (i.e. north of the railroad tracks and outside of the MSW landfill boundaries) has been measured at concentrations ranging from approximately 1 to 30 pbv.
- Dissolved metals are also present in groundwater at the Mill Site due to reducing conditions associated with groundwater contact with and leaching of organic materials from wood debris located at the Mill Site. Similar to the Landfill Site, the primary metals of concern are arsenic, iron, and manganese.

Based on the Mill Site Draft Remedial Investigation Work Plan (Barr/Fulcrum 2019), other suspected or potential contaminants of concern within the roadway alignment may include:

- Chromium (unspeciated) and polycyclic aromatic hydrocarbons (PAHs) have been identified in a limited number of soil samples in the area around the former “Boiler House”; however, the nature and extent have not been determined. Polychlorinated biphenyls (PCBs) and mineral oil may also be present in this area due to the former presence of an electrical capacitors in the Boiler House and other oil-filled transformers in this area.
- TPH in the diesel- and oil-range (TPH-D/O) have been detected in groundwater in the vicinity of the former plywood mill area. Based on groundwater data from monitoring wells, dissolved-phase TPH-D/O may have migrated beneath the roadway corridor in the area east of the former plywood mill of the south of the railroad tracks.



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## **4.0 ALTERNATIVE INTERIM ACTIONS CONSIDERED**

During planning and design of the transportation corridor, various alternatives were considered to address geotechnical conditions beneath the roadway prism. Of all of the geotechnical alternatives considered, only the full removal of MSW and wood debris resulted in meeting the roadway project geotechnical needs.

This design choice represents the most conservative action from an environmental perspective. As the most conservative potential approach for landfill cleanup, this alternative presents no issues with analysis of the range of likely final remedial alternatives that will be considered, nor will be likely to interfere with performance of the final selected MTCA cleanup. The ROW removal will result in an approximate 25 percent reduction in MSW and wood debris for the entire former Landfill Site, and reduction of wood debris from sections of the Mill Site. Therefore, this action will not foreclose any reasonable remedial technologies that may be evaluated or selected for the final cleanup action.

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## 5.0 DESIGN AND CONSTRUCTION REQUIREMENTS

Construction of the roadway corridor will require excavating all wood debris and MSW from below the roadway to the underlying native material or to the final depth of utilities to be located beneath the roadway, whichever is deeper. Drawings showing the excavation are provided in the City's Bravo Company Boulevard roadway design package (not included with this report). The excavation faces will then be covered with a geocomposite LFG migration barrier. Following removal of MSW and wood debris, subsurface utilities will be installed, the excavation will be backfilled with clean fill imported from offsite, and the surface infrastructure of the roadway alignment will be constructed.

More specifically applicable to this IA, the transportation corridor plans will incorporate designs and plans to:

- Mitigate potential LFG migration toward the roadway prism;
- Collect and manage stormwater falling on the impermeable surfaces of the roadway; and
- Properly dispose of soil, wood debris, and MSW removed during excavation for roadway construction and characterize, manage, and dispose of previously unidentified hazardous or dangerous waste if encountered during construction.

Each of these components will be compatible with the final remedy selected for the site. Details for the design of each of these components are presented in the following sections. A summary of the design and specification preparation steps and the relationship/integration of such into the final roadway design package, and a summary of other pertinent construction and implementation requirements is also included below.

### 5.1 LFG Migration Mitigation

Because all wood debris and MSW will be removed from the roadway prism, LFG will not be generated below the roadway after completion of the interim action. The LFG migration barrier will therefore be designed to prevent potential migration of LFG from and generated by adjacent biodegradable materials into the roadway prism. This will minimize the potential for accumulation of LFG in the subsurface beneath low-permeability roadway surfaces that could inhibit natural ventilation and/or result in uncontrolled lateral migration, which could occur through higher permeability fill materials (e.g., gravel backfill in utility corridors). The LFG migration barrier will consist of the following components:

- LFG barrier/membrane layer beneath the lateral limits of the roadway fill prism to prevent lateral migration of LFG from remaining MSW and wood debris proximate to the roadway corridor to beneath the roadway and along utility corridors associated with the roadway project
- Sealed boots around utility laterals to prevent LFG migration along utility corridors/lines that intersect/penetrate the membrane
- Trench dams to prevent off-site migration of LFG through utility corridors.

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### 5.1.1 LFG Barrier Layer

The LFG barrier layer will be a geosynthetic membrane material, which is a flexible roll-out material. Installation will be accomplished by securing the lower end of the membrane in an anchor trench at the bottom of the fill prism slope and rolling out the membrane vertically over the fill prism at a minimum slope of 2 horizontal: 1 vertical (2H:1V) to a maximum slope of 1H:1V. The top of the membrane will be terminated at the inside edge of the sidewalks along the roadway corridor; the strip of landscaping between the sidewalks and roadway surface will thereby act as a natural ventilation point for any (unanticipated) LFG that migrates beyond the barrier and into the roadway prism. Membrane overlaps and seams will be completed and sealed as necessary in accordance with the manufacturer's recommendations. Penetrations of the membrane by utility laterals and stubs will be sealed with boots in accordance with the manufacturer's recommendations. LAI will conduct a quality control inspection before cover is placed to ensure proper construction and installation.

### 5.1.2 LFG Regulatory Compliance

The LFG migration barrier system described above would not trigger any requirements for an air permit; however, LFG production rates were evaluated for potential regulatory compliance requirements in the Landfill Gas Evaluation technical memorandum prepared for the site by LAI (Appendix B; LAI 2017)) in case the design were to be modified to include point source air discharges (e.g., supplemental LFG venting systems).

The LFG production rate for the Landfill Site developed in the technical memorandum are for the remaining landfill and wood debris at the site and can be used to estimate potential LFG discharge rates from any supplemental venting systems that may be installed. However, the LFG discharge rates at such vents would be significantly lower than the overall LFG production rates developed in the technical memorandum and are not anticipated to trigger air permitting requirements.

## 5.2 Stormwater Management

The roadway designs include a system to collect, manage, and transport offsite precipitation that falls on the low-permeability surfaces of the roadway is needed to prevent the concentration and/or infiltration of stormwater through wood debris and landfill material that could result in exacerbation of groundwater conditions. Stormwater controls are included in the roadway design to minimize the potential for this, including stormwater collection and sewer lines to direct and transport stormwater runoff offsite. The designs do not include any engineered features for onsite stormwater infiltration such as infiltration ponds, swales, or other types of infiltration galleries.

During construction, other stormwater related controls must be considered including obtaining and complying with the conditions of a Construction Stormwater General Permit, including preparing applicable stormwater management plans and providing temporary erosion and sediment controls for excavation and grading areas to prevent potential migration of stormwater runoff and sediment. Treatment of collected stormwater will be performed as indicated in Section 7.2.2.

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## 5.3 Groundwater Management

If groundwater is encountered during construction, the contractor should be aware of general groundwater conditions in the roadway project area, which includes the presence of dissolved metals (primarily arsenic, iron, and manganese). Additionally, as indicated in Section 3.2, prior investigations have identified TPH-D/O in groundwater in the vicinity of the former plywood mill area which may have migrated east from the former plywood mill area and beneath the roadway corridor in the area immediately south of the railroad tracks. Treatment of collected groundwater will be performed as indicated in Section 7.2.2.

## 5.4 Excavated Materials Management

Soil, wood debris, and MSW excavated during construction must be properly handled and disposed of or appropriately recycled to prevent spreading contamination outside the project boundaries. Only appropriately certified facilities will be used for disposition or recycling of excavated material. Excavated MSW must be disposed of at a Subtitle D-permitted disposal facility. The nearest appropriate facilities to the site include, but are not limited to:

- Terrace Heights Landfill – 7151 Roza Hill Drive, Yakima, Washington
- Cheyne Landfill – 4970 Cheyne Road, Zillah, Washington
- Greater Wenatchee Landfill and Recycling Center – 191 Webb Road, East Wenatchee, Washington
- Roosevelt Regional Landfill – 500 Roosevelt Grade Road, Roosevelt, Washington
- Columbia Ridge Landfill – 18177 Cedar Springs Lane, Arlington, Oregon.

If appropriately characterized, wood debris may be hauled to a permitted wood material recycling or composting facility; or it may be sent to the same disposal facility as the MSW.

### 5.4.1 Disposal of MSW and Wood Debris

Excavated MSW and wood debris will be segregated for disposal if separate disposal and recycling facilities are used for each material. If required by the disposal facility (i.e. if existing sampling data is not sufficient for facility characterization, profiling, and acceptance criteria), soil, MSW, and wood debris may be stockpiled on-site and sampled for waste or recycling characterization analysis.

If necessary, additional excavated materials management details for MSW and wood debris are provided in the Excavated Materials Management Plan (EMMP) provided in Appendix C, and the Sampling and Analysis Plan (SAP) provided in Appendix D.

### **5.4.2 Management of Previously Unidentified Dangerous or Hazardous Waste**

Because of the nature of older landfills, there is a potential for unexpected waste materials to be encountered during mass excavation activities. If potentially dangerous, hazardous, or otherwise regulated waste materials are encountered during construction, these materials will need to be properly characterized for protection of worker health and safety and in order to determine proper materials management and disposal requirements.

In the event that unidentified or unanticipated waste materials are encountered during construction activities, the EMMP provided in Appendix C and the SAP provided in Appendix D may be used by the City and its contractor(s) during the construction activities. These documents address recognition of known and unanticipated contamination and characterization of contamination, as well as issues related to excavated materials and associated stormwater handling and disposal.

## **5.5 Integration of Interim Action Design Elements into Roadway Project Designs**

It is the City's intent to procure a single general contractor to coordinate and perform all elements of the roadway construction project, including each of the construction elements of the IA described in this work plan. As such, the City also intends to prepare and provide one comprehensive bid set of construction design drawings and specifications for bidding/contracting and a final construction set to the selected general contractor to inform and direct the construction work.

In order to accomplish this objective, LAI has been working and will continue to work closely with the City and its design team to integrate the requirements and conceptual designs presented in this work plan into the roadway design package. This includes working on the following elements for inclusion/integration into the roadway design package:

- Determine the final cut and fill profiles for the roadway needed to accommodate both the roadway and associated infrastructure (e.g., roads, sidewalks, utility corridors) and the necessary elements of the IA (e.g., LFG migration barrier and applicable extent of MSW and wood debris removal).<sup>2</sup>
- Preparation of bid and construction ready designs and specifications for the specific IA design elements described above, including identification of specific performance standards and inspection/documentation requirements for installation (and protection during subsequent construction activities) of the LFG migration barrier to confirm adequate completion of construction.
- Identification of stormwater permitting and management/treatment requirements, including erosion and sediment control measures.

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<sup>2</sup> Based on the cut and fill profiles, the dimensions and extent of the land needed for property acquisition, construction easements, and utility easements for the roadway project ROW will also be determined.

- Identification of groundwater management/treatment requirements if encountered during construction.
- Identification of specific applicable and appropriately permitted waste disposal facilities to be contracted for disposition of materials excavated from the roadway ROW, as necessary.
- Preparation of a cultural resources plan as required by DAHP, including an inadvertent discovery plan, and/or to provide needed information for the State Environmental Policy Act (SEPA) documentation and for the roadway project.

The City's design team has reviewed this IA Work Plan for feasibility and constructability. While conditions and project design may change, the likelihood of modifications at this point or in the future is minimal. Therefore, the design team has reviewed the pertinent sections of this report and agree that the applicable elements of the IA Work Plan related to the roadway are constructible, feasible, and conform to construction practices and norms. The requirements and design elements outlined in the IA Work Plan will be incorporated into construction plans, provided to contractors, and carried out (or modified as necessary) in consultation with appropriate parties, regulators, and stakeholders.

## 5.6 Monitoring Well Decommissioning

A number of existing groundwater and landfill/soil gas monitoring wells are located within the proposed roadway alignment. Consequently, the following wells may need to be decommissioned to accommodate the roadway construction activities:

### Landfill gas monitoring probes

- GP-11
- GP-28
- GP-32
- GP-33
- GP-34
- GP-35
- GP-36
- GP-37
- GP-38
- GP-39
- GP-40
- GP-41
- GP-43
- GP-44

### Groundwater monitoring wells

- MW-101
- MW-102
- MW-104
- MW-106
- MW-109.

As applicable, each of these wells will be decommissioned in accordance with Ecology's Minimum Standards for Construction and Maintenance of Wells (WAC 173-160-460). Other existing wells located proximate to the roadway alignment may also need to be removed to accommodate excavation or other construction activities, in which case they will be decommissioned in the same manner.

As required by Ecology, certain groundwater monitoring wells and landfill gas monitoring probes may need to be re-installed to monitoring site conditions after completion of roadway construction (see Section 7.2.3). Unless otherwise approved by adjacent land owners, these wells will be installed within the City-owned roadway ROW.

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## 6.0 INTEGRATION WITH FINAL REMEDY

The IA will allow for the final selected remedy for the Landfill Site to be complementary or supplementary to the IA and the infrastructure installed as part of the roadway project and not foreclose reasonable alternatives for the final cleanup action at the site. The feasibility studies for the Landfill and Mill Sites have not been prepared, so the final remedy is currently unknown. However, based on the large volume of MSW and wood debris at the site, excavation and off-site removal would likely present a disproportionate cost relative to the benefit of performing such removal. Some form of capping and containment (with integrated LFG management, if needed) is, therefore, assumed to be the most likely option for the final remedy.

If a graded soil/vegetated cap is selected as the final remedy, this can easily be integrated with the IA with appropriate grading considerations.

If a low-permeability cap that extends over the Landfill Site is selected for the final remedy, the cap could be integrated with the roadway alignment by extending the cap to the edge of the alignment such that the cap and roadway form a continuous low-permeability surface. The cap's LFG management system would not be affected by the proposed LFG barrier for the roadway alignment.

Although very unlikely to be selected as a final remedy, the IA would also not preclude excavation and removal of the remaining MSW and wood debris. Because construction of the roadway will include removal of MSW and wood debris below the alignment, the full-site excavation would only need to extend to the limits of the roadway prism to remove the remaining waste.

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## 7.0 COMPLIANCE MONITORING

Compliance monitoring will be conducted to confirm the effectiveness of the IA. Compliance monitoring consisting of protection, performance, and confirmation monitoring is required for the project. To the extent the project implicates any permitting or other relevant or applicable regulatory requirements including or beyond what is discussed below, the City will comply through its AO process with Ecology.

### 7.1 Protection Monitoring

Protection monitoring addresses worker health and safety for activities related to construction activities during the interim action, as well as protection of the general public, if conditions are encountered that indicate that workers or the general public could be exposed to hazardous substances or conditions.

Worker health and safety will be addressed through a project health and safety plan (HASP). The requirements for a project HASP will be included in the project construction documents, and the contractor will prepare the HASP to protect workers from exposure to hazardous materials during construction. The HASP will address potential physical and chemical hazards associated with Landfill Site activities and shall be prepared using requirements and guidance from, but not limited to:

- National Institute for Occupational Safety and Health/Occupational Safety and Health Administration/EPA: Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities
- 29 CFR 1910.120: Hazardous Waste Operations and Emergency Response
- 29 CFR 1926: Safety and Health Regulations for Construction
- 49.17 Revised Code of Washington: Washington Industrial Safety and Health Act
- WAC 173-340-810: Worker Safety and Health
- WAC 296-24: General Safety and Health Standards
- WAC 296-155: Safety Standards for Construction Work
- WAC 296-843: Hazardous Waste Operations.

The HASP shall provide for protection of the contractor's personnel and the public and contain the following:

- Procedures to monitor worker safety (e.g., monitoring equipment, frequency of monitoring, required actions if monitoring indicates a dangerous situation)
- List of responsible individuals, including the site safety officer, and their respective duties
- Site organization; describing work zones (exclusion zone, contamination reduction zone, and support zone); access and mobility between zones
- List of physical and chemical hazards associated with the anticipated work tasks
- Routes to the nearest hospital or urgent care facility
- Description of personal safety equipment and the appropriate action levels
- Decontamination procedures for personnel and equipment.



Anticipated potential physical hazards include working in proximity to heavy equipment, heat stress or cold stress, working in shored and unshored excavations, vehicular traffic, and potentially combustible, flammable, explosive hazards related to wood debris, MSW, and LFG (e.g., methane). Anticipated potential chemical hazards include exposure to Landfill Site contaminants through various exposure pathways (i.e. direct contact, inhalation, and ingestion). Because the IA includes extensive excavation in areas known to contain MSW, wood debris, LFG, and contaminated groundwater, screening during construction for potential chemical exposure will need to be conducted. This will include use of a photoionization detector (PID) and an intrinsically safe multi-gas meter to screen for VOCs, methane, and hydrogen sulfide during construction. The HASP will address screening frequency and methods and include screening levels at which engineering controls and/or elevated personal protective equipment (PPE) will be required.

Oversight and protection monitoring performed during and after roadway construction by LAI will be performed under a site-specific HASP.

## **7.2 Performance Monitoring**

Performance monitoring will consist of construction quality assurance (CQA) monitoring to confirm that the IA is constructed according to the IA design drawings and specifications, and proper excavated materials management is conducted to ensure that soil, wood debris, and MSW is properly handled and disposed. CQA monitoring will include physical testing and construction observations, as applicable. This will include a post-excavation survey to identify the limits of soil, MSW, and wood debris removal performed during roadway construction. Proper treatment and testing of stormwater and/or groundwater collected during construction will also be included as required by permit conditions and/or as necessary to discharge. Pre- and post-construction groundwater quality monitoring will also be performed to document any changes to groundwater quality as a result of IA and construction activities. Management procedures for excavated materials, including handling, storage, and disposal are addressed below.

### **7.2.1 Excavated Materials Management**

As applicable, excavated material may be managed as suggested in the EMMP provided in Appendix C. In general, excavated material may be segregated based on physical/visual characteristics into soil, MSW, and wood debris stockpiles on-site until waste and or recycling characterization and profiling is complete. Existing data for chemical concentrations in soil, MSW, and wood debris from sampling locations nearest the roadway alignment will be used to provide information on potential COCs in the various excavated media that would require characterization analysis. Previously unidentified contaminated materials encountered during construction will be sampled and analyzed to characterize the type of contamination encountered. If needed, waste characterization and unidentified materials sampling and analysis procedures are included in the SAP provided in Appendix D.

All excavated material will be recycled or disposed of at an appropriate offsite recycling or disposal facility in accordance with Washington State regulations. Transportation manifests for waste materials

will be signed and tracked for disposal recordkeeping purposes and to ensure that wastes are tracked from the time they are first created until they are properly treated, disposed, or recycled.

Potentially contaminated material encountered during construction that does not require removal for construction purposes will remain in place unless over-excavation is specified by the City. The location(s) and contamination characteristics of newly identified contaminated material (if any) shall be documented. The location and quantity of MSW, wood debris, and other contaminated material excavated or otherwise removed from the site will be documented through post-excavation survey(s) to provide applicable information for as-built drawings (see Section 8.0).

### **7.2.2 Stormwater and Groundwater Collection, Containment, and Disposal**

Stormwater and groundwater accumulated or collected in trenches/excavations will be contained as necessary, sampled, and treated as needed prior to discharge to the City's sanitary or storm sewer system, depending on the permit conditions. It is assumed that treatment will consist of filtrations using granular activated carbon (GAC), with additional turbidity removal if discharge will be to the storm sewer. However, this treatment approach will be modified as necessary depending on the permit requirements and observed conditions. For example, if liquid-phase petroleum is observed in excavations or collected stormwater, adsorbent booms and pads may need to be deployed and/or an oil-water separator may need to be included in the treatment train. All discharges and monitoring/sampling thereof will comply with the provisions of the requisite permit obtained by the contractor. Groundwater Quality Monitoring

Pre- and post-construction groundwater sampling events will be performed and the results compared to assess and document groundwater quality and potential impacts to groundwater quality as a result of the IA and roadway construction activities. This monitoring will consist of one sampling event at the following monitoring wells prior to commencing IA/roadway construction activities:

- FPP-MW-1      • MW-6              • MW-15            • MW-102            • MW-108
- FPP-MW-2      • MW-7              • MW-16            • MW-103            • MW-109
- FPP-MW-3      • MW-8              • MW-17            • MW-104
- TP-MW-1        • MW-9              • MW-18            • MW-105
- TP-MW-2        • MW-11             • MW-100           • MW-106
- MW-5            • MW-14             • MW-101           • MW-107

As indicated in Section 5.6, monitoring wells MW-101, MW-102, MW-104, MW-106, and MW-109 may need to be decommissioned prior to commencing construction activities. Therefore, the post-construction groundwater quality monitoring event will be performed at all the same wells as during the pre-construction except for these wells. New monitoring wells will also be installed (in accordance with WAC 173-160) to replace monitoring wells MW-101 (because of its location with respect to the former plywood plant TPH groundwater plume) and MW-109 (which monitors groundwater downgradient of the western edge of the MSW). In addition to the list of wells above,

these replacement wells (and any additional replacement wells required by Ecology<sup>3</sup>) will also be sampled during the post-construction monitoring event.

### 7.2.3 Cultural Resources

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires federal agencies to consider a project, activity, or program's effects on historic properties of projects. They carry out, assist, fund, permit, license, or approve throughout the country. If a federal or federally-assisted undertaking may affect historic properties, a Section 106 review will take place. Section 106 gives the state historic preservation office, in this cast the Department of Archaeology and Historic Preservation (DAHP), interested parties, and the public a chance to weigh in on activities before a final decision is made. This process is an important tool for citizens to lend their voice in protecting and maintaining historic properties in their communities.

The proposed work for removing MSW and wood debris from the roadway corridor will be included in the Section 106 process. Based on the scope of the ground disturbing activities planned for the roadway corridor, the East West Corridor *Project Area of Potential Effect* (approved by DAHP July 30, 2013) will be modified to include the proposed additional work within the Landfill Site and the Mill Site. Once this modification is completed, WSDOT will instruct Yakima County to supplement the Cultural Resources Report (dated July 14, 2014) to document the effects of the additional project activities for the additional areas. This supplemental report will be circulated to DAHP for concurrence and all interested tribes for comment. After this concurrence and comment period, the approved document will be provided to Ecology prior to any ground disturbing activities. The updated Section 106 document comments may trigger mitigation activities during construction, which may include the right to observe or inspect areas of active construction. The City and County will comply with any outcomes from the forthcoming Section 106 process, and will allow observation, inspection, or other elements as determined through completion of, and comments to, the cultural resources report.

If required by DAHP, ground disturbing activities near the interface of the MSW and wood debris with native soil may require monitoring by an archaeologist for evidence of cultural resources. Additionally, The City and county will work in good faith with the Yakama Nation to provide an opportunity for appropriate representatives<sup>4</sup> to observe the excavation interface with native soil during construction. Any cultural resource monitoring will be done in accordance with applicable regulations. Depending on DAHP's determination, a Cultural Resources Plan/Inadvertent Discovery may be developed for the roadway contractor to follow when performing subgrade excavation and

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<sup>3</sup> Depending on the final inventory of monitoring wells removed due to construction and/or the results of post-construction sample analysis, a final determination of which wells will be replaced will be identified in consultation with Ecology. Similarly, the final list of soil gas probes to be replaced and monitored will be determined in consultation with Ecology based on final roadway design considerations.

<sup>4</sup> All personnel entering the excavation must have appropriate health and safety training and certification to work within the exclusion zone of a cleanup site and in accordance with the Site-specific health and safety plan and applicable regulations.

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construction activities. The City and County and its contractors and agents, will implement procedures in any Cultural Resources Plan/Inadvertent Discovery Plan.

Although not identified during previous Site investigation activities, if archaeological resources are discovered during construction, work will be stopped immediately and the City, the County, and their respective contractors and agents, Ecology, DAHP, the City, and the appropriate Tribes' Cultural Resources Department will be notified by the close of business on the day of discovery. A licensed archaeologist will inspect the Site and document the discovery, provide a professionally documented site form, and report to the above-listed parties. In the event of an inadvertent discovery of human remains, work will be immediately halted in the discovery area, the remains will be covered and secured against further disturbance, and the Yakima Police Department and Yakima County Medical Examiner will be immediately contacted, along with the DAHP Physical Anthropologist and authorized Tribal representatives. A treatment plan by a licensed archaeologist would then be developed in consultation with the above-listed parties consistent with Revised Code of Washington (RCW) 27.44 and RCW 27.53 and implemented according to Chapter 25-48 WAC.

### **7.3 Confirmation Monitoring**

Confirmation monitoring will consist of sampling LFG monitoring probes, which will be installed within the roadway prism to monitor for potential migration through or past the geosynthetic LFG barrier layer. LFG monitoring may also be conducted in subsurface utility vaults along the alignment to evaluate the LFG barrier membrane's ability to prevent LFG migration beneath the roadway alignment. The LFG probes will also be monitored quarterly for the first year, and then as needed thereafter until a cleanup action plan is developed.

After completion of performance monitoring and sampling (Section 7.2.3), groundwater monitoring wells within the roadway right-of-way on the Mill Site will be monitored in accordance with the Mill Site AO and/or RI Work Plan (Barr/Fulcrum 2019). Additional groundwater monitoring at the Landfill Site will be performed, as required, in conjunction with the cleanup action plan for the final remedy.

Sampling procedures are detailed in the SAP provided in Appendix D.

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## 8.0 REPORTING

As required under the AO, within 60 days of completion of IA activities, a draft Interim Action Report will be prepared for submission to Ecology. The Interim Action Report will include, as applicable:

- A written summary of IA construction activities.
- A summary of deviations from this IAWP.
- As-built survey results for IA related work.
- As-built drawings identifying the limits of excavation of MSW, wood debris, and removal of any other identified contaminated materials.
- As-built drawings of the location, layout, and details of the LFG migration barrier.
- Select pertinent photographs of IA construction activities and infrastructure installation.
- Copies of construction and performance monitoring and inspection results.
- Pre- and post-construction groundwater quality monitoring results.
- Copies of analytical laboratory reports (and tabulated data summaries) for any applicable performance or confirmation sampling results.
- Waste disposal documentation, including:
  - Bills of lading
  - Waste manifests
  - Weight tickets
  - Estimates of total MSW, wood debris, and contaminated soil volumes removed for offsite disposition
  - Estimates of groundwater volume treated and discharged during construction activities.

The report will be finalized after applicable review and approval by Ecology.

## **9.0 USE OF THIS REPORT**

This IAWP has been prepared for the exclusive use of the City of Yakima and Washington State Department of Ecology for specific application to the transportation corridor project and interim action at the closed City of Yakima Landfill Site. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of LAI. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by LAI, shall be at the user's sole risk. LAI warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

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## 10.0 REFERENCES

- Barr/Fulcrum. 2019. Revised Final Remedial Investigation Work Plan, Yakima Mill Site (aka Boiese Cascade Mill Site). January.
- City of Yakima. 1996. Letter: Interstate I-82 Gateway Project – January 11, 1996 Meeting Regarding Landfill and Wetland Issues. From to Washington State Department of Ecology. January 22.
- City of Yakima. 2018. "Cascade Mill District Development Project."  
<https://www.yakimawa.gov/services/strategic-projects/cascade-mill-district-development-project>.
- EPA. 2008. Background Information Document for Updating AP42 Section 2.4 for Estimating Emissions from Municipal Solid Waste Landfills. Publication No. EPA/600/R-08-116. US Environmental Protection Agency. September.
- LAI. 2015a. Remedial Investigation Interim Data Report - September 2014 through January 2015, Closed City of Yakima Landfill Site, Yakima, Washington. Landau Associates, Inc. April 13.
- LAI. 2015b. Agency Review Draft: Supplemental Remedial Investigation Report, Closed City of Yakima Landfill Site, Yakima, Washington. Landau Associates, Inc. September 29.
- LAI. 2017. Technical Memorandum: Transportation Corridor Landfill Gas Evaluation, Former Boise Cascade Mill Site and Closed City of Yakima Landfill Site, Yakima, Washington, Facility/Site No. 1927. Landau Associates, Inc. March 24.
- LAI. 2018. Technical Memorandum: Transportation Corridor Wood Debris and Landfill Gas Investigation, Former Boise Cascade Mill Site and Closed City of Yakima Landfill Site, Yakima, Washington, Facility/Site No. 1927. Landau Associates, Inc. September 12.



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Data Source: Esri 2012

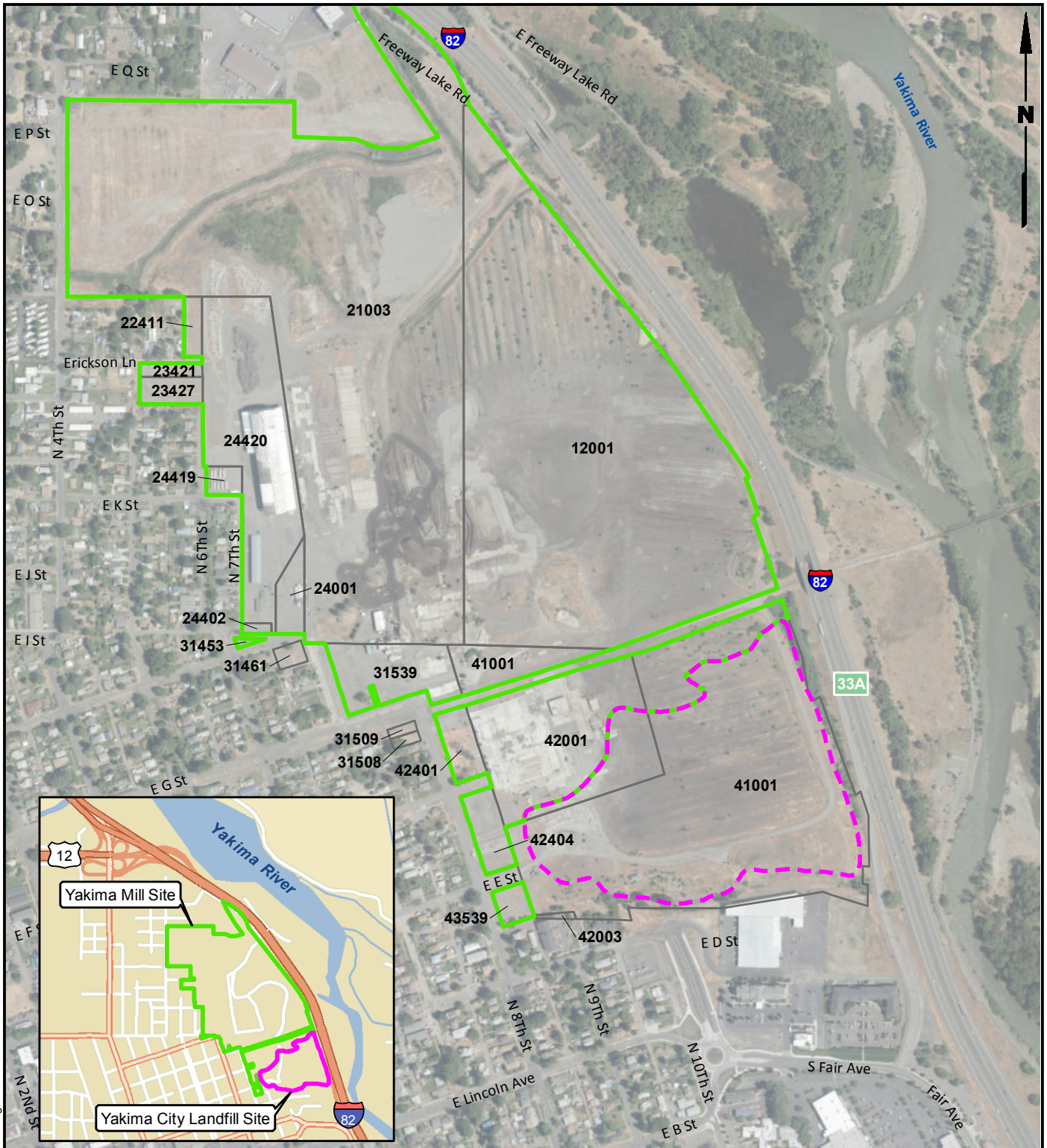


Closed City of Yakima  
Landfill Site  
Yakima, Washington

**Vicinity Map**

Figure  
**1**





**Legend**

- Yakima Landfill Site Boundary (AO No. DE 15862)
- Yakima Mill Site Boundary (AO No. DE 13959)
- Tax Parcels and Parcel Site Number (191318-XXXX)

**Note**

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 700 1,400



Scale in Feet

Data Source: Yakima County GIS, Esri World Imagery.

G:\Projects\11480\09\0100\14\IAW\PI\F02 SiteDiagram.mxd 9/13/2018



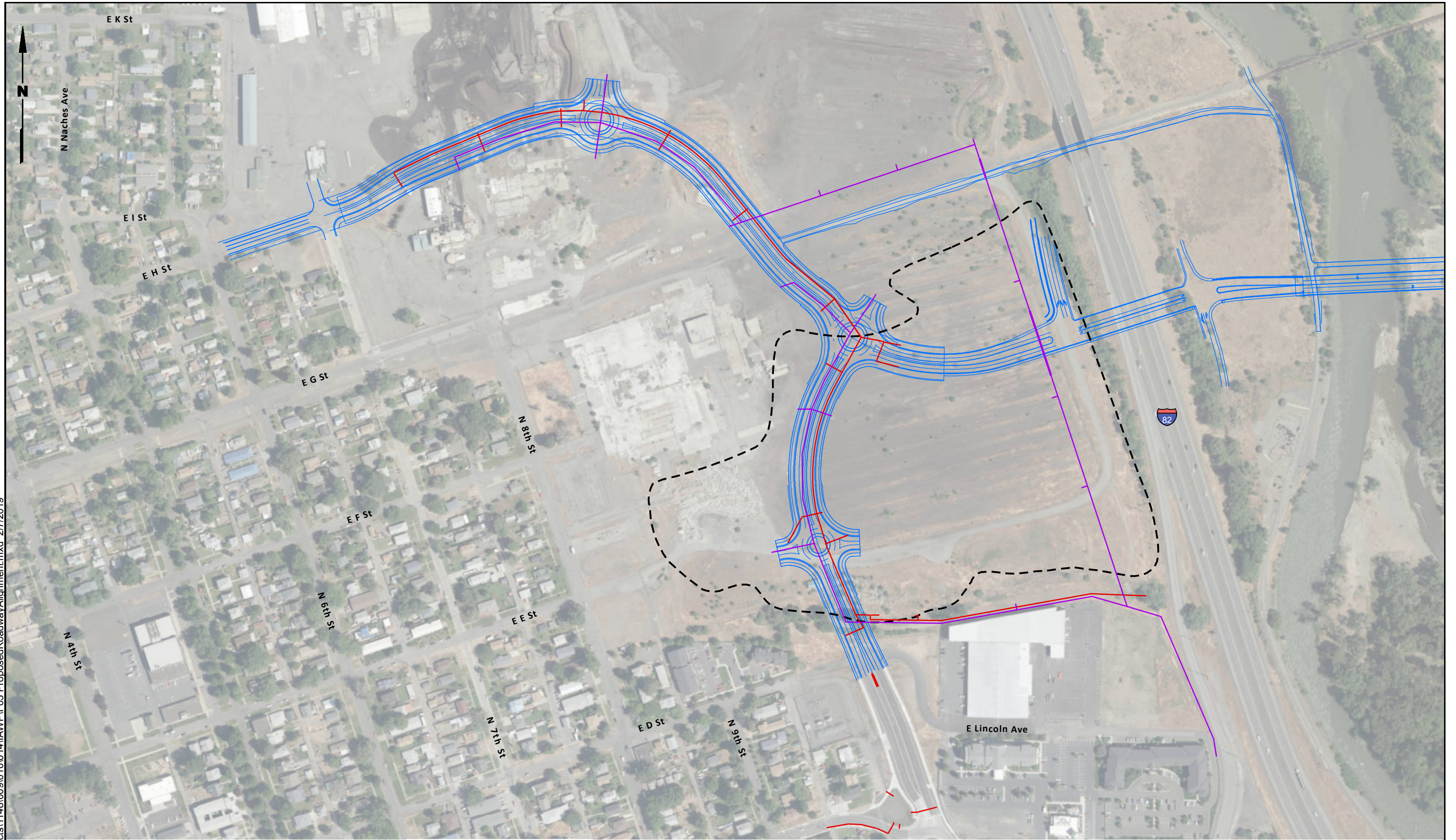
Yakima City Landfill  
Yakima, Washington

**Site Diagram**  
**Yakima Landfill Site and Mill Site**

Figure

**2**

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**Legend**

- Sanitary Sewer Line
- Storm Sewer Line
- Municipal Landfill Extent

**Notes**

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



Data Source: HLA Engineering and Land Surveying, Inc; Lochner Engineering; Esri World Imagery.

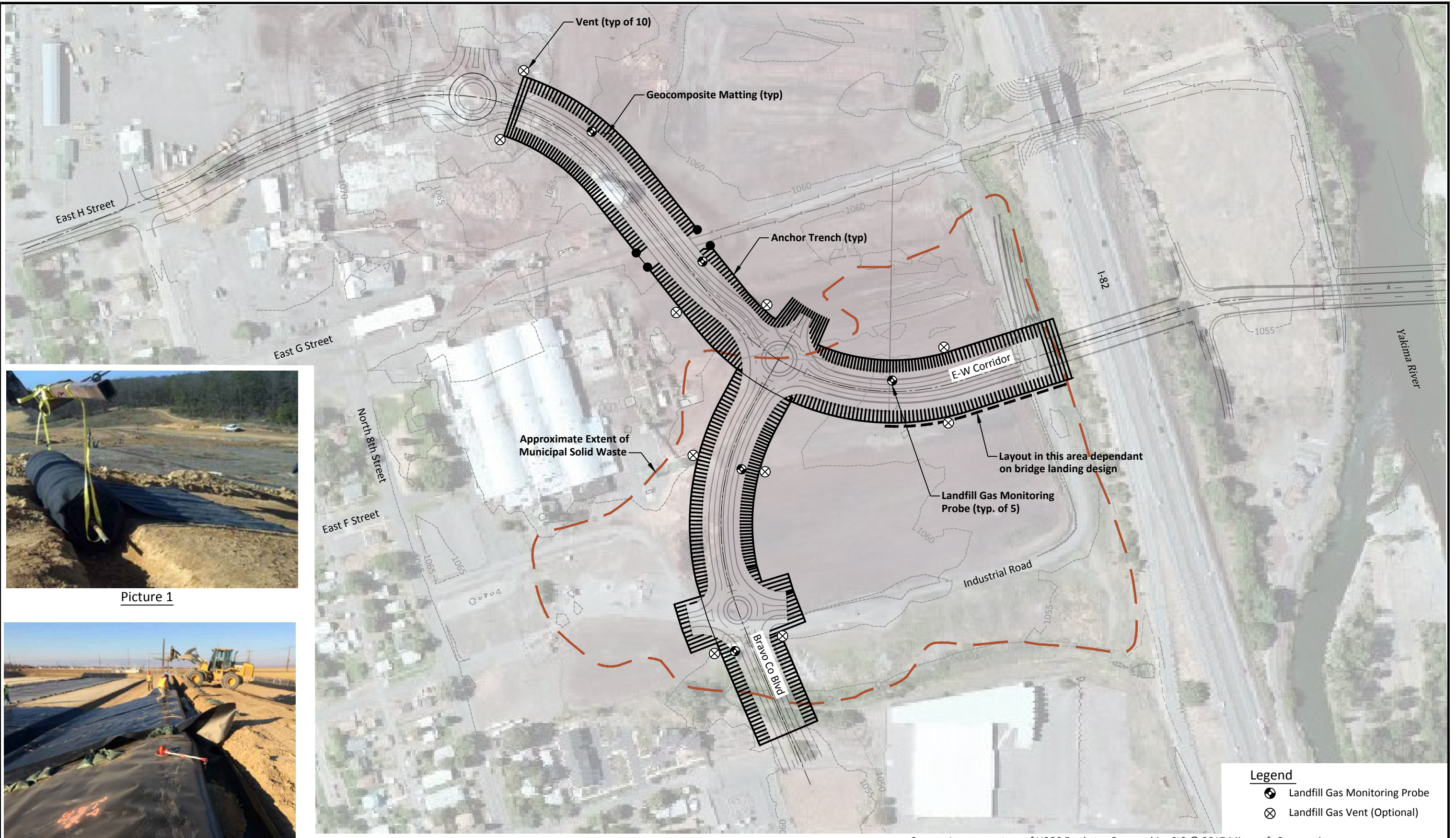
Closed City of Yakima  
Landfill Site  
Yakima, Washington

**Proposed Roadway Alignment**  
**(As of 10/20/16)**

Figure  
**3**



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Picture 1



Picture 2

- Legend**
- Landfill Gas Monitoring Probe
  - ⊗ Landfill Gas Vent (Optional)

Source: Image courtesy of USGS Earthstar Geographics SIO © 2017 Microsoft Corporation



Interim Action Workplan  
Yakima, Washington

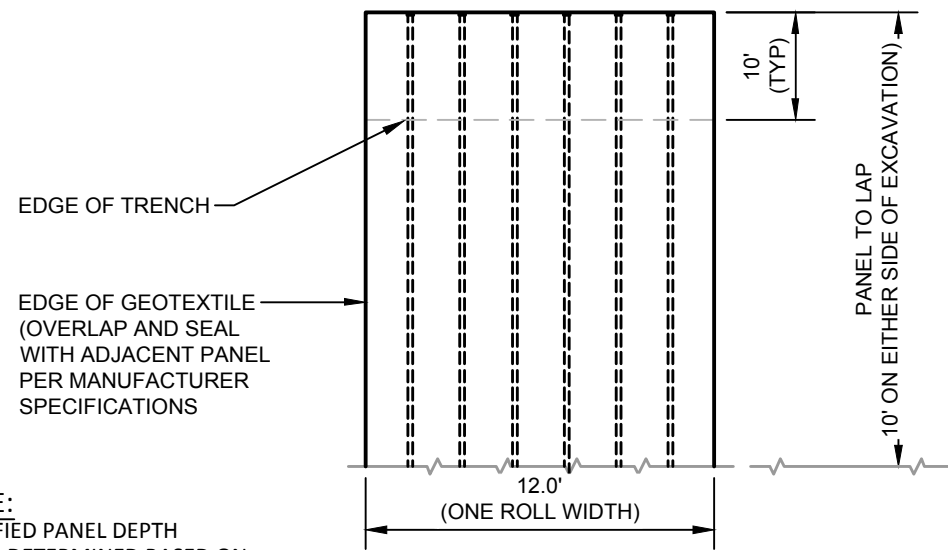
**Transportation Corridor  
Landfill Gas Migration  
Barrier Conceptual Plan**

Figure  
**4**



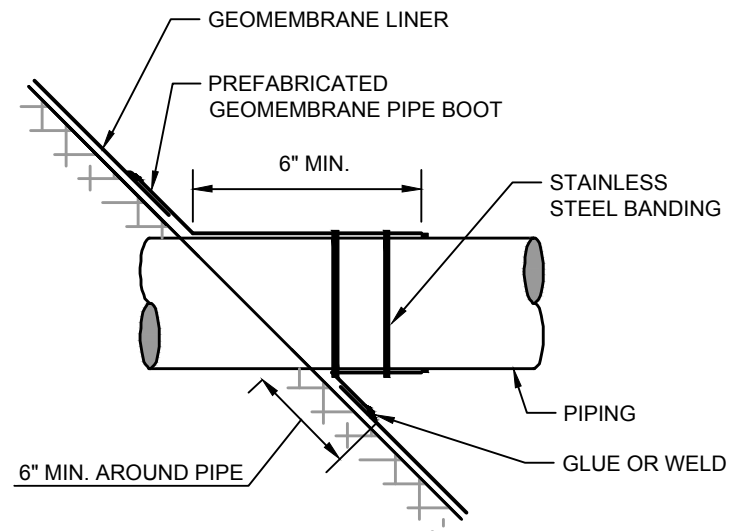


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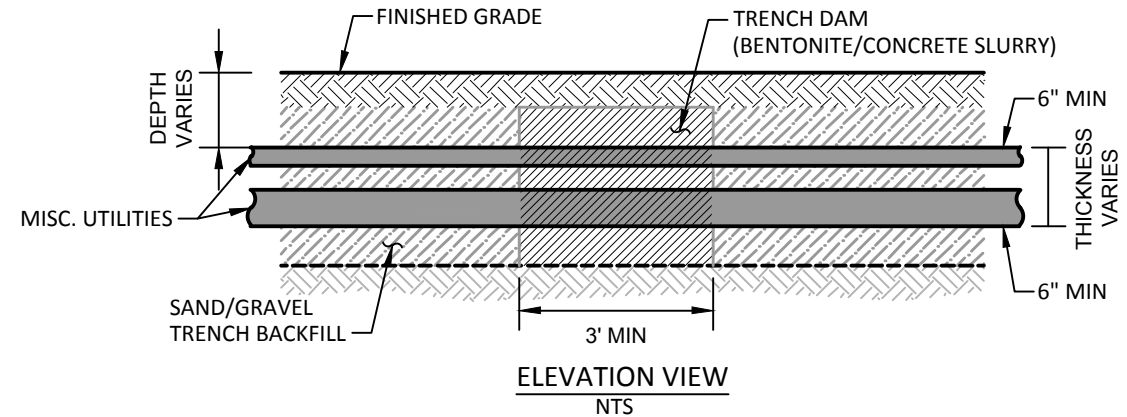
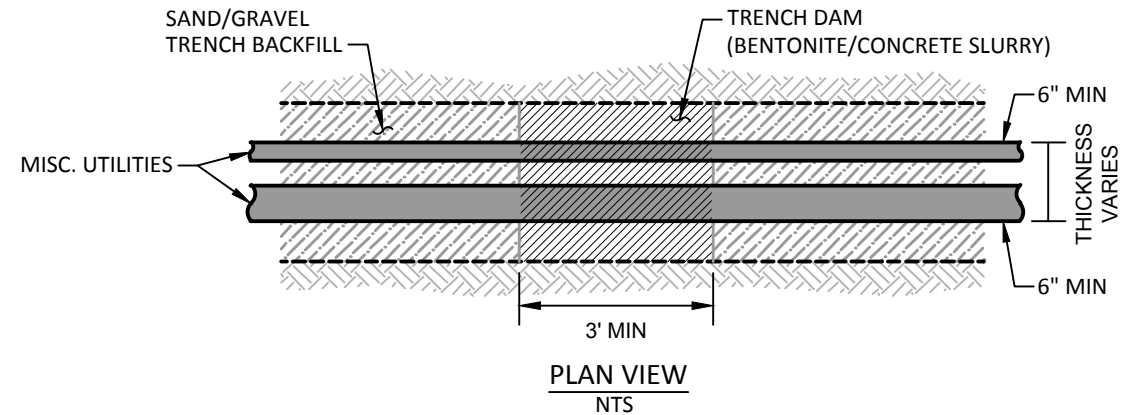


NOTE:  
SPECIFIED PANEL DEPTH  
TO-BE-DETERMINED BASED ON  
FINAL DESIGNED TRENCH DEPTH

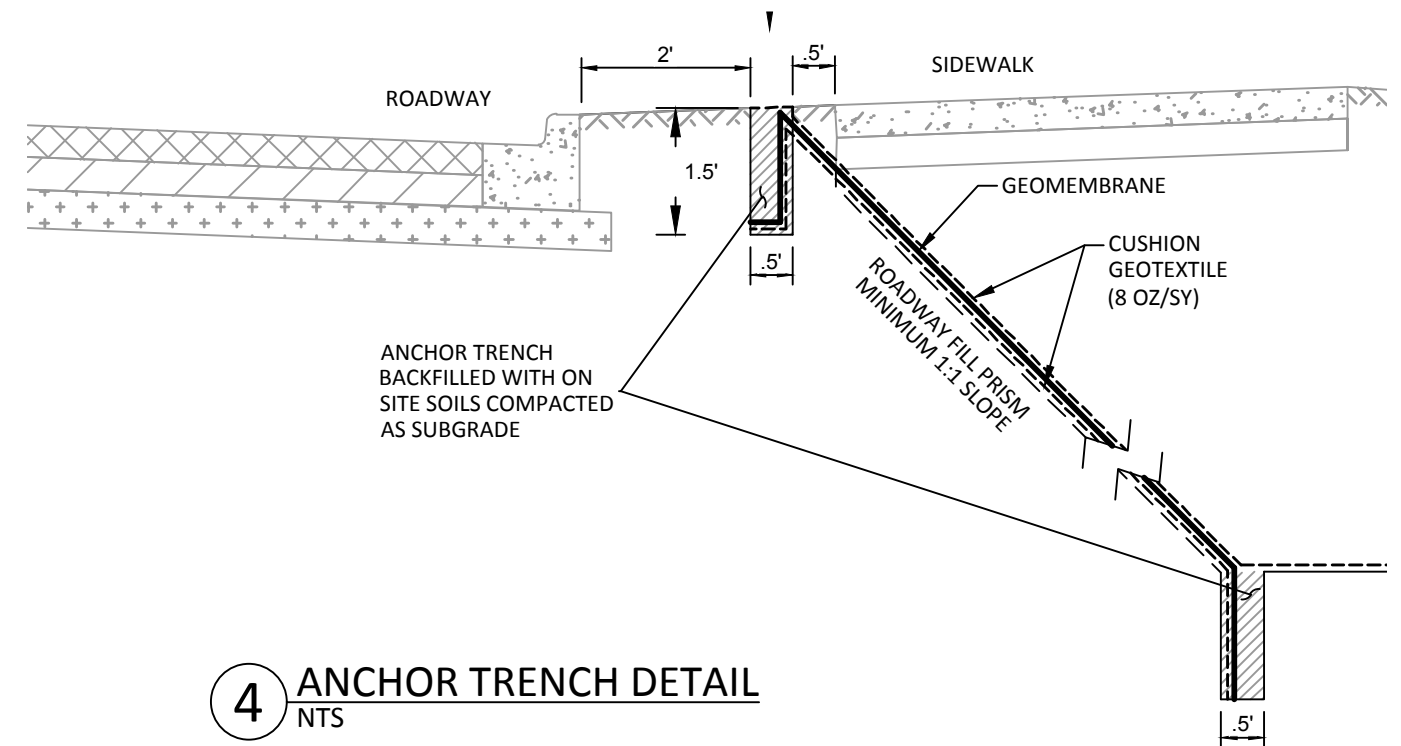
**1** GEOCOMPOSITE PANEL DETAIL  
NTS



**3** LINER PENETRATION BOOT DETAIL  
NTS



**2** TRENCH DAM DETAIL  
NTS



**4** ANCHOR TRENCH DETAIL  
NTS

**Transportation Corridor Wood Debris  
and Landfill Gas Evaluation  
(September 2018)**

# Technical Memorandum

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**TO:** Mr. Chris Wend, Washington State Department of Ecology

**FROM:** Cody Johnson, PE and Piper Roelen, PE, Landau Associates; Joan Davenport and Brett Sheffield, City of Yakima

**DATE:** September 12, 2018

**RE:** **Transportation Corridor Wood Debris and Landfill Gas Investigation  
Former Boise Cascade Mill Site and Closed City of Yakima Landfill Site  
Yakima, Washington  
Facility/Site No. 1927**

Landau Associates, Inc. (LAI) has prepared the following technical memorandum on behalf of the City of Yakima (City) to summarize investigation activities conducted at the former Boise Cascade Mill Site (Mill Site) and the former City Municipal Solid Waste (MSW) Landfill Site (Landfill Site), collectively referred to as the Site. The focus of our investigations was to collect Site-specific information regarding subsurface conditions, including the presence or absence of wood debris, and the levels and composition of landfill gas (LFG), to support design of the planned transportation corridor that will be constructed across much of the Landfill Site and the southern end of the Mill Site. Because this work was conducted on an active Model Toxics Control Act (MTCA) cleanup site, this data is being provided to the Washington State Department of Ecology (Ecology) for its use and understanding of environmental conditions at the Site.

## Site Background

The Site is located on the eastern edge of the City adjacent to Interstate 82 (I-82). The overall Site includes 20 parcels, comprising 19 parcels owned by LeeLynn, Inc. and Wiley Mt., Inc., and 1 parcel owned by OfficeMax Corporation (OfficeMax), totaling approximately 207 acres. A BNSF-owned right-of-way (ROW) with railroad tracks runs in an east-west orientation through the middle of the Site. The closed MSW landfill is located at the southern end of the Site and was operated by the City between 1963 and 1970. As part of landfill operations, MSW was placed in a former log pond that originally occupied the Site (City of Yakima 1996). When landfill operations ceased, the MSW was covered and the area brought to grade with a mixture of fill soil and wood debris. The Site was then used until 2010 for log storage, including temporary log storage and log chipping operations by the tenant of the landfill parcel, Yakima Resources, LLC (Yakima Resources).

The planned transportation corridor that will extend across the Site includes the northern extension of Bravo Boulevard and the East-West Corridor from East H Street to the bridge crossing over I-12 and the Yakima River (see Figure 1). The transportation corridor is being designed by the Lochner and HLA Engineering & Land Surveying, Inc. (HLA) team in consultation with the City and Yakima County (County). The proposed alignment for the transportation corridor will require construction activities, including subsurface disturbance, in many areas of the Site that are known to be underlain by varying

amounts of wood debris and MSW resulting from historical operations. A better understanding of the locations and quantities of wood debris is necessary for roadway design purposes. Based on the significant quantities of MSW and wood debris present throughout the project area, it is also necessary to determine how much LFG may be produced during the degradation of these materials over time, and what constituents may be in the gas that may trigger health and safety or air emissions requirements.

The investigation activities summarized below obtained Site-specific information along the roadway alignments necessary for the development of the transportation corridor design package.

## **Transportation Corridor Investigation**

As shown on Figure 1, several subsurface investigations have previously been conducted throughout the Site since 1988. LAI conducted additional investigations along the proposed transportation corridor alignment in the fall of 2016, including:

- Surveying and staking the planned transportation corridor alignment based on the information provided by the Lochner/HLA team in March 2016.
- Conducting test pit investigations to further evaluate and document the lateral and vertical extent, occurrence, and physical characteristics of the wood debris present along the proposed roadway alignments (Appendix A).
- Installing and sampling additional LFG monitoring probes (Appendix B).

## **Roadway Alignment and Exploration Point Survey**

A roadway alignment survey was conducted by HLA to mark the locations of the roadway alignments to guide the field investigations. The planned roadway corridor consists of an area that is approximately 120 to 150 feet (ft) wide and approximately 5,300 ft long. The centerline and edges of the proposed roadway alignments within the corridor were staked in the field by HLA at 100-ft intervals to facilitate the subsurface exploration activities. HLA also surveyed the current ground surface elevation of each staked location and the final locations and elevations of the new test pits and LFG monitoring probes. The survey facilitated comparison of ground elevations associated with past explorations within and near the roadway corridor with the elevations of the 2016 exploration locations. The surveys used State Plane as the horizontal datum and North American Vertical Datum of 1988 (NAVD88) as the vertical datum.

## **Wood Debris Field Investigation**

A test-pit investigation was conducted to further evaluate the lateral and vertical extent of wood debris present along the planned roadway alignment. The test-pit information was collected to estimate wood debris volumes and to obtain samples for testing. The final test pit locations were



selected in the field based on the results of the public and private utility clearance surveys, access limitations, and the locations of previous subsurface explorations along or near the roadway alignments and remaining Site infrastructure (e.g., foundations, etc.).

Ken Leingang Excavating, Inc., under subcontract to LAI, provided an excavator and operator to advance 34 test pit explorations at a spacing of approximately 100 ft along the planned roadway alignment, and an additional 21 test pit explorations between some of those test pits to provide the higher data resolution necessary to map and document the depth and types of wood debris encountered. Test pit explorations were conducted September 26 through 30, 2016. Subsurface conditions exposed in the test pits were observed and documented by an LAI field geologist. The test pits were excavated to a typical maximum depth of approximately 15 ft below ground surface (bgs) or to the bottom of the wood debris (if shallower than 15 ft bgs), and were backfilled with the excavated materials. However, if groundwater or MSW was encountered prior to reaching 15 ft bgs, the depth of groundwater or MSW was noted and the test pit was terminated and backfilled.

The test-pit logs for each of the test pit explorations are provided in Appendix A. The locations of the test pits with respect to the roadway alignment plan are shown on Figure 1. Figures 2 through 5 provide cross sections (A-A' through D-D', respectively) which graphically depict the materials expected to be encountered under the proposed roadway based on observations from the current and previous investigations. In general, wood debris was encountered in most of the test pits in the area south of the railroad tracks, with some additional wood debris encountered in test pits within and northeast of the proposed roadway alignment north of the railroad tracks.

Within the exploration areas south of the railroad tracks, the wood debris is further characterized as follows:

- South of the proposed central roundabout (shown on Figures 2, 3, and 4b), the wood debris is present at the ground surface and ranges in thickness from approximately 1.0 to 6.5 ft, is generally loose, and consists of wood chips mixed with approximately 10 to 50 percent by volume of gravel and cobbles, with some interbedded dense gravel layers. MSW was encountered below the wood debris in this area and the test pit excavations were stopped once the MSW was encountered.
- Within and around the proposed central roundabout (shown on the right side of Figure 2 and left-central side of Figure 4b) the wood debris is at or within approximately 1 ft of the ground surface and extends below the completion depths of the test pit excavations (greater than 15 ft bgs). The wood debris varies in type and size with depth generally consisting of:
  - Wood chips mixed with gravel and sand from the ground surface to 1 to 3 ft bgs
  - Grading to bark chips and wood shavings extending 6 to 10 ft bgs
  - Grading to buried logs within saw dust and shavings extending below the completion depths of the test pits (greater than 15 ft bgs).

- North of the proposed central roundabout (shown on the left side of Figure 4b) the wood debris is encountered below a dense layer of silt, sand, gravel and/or cobbles that ranges in thickness from 1 to 11 ft. The wood debris below that dense soil layer generally consists of:
  - Wood chips with up to 50 percent gravel from 1 to 8 ft bgs
  - Grading to buried logs within saw dust and shavings from 8 ft bgs to beyond the termination depth of the test pit.

In areas where the wood debris did not extend beyond the depth of the test pit, the wood debris was underlain by sandy gravel.

The test pit explorations in the areas of the proposed alignment north of the railroad tracks that will extend to the north and west indicate that this portion of the alignment will not generally be underlain by wood waste or MSW. Although subgrade pockets of wood debris were encountered around test pits TP15-16 (right side of Figure 4a) and TP14A-16 and TP13A-16 (left side of Figure 4b). Several test pits were also excavated northeast of the roadway alignment<sup>1</sup> (shown on Figure 5, Section D-D’); two of the test pits (TP24A-16 and TP25-16) also identified wood debris from approximately 6 ft bgs to below the groundwater table (approximately 14 ft bgs).

The quantity of the wood debris below the proposed roadway alignment was generally estimated by multiplying the proposed width of development (150 ft wide for the roadways and 200-ft diameter for roundabouts) with 1 horizontal to 1 vertical (1H:1V) cuts, by length of proposed roadway over the wood waste, by the depth of wood debris shown on the cross sections. It was estimated that there is approximately 46,900 in-place (bank) cubic yards (CY) of wood debris under the proposed roadway prism. Using elevation and wood debris thickness data from beneath the roadway and from the rest of the Landfill Site to create comparable top and bottom surfaces of the wood debris with computer-aided design (CAD), which calculated an estimated volume of approximately 182,000 in-place CY of wood debris within the horizontal boundaries of the MSW landfill.<sup>2</sup>

It is also noteworthy that, as shown on the right side of Figure 4a and on Figure 5, a layer of large-size concrete debris and boulders (designated as “BD” on the cross sections) exists under approximately 250 linear feet of the alignment, and extends from the ground surface to more than 13 ft deep in some places. For the alignment west of this large concrete and boulder debris pile, the proposed roadway alignment is generally underlain by dense silty sands and gravels.

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<sup>1</sup> The roadway alignment was modified after the investigation was completed; these test pits were excavated in the former location of the northern extension of the northern roundabout.

<sup>2</sup> Using the updated elevation data from the roadway investigation, the volume of MSW was also calculated with CAD which estimated a total volume of MSW in the Landfill Site of approximately 319,500 in-place cubic yards.

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## Wood Debris Analytical Testing

Representative samples of the wood debris encountered were collected and analyzed at the ALS Environmental (ALS) analytical laboratory to help characterize the material for potential reuse and/or disposal. Wood debris sample analysis included the following:

- 20 wood debris samples were analyzed for Toxicity Characteristic Leaching Procedure (TCLP) Resource Conservation and Recovery Act (RCRA) 8 metals by US Environmental Protection Agency (EPA) Method 6010C/7470A
- The same 20 wood debris samples were also tested for High Heat British thermal unit (BTU) Value (BTU/pound [lb]) by Method ASTM International (ASTM) D2015
- Five wood debris samples with the highest BTU value results were also analyzed for total chlorine by EPA Method 5050/9056, which is required to interpret potential of reuse of wood debris as a fuel resource.

The results of the wood debris testing are provided in Table 1 and associated laboratory reports are included as Appendix C. The heating value of the wood debris samples tested range from 3,100 to 9,600 BTU/lb, with an average of 6,550 BTU/lb for the 20 samples tested. The distribution of heating values for each sample is shown on Figures 2, 4b, and 5. The TCLP analysis detected barium in all samples at concentrations ranging from 0.17 to 0.33 milligrams/liter (mg/L) with the exception of detection of 3.0 mg/L in one sample. Without the outlier, the barium concentration averaged 0.24 mg/L. Lead was detected in only two of the 20 samples at concentrations of 0.025 mg/L and 0.042 mg/L. All other TCLP metals were not detected in the 20 samples tested.

Two soil samples collected from the upper 2 ft of test pits TP-15-16 and TP-16B-16 were also analyzed by Northwest total petroleum hydrocarbon-diesel extended range (NWTPH-Dx) method with silica gel cleanup. These samples were collected because visual or odor evidence of potential petroleum hydrocarbons was identified in the shallow portion of the test pits during excavation. These areas were not identified as total petroleum hydrocarbon (TPH)-contaminated soils in the remedial investigation (LAI 2015). As summarized in Table 1 and included in Appendix C, the TPH detected was in the oil range and was 14,000 milligrams per kilogram (mg/kg) at TP-15-16 and 500 mg/kg at TP-16B-16. Based on observations from these two test pits and other nearby test pits with no evidence of petroleum contamination, there could be as much as 2,800 CY of petroleum-contaminated soil in this area of the proposed roadway that may require special management prior to or during construction.

## Landfill Gas Probe Installation

To evaluate LFG in the project area, 13 new LFG monitoring probes (GP-32 through GP-44) were installed along the proposed roadway alignment. The spacing of LFG probes along the alignments is approximately 400 ft between probes north of the railroad tracks (where no MSW is located and wood debris is less abundant) and approximately 250 ft between probes within the area of the former

landfill. Five existing LFG probes (GP-5, GP-11, GP-18, GP-19, and GP-28) were previously installed as part of remedial investigation activities. The five existing LFG probes are located within or proximal to the alignments, and were used to limit the number of new installations required. The locations of the new and previously-existing LFG monitoring probes are presented on Figure 1.

The new LFG probes were installed in October 2016 using hollow-stem auger drilling methods, consistent with procedures and materials of construction used for previous LFG probe installations at the Site. A 3.25-inch outside diameter Dames & Moore sampler was used with a 300-lb hammer and a 30-inch drop to retrieve split spoon samples of the materials encountered, and measure the blow counts required to penetrate into the underlying material. Each boring was advanced to 10 ft bgs. The LFG probes were completed with 0.5-inch-diameter Schedule 40 PVC pipe with a 5-ft screen from 5 to 10 ft bgs. The screens were constructed with 0.03-inch to 0.04-inch machine-slotted perforations. The filter pack surrounding the screens consisted of pea gravel to facilitate soil vapor/LFG movement into the probe during purging and monitoring. The probes were constructed by a licensed well driller and an LAI field scientist observed the drill cuttings and prepared a boring and installation log at each location. The boring logs for the LFG probes are provided in Appendix B.

### **Landfill Gas Monitoring**

LFG monitoring was conducted at the 13 new probes and the five existing monitoring points during four monitoring events completed on October 13, November 16, December 21, and December 29, 2016. The LFG measurements were collected during conditions of falling barometric pressure to minimize potential atmospheric dilution effects. A Landtec GEM 5000 soil vapor/LFG analyzer was used to monitor *in situ* concentrations of methane, oxygen, carbon dioxide, and balance gases (the mixture of all other gases making up the balance of the air sample), to evaluate for potential soil-vapor impacts from degrading MSW or wood debris.

In addition to the data collected using the portable LFG analyzer, samples of LFG were collected during the second and fourth monitoring events at the four LFG monitoring probe locations with the highest concentrations of methane based on evaluation of the initial monitoring event result (GP-38, GP-39, GP41, and GP-43). The samples were collected into certified-clean stainless steel Summa canisters with Silonite linings for laboratory analysis of total reduced sulfur by ASTM standard D-5504, fixed gases (methane, carbon dioxide, carbon monoxide, oxygen, and nitrogen) by ASTM D-1945, non-methane organic compounds (NMOCs) by EPA Method 25C, and volatile organic compounds (VOCs) by EPA Compendium Method TO-15.

The field measurement results are presented in Table 2. A summary of the laboratory analytical results is presented in Table 3 and the analytical laboratory reports are included in Appendix C. A summary of pertinent data is provided below:

- The highest concentrations of methane, ranging from approximately 48 to 72 percent by volume (pbv), were detected in areas of buried MSW. Lower methane concentrations were detected outside the landfill boundaries where only buried wood debris is present, ranging from approximately 1 to 20 pbv. Methane was typically not detected at monitoring points where MSW or wood debris is not present, except at locations in close proximity to MSW or wood debris deposits. Figure 6 shows the limits of the MSW landfill and presents the methane results for all previous LFG monitoring events at the site, including the four 2016 monitoring events.
- The laboratory fixed-gas results are similar to the concentrations measured using the hand-held LFG analyzer, confirming the usability of the field-collected data for design.
- Elevated concentrations of hydrogen sulfide (H<sub>2</sub>S) were detected in several samples. The most notable of these observations was a detection of 14,000 micrograms per cubic meter (µg/m<sup>3</sup>) H<sub>2</sub>S in GP-39 on November 11, 2016.
- Static pressure measurements across the landfill ranged generally from -0.55 to 0.11 inches of water (in. H<sub>2</sub>O).
- The results of VOC testing indicate detectable concentrations of VOCs in the LFG coming from within the MSW landfill boundaries. The VOCs detected are those typically associated with LFG. The highest observed total VOC concentration (expressed as the sum of all detected VOCs) was at GP-39 in the sample collected on November 16 29, 2016, with a concentration of approximately 76,500 µg/m<sup>3</sup>—less than 3 percent of the concentration typically present in LFG.

## Limitations

This technical memorandum has been prepared for the exclusive use of the City of Yakima and the Washington State Department of Ecology for specific application to the Former Boise Cascade Mill Site and Closed City of Yakima Landfill Site Transportation Corridor. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of LAI. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by LAI, shall be at the user's sole risk. LAI warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

LANDAU ASSOCIATES, INC.



Cody Johnson, PE  
Senior Engineer



Piper Roelen, PE  
Principal

CMJ/PMR/ljl

[P:\1148\009\R\WOOD DEBRIS AND LFG INVESTIGATION TM\YAKIMA LANDFILL WOOD DEBRIS AND LFG DATA MEMO\_091218.DOCX]

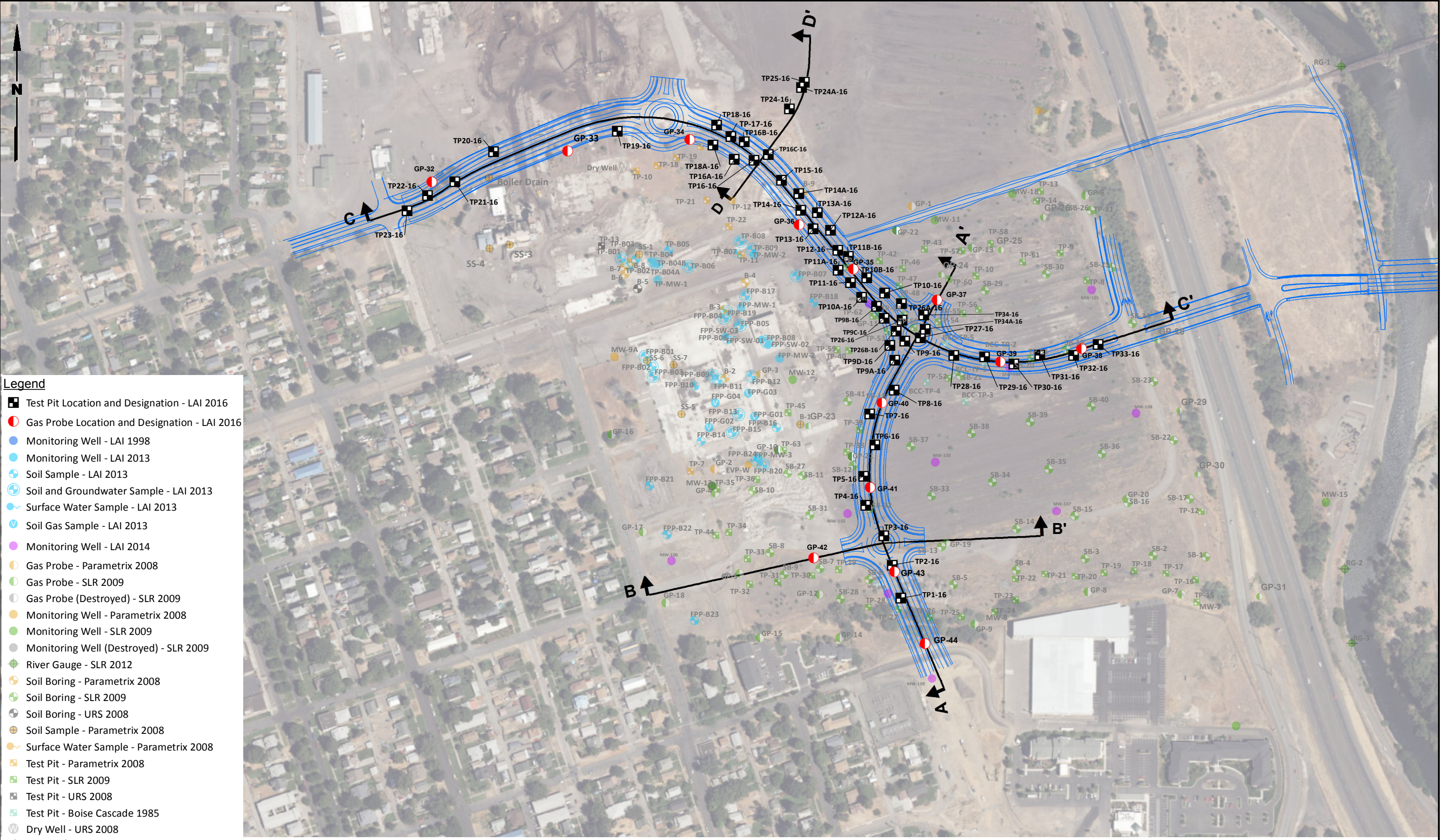
Attachments: Figure 1. Gas Probe and Test Pit Locations  
Figure 2. Geologic Cross Section A-A'  
Figure 3. Geologic Cross Section B-B'  
Figure 4a. Geologic Cross Section C-C'  
Figure 4b. Geologic Cross Section C-C'  
Figure 5. Geologic Cross Section D-D'  
Figure 6. Landfill Gas Monitoring Results  
Table 1. Test Pit Soil and Wood Debris – Analytical Results  
Table 2. Landfill Gas Monitoring Field Measurements  
Table 3. Landfill Gas Monitoring Data – Analytical Results  
Appendix A. Test Pit Boring Logs  
Appendix B. Landfill Gas Probes Logs  
Appendix C. Analytical Laboratory Reports

## References

City of Yakima. 1996. Letter: Interstate I-82 Gateway Project – January 11, 1996 Meeting Regarding Landfill and Wetland Issues. From City of Yakima, to Washington State Department of Ecology. January 22.

LAI. 2015. Agency Review Draft: Supplemental Remedial Investigation Report, Closed City of Yakima Landfill Site, Yakima, Washington. Landau Associates, Inc. September 29.

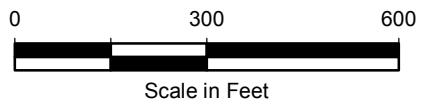
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- Legend**
- Test Pit Location and Designation - LAI 2016
  - Gas Probe Location and Designation - LAI 2016
  - Monitoring Well - LAI 1998
  - Monitoring Well - LAI 2013
  - Soil Sample - LAI 2013
  - Soil and Groundwater Sample - LAI 2013
  - Surface Water Sample - LAI 2013
  - Soil Gas Sample - LAI 2013
  - Monitoring Well - LAI 2014
  - Gas Probe - Parametrix 2008
  - Gas Probe - SLR 2009
  - Gas Probe (Destroyed) - SLR 2009
  - Monitoring Well - Parametrix 2008
  - Monitoring Well - SLR 2009
  - Monitoring Well (Destroyed) - SLR 2009
  - River Gauge - SLR 2012
  - Soil Boring - Parametrix 2008
  - Soil Boring - SLR 2009
  - Soil Boring - URS 2008
  - Soil Sample - Parametrix 2008
  - Surface Water Sample - Parametrix 2008
  - Test Pit - Parametrix 2008
  - Test Pit - SLR 2009
  - Test Pit - URS 2008
  - Test Pit - Boise Cascade 1985
  - Dry Well - URS 2008

Section Alignment

**Notes**  
 1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

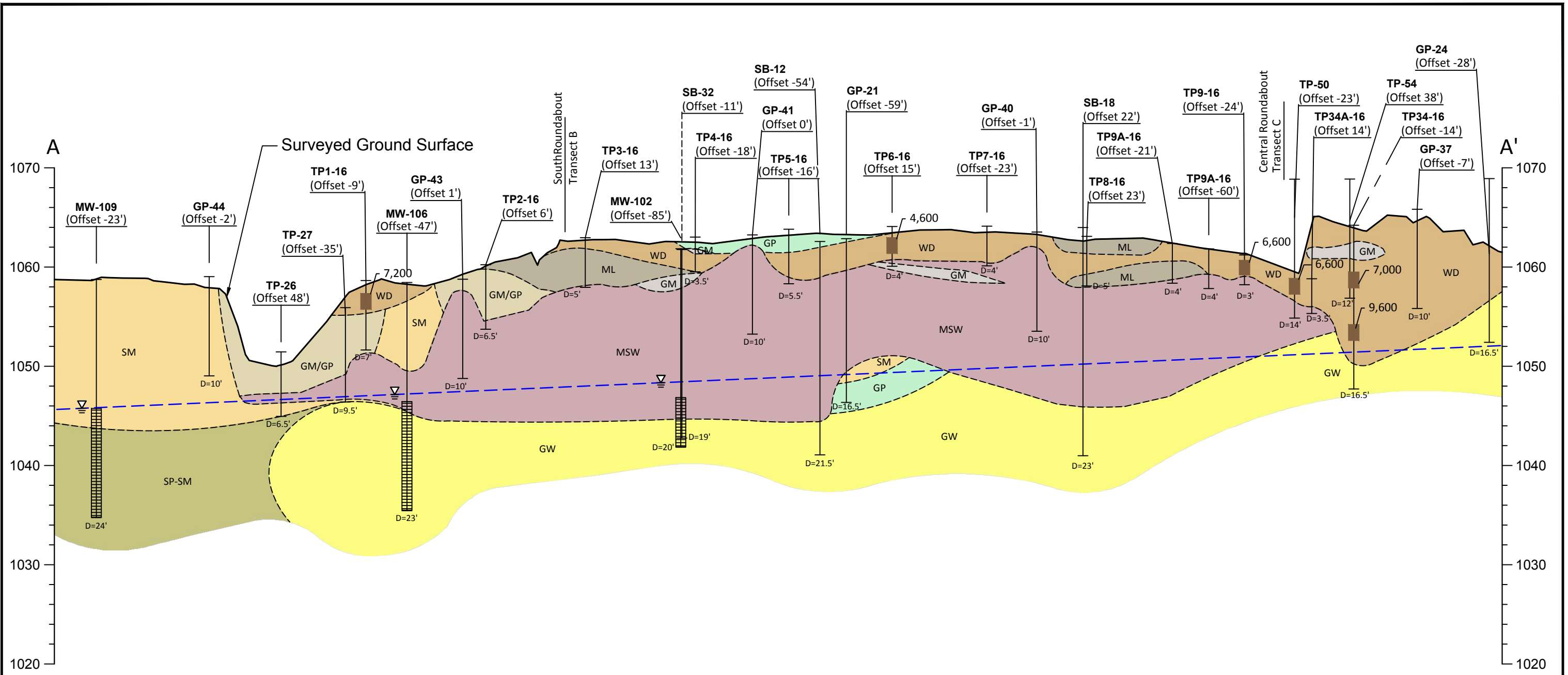


Data Source: HLA Engineering and Land Surveying, Inc; SLR; URS; Parametrix; Lochner Engineering; Boise Cascade; Esri World Imagery.

Closed City of Yakima Landfill Site Yakima, Washington	<b>Transportation Corridor Project</b> <b>Gas Probe and Test Pit Locations</b>	Figure <b>1</b>
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LANDAU ASSOCIATES, INC. | G:\Projects\1148\09\0100\14\Cross Sections A B C.dwg (A) Figure 2 9/12/2018



- |  |                                       |  |                         |
|--|---------------------------------------|--|-------------------------|
|  | MSW (municipal solid waste)           |  | GP (clean gravel)       |
|  | WD (wood debris)                      |  | GM (gravel with fines)  |
|  | SP (clean sand)                       |  | GM-GP                   |
|  | SM (sand with fines)                  |  | GW (well graded gravel) |
|  | SP-SM                                 |  | ML (silt and sand)      |
|  | BD (large concrete debris & boulders) |  |                         |

**Legend**

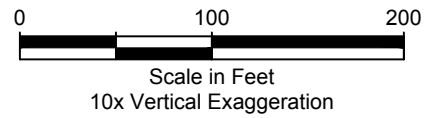
7,200  
Sample location of wood debris tested for heating value.  
Heating value provided in BTU/LB

Groundwater well and screen interval

Approximate groundwater surface, seasonal high (September 2014)

Approximate groundwater surface at time of exploration (September 2016)

**Geologic Profile Transect A**  
Horizontal Scale in Feet: 1"=100'  
Vertical Scale in Feet: 1"=10'



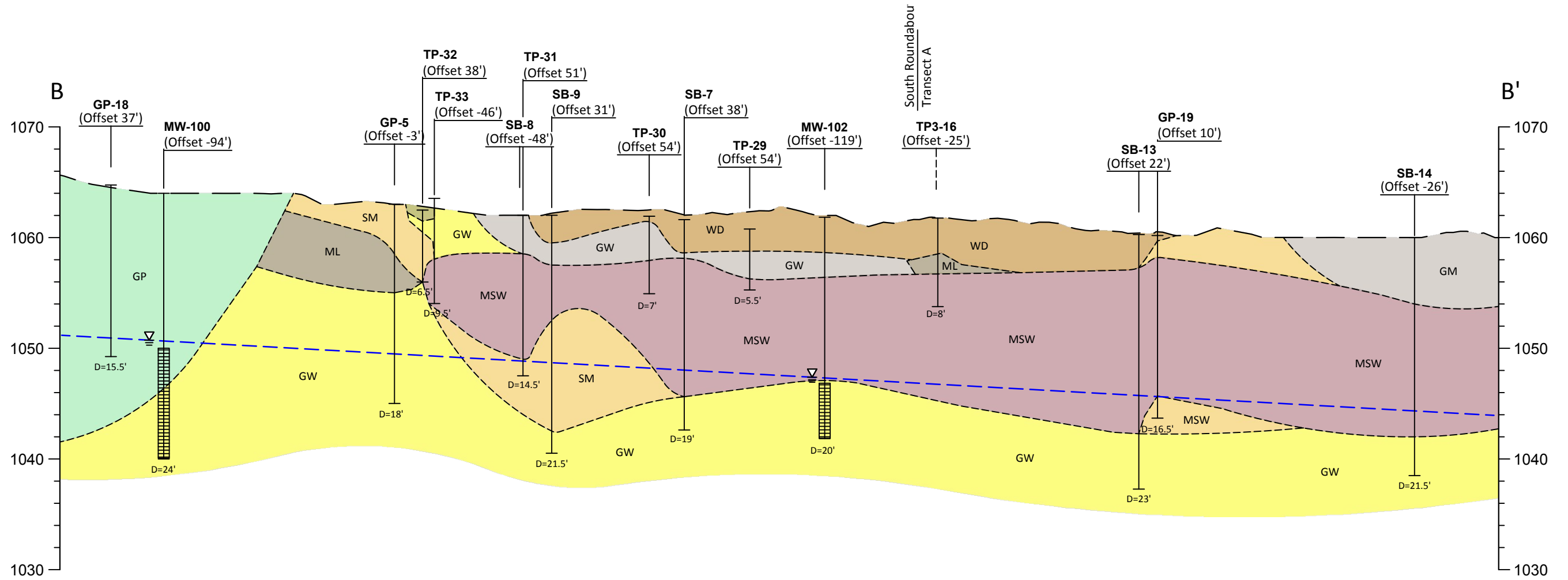
Source: Yakima County GIS; SLR, URS, Parametrix 2008, Boise 1985.

Closed City of Yakima Landfill Site Yakima, Washington	<b>Geologic Cross Section A-A'</b>	Figure <b>2</b>
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LANDAU ASSOCIATES, INC. | G:\Projects\1148\009\010\014\Cross Sections A B C.dwg (A) Figure 3 9/12/2018



- |  |                                       |  |                         |
|--|---------------------------------------|--|-------------------------|
|  | MSW (municipal solid waste)           |  | GP (clean gravel)       |
|  | WD (wood debris)                      |  | GM (gravel with fines)  |
|  | SP (clean sand)                       |  | GM-GP                   |
|  | SM (sand with fines)                  |  | GW (well graded gravel) |
|  | SP-SM                                 |  | ML (silt and sand)      |
|  | BD (large concrete debris & boulders) |  |                         |

**Legend**

7,200  
Sample location of wood debris tested for heating value.  
Heating value provided in BTU/LB

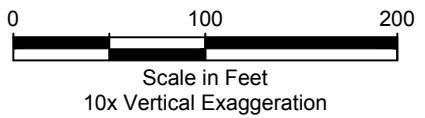
Groundwater well and screen interval

Approximate groundwater surface, seasonal high (September 2014)

Approximate groundwater surface at time of exploration (September 2016)

**Geologic Profile Transect B**

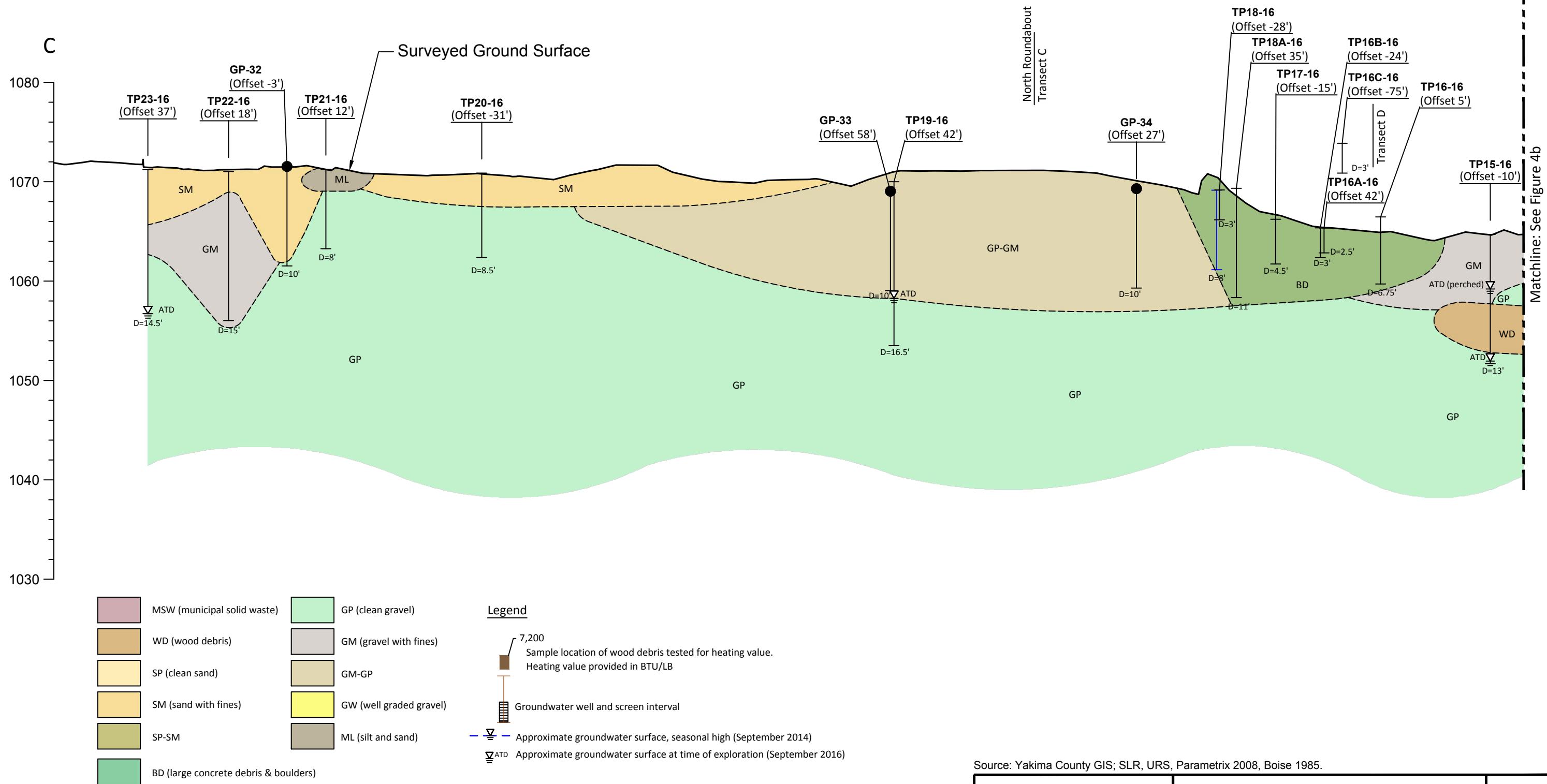
Horizontal Scale in Feet: 1"=100'  
Vertical Scale in Feet: 1"=10'



Source: Yakima County GIS; SLR, URS, Parametrix 2008, Boise 1985.



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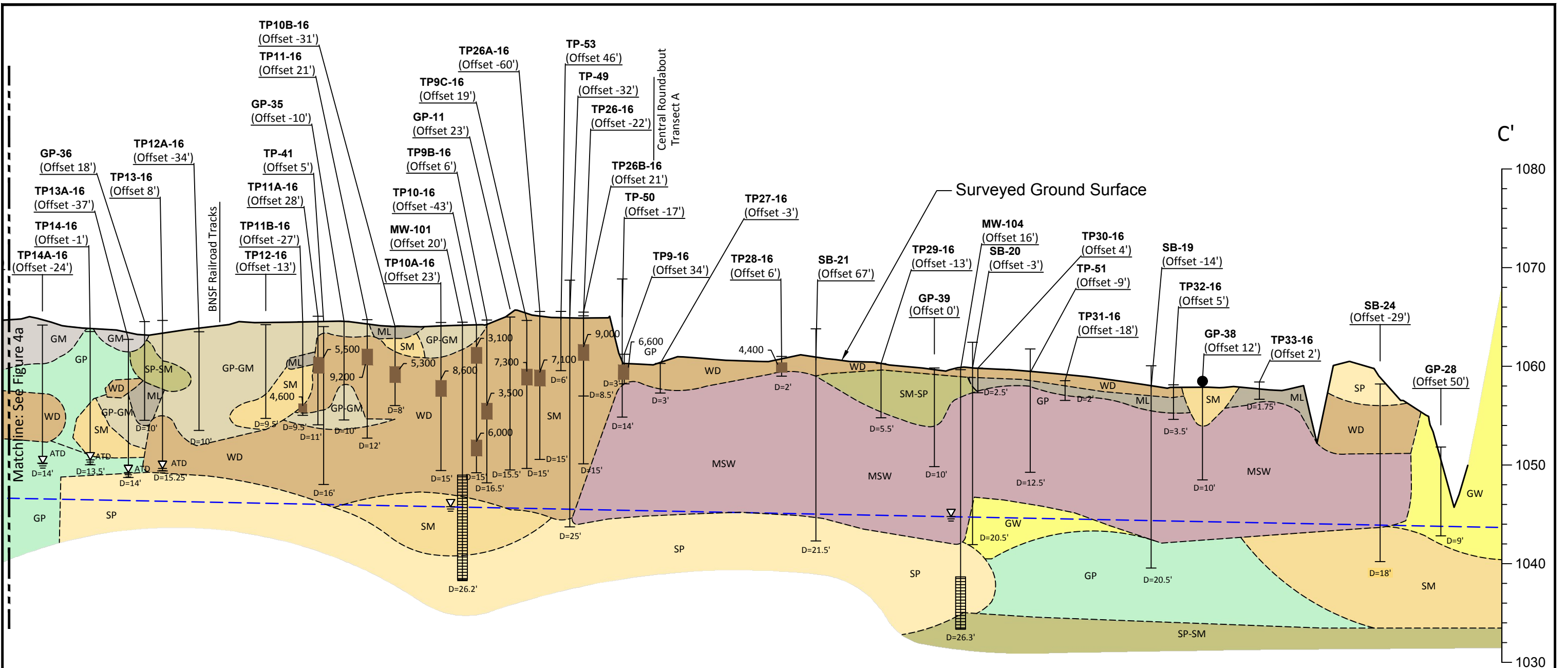


Source: Yakima County GIS; SLR, URS, Parametrix 2008, Boise 1985.



<p>Closed City of Yakima Landfill Site Yakima, Washington</p>	<p><b>Geologic Cross Section C-C'</b></p>	<p>Figure <b>4a</b></p>
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LANDAU ASSOCIATES, INC. | G:\Projects\1148\009\010\014\Cross Sections A B C\Cross Sections A B C.dwg (A) Figure 4b 9/12/2018



- |  |                                       |  |                         |
|--|---------------------------------------|--|-------------------------|
|  | MSW (municipal solid waste)           |  | GP (clean gravel)       |
|  | WD (wood debris)                      |  | GM (gravel with fines)  |
|  | SP (clean sand)                       |  | GM-GP                   |
|  | SM (sand with fines)                  |  | GW (well graded gravel) |
|  | SP-SM                                 |  | ML (silt and sand)      |
|  | BD (large concrete debris & boulders) |  |                         |

**Legend**

- 7,200  
Sample location of wood debris tested for heating value.  
Heating value provided in BTU/LB
- Groundwater well and screen interval
- Approximate groundwater surface, seasonal high (September 2014)
- Approximate groundwater surface at time of exploration (September 2016)



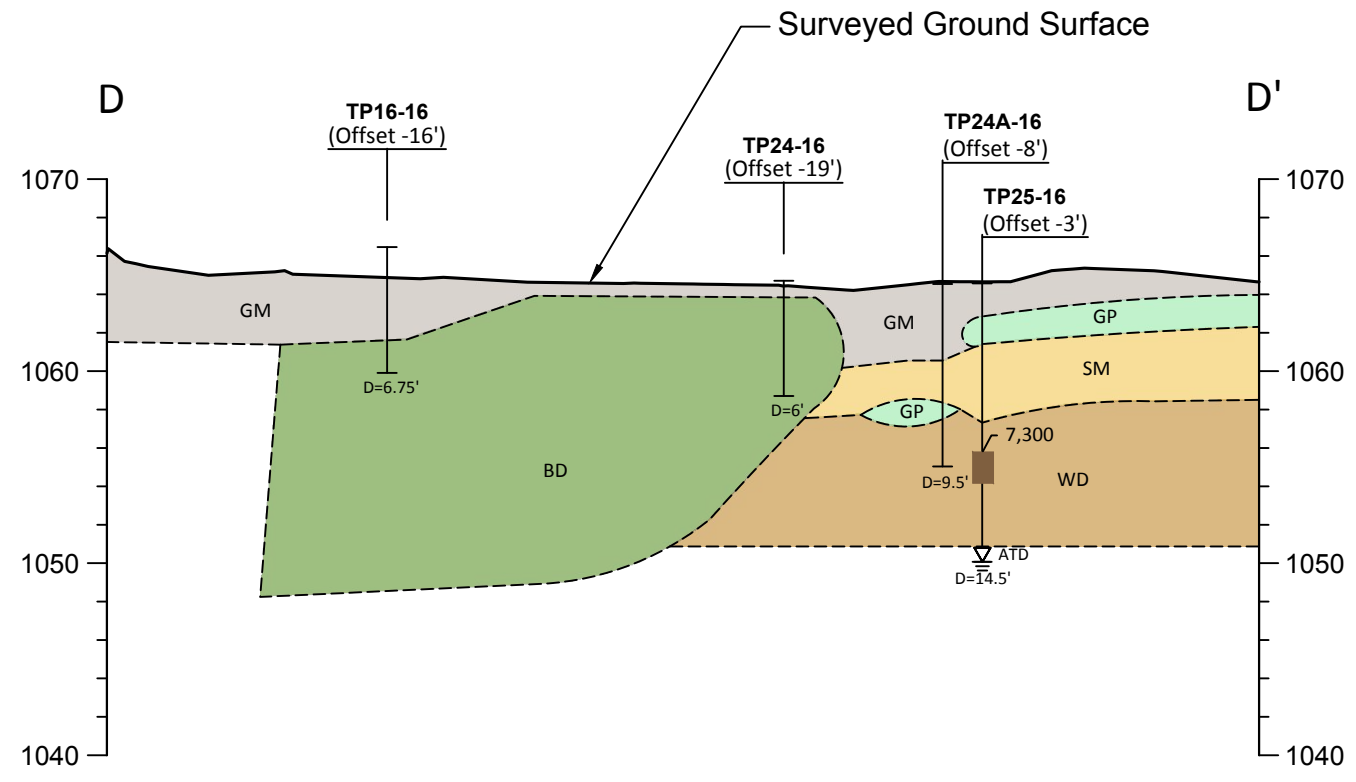
Source: Yakima County GIS; SLR, URS, Parametrix 2008, Boise 1985.

Closed City of Yakima  
Landfill Site  
Yakima, Washington

**Geologic Cross Section C-C'**

Figure  
**4b**





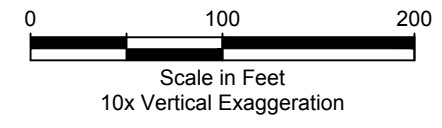
**Geologic Profile Transect D**

Horizontal Scale in Feet: 1"=100'  
Vertical Scale in Feet: 1"=10'

- |  |                                       |  |                         |
|--|---------------------------------------|--|-------------------------|
|  | MSW (municipal solid waste)           |  | GP (clean gravel)       |
|  | WD (wood debris)                      |  | GM (gravel with fines)  |
|  | SP (clean sand)                       |  | GM-GP                   |
|  | SM (sand with fines)                  |  | GW (well graded gravel) |
|  | SP-SM                                 |  | ML (silt and sand)      |
|  | BD (large concrete debris & boulders) |  |                         |

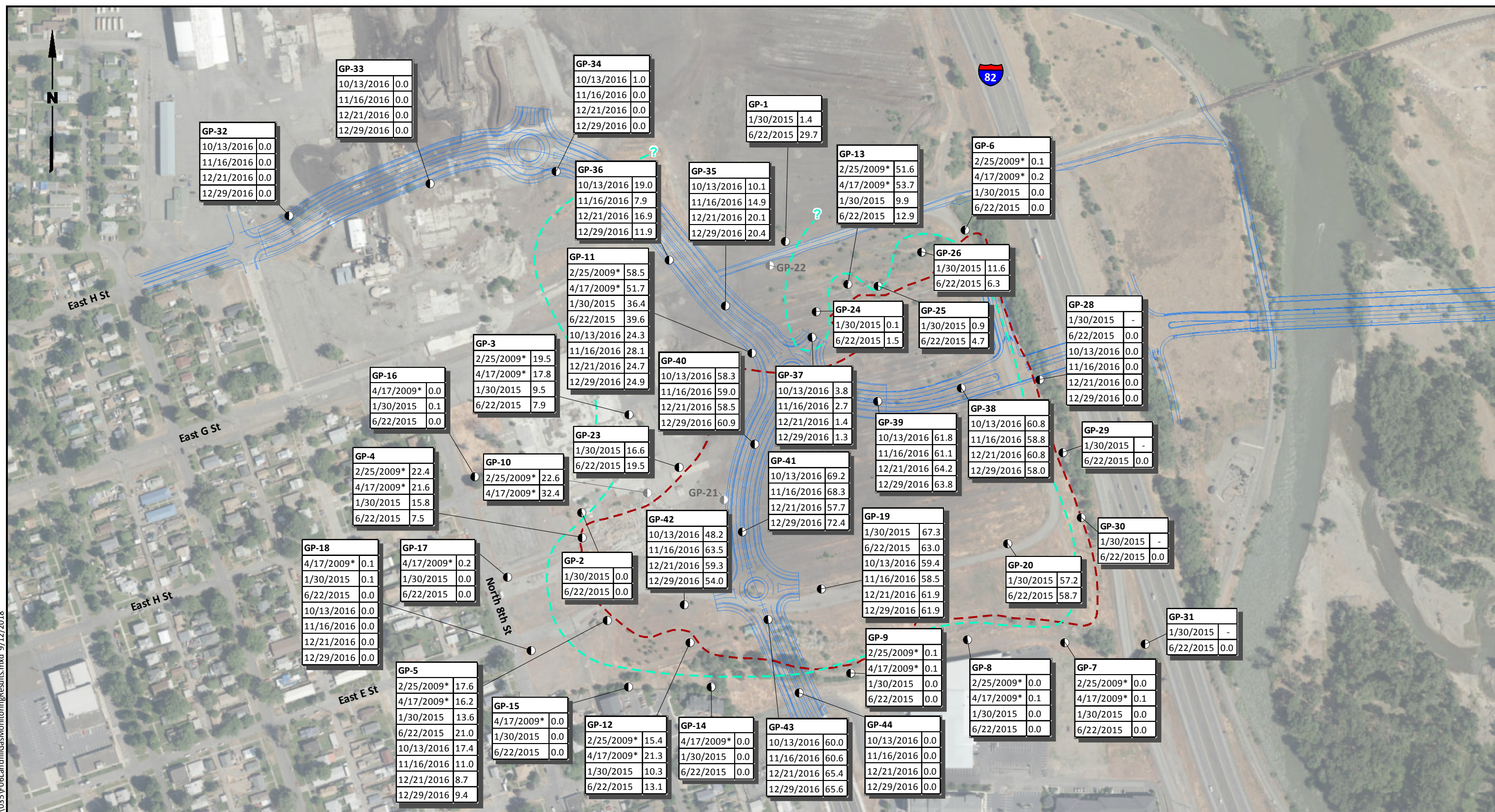
**Legend**

- 7,200  
Sample location of wood debris tested for heating value.  
Heating value provided in BTU/LB
- Groundwater well and screen interval
- Approximate groundwater surface, seasonal high (September 2014)
- Approximate groundwater surface at time of exploration (September :)



Source: Yakima County GIS; SLR, URS, Parametrix 2008, Boise 1985.

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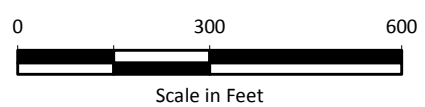


**Legend**

- Gas Probe
- Gas Probe (Destroyed)
- - - Extent of Municipal Solid Waste
- - - Approximate Extent of Landfill Gas (Methane >5% by volume)

Monitoring Date	Methane Concentration (% by volume)
2/25/2009*	0.0
4/17/2009*	0.1
1/30/2015	0.0
6/22/2015	0.0

\*Data reported by SLR (2009)



**Note**

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Data Source: Esri World Imagery.

**Table 1**  
**Test Pit Soil and Wood Debris - Analytical Results**  
**Transportation Corridor**  
**Yakima, Washington**

Analyte	Location ID, Sample Depth Interval (ft), Laboratory Sample ID, Sample Date, and Sample Type										
	TP-15-16 1.5-2.0 EV16100003-01 9/27/2016 N	TP-16B-16 0-2.0 EV16100003-02 9/28/2016 N	TP-1-16 S-1 1.0-2.0 EV16100095-01 9/26/2016 N	TP-6-16 S-2 1.5-2.0 EV16100095-02 9/26/2016 N	TP-9-16 S-1 0-1.5 EV16100095-03 9/26/2016 N	TP-9B-16 S-4 8.0-9.0 EV16100095-04 9/29/2016 N	TP-9C-16 S-3 5.0-6.0 EV16100095-05 9/30/2016 N	TP-10-16 S-2 1.0-2.0 EV16100095-06 9/26/2016 N	TP-10-16 S-5 10.0-12.0 EV16100095-07 9/26/2016 N	TP-10A-16 S-4 6.0-7.0 EV16100095-08 9/29/2016 N	TP-10B-16 S-4 5.0-5.5 EV16100095-09 9/29/2016 N
<b>Petroleum Hydrocarbons (mg/kg; NWTPH-dx)</b>											
Diesel Range Organics	620 U	25 U	--	--	--	--	--	--	--	--	--
Oil Range Organics	<b>14,000</b>	<b>500</b>	--	--	--	--	--	--	--	--	--
<b>TCLP Metals (mg/L; SW-846 7470/6020)</b>											
Mercury	--	--	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
Arsenic	--	--	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Barium	--	--	<b>3.0</b>	<b>0.25</b>	<b>0.29</b>	<b>0.24</b>	<b>0.23</b>	<b>0.31</b>	<b>0.28</b>	<b>0.18</b>	<b>0.17</b>
Cadmium	--	--	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Chromium	--	--	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Lead	--	--	<b>0.042</b>	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Selenium	--	--	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Silver	--	--	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
<b>Gross Heating Value (BTU/lb; ASTM D5865)</b>											
Heating Value	--	--	<b>7,200</b>	<b>4,600</b>	<b>6,600</b>	<b>3,500</b>	<b>7,300</b>	<b>3,100</b>	<b>6,000</b>	<b>8,600</b>	<b>5,300</b>
<b>Chlorine (mg/kg; EPA 9056)</b>											
Chlorine	--	--	--	--	--	--	--	--	--	<b>56</b>	--

**Table 1**  
**Test Pit Soil and Wood Debris - Analytical Results**  
**Transportation Corridor**  
**Yakima, Washington**

Analyte	Location ID, Sample Depth Interval (ft), Laboratory Sample ID, Sample Date, and Sample Type										
	TP-11-16 S-3 3.0-3.5 EV16100095-10 9/26/2016 N	TP-11A-16 S-3 5.0-6.0 EV16100095-11 9/29/2016 N	TP-11B-16 S-5 8.0-9.0 EV16100095-12 9/29/2016 N	TP-25-16 S-5 8.0-10.0 EV16100095-13 9/28/2016 N	TP-26-16 S-3 4.0-4.5 EV16100095-14 9/28/2016 N	TP-26A-16 S-3 6.0-7.0 EV16100095-15 9/30/2016 N	TP-26B-16 S-3 4.0-5.0 EV16100095-16 9/30/2016 N	TP-28-16 S-1 1.0-2.0 EV16100095-17 9/28/2016 N	TP-34-16 S-4 6.0-7.0 EV16100095-18 9/30/2016 N	TP-34-16 S-5 10.0-11.0 EV16100095-19 9/30/2016 N	TP-34A-16 S-1 0-3.0 EV16100095-20 9/30/2016 N
<b>Petroleum Hydrocarbons (mg/kg; NWTPH-dx)</b>											
Diesel Range Organics	--	--	--	--	--	--	--	--	--	--	--
Oil Range Organics	--	--	--	--	--	--	--	--	--	--	--
<b>TCLP Metals (mg/L; SW-846 7470/6020)</b>											
Mercury	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U	0.00020 U
Arsenic	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Barium	<b>0.18</b>	<b>0.27</b>	<b>0.23</b>	<b>0.19</b>	<b>0.21</b>	<b>0.27</b>	<b>0.33</b>	<b>0.20</b>	<b>0.28</b>	<b>0.20</b>	<b>0.25</b>
Cadmium	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Chromium	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Lead	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	<b>0.025</b>
Selenium	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Silver	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
<b>Gross Heating Value (BTU/lb; ASTM D5865)</b>											
Heating Value	<b>9,200</b>	<b>5,500</b>	<b>4,600</b>	<b>7,300</b>	<b>9,000</b>	<b>7,100</b>	<b>8,500</b>	<b>4,400</b>	<b>7,000</b>	<b>9,600</b>	<b>6,600</b>
<b>Chlorine (mg/kg; EPA 9056)</b>											
Chlorine	<b>41</b>	--	--	--	<b>56</b>	--	<b>130</b>	--	--	<b>53</b>	--

**Notes**

**Bold** = detected analyte  
 U = The analyte was not detected at the reported concentration.

**Abbreviations and Acronyms**

-- = not analyzed  
 BTU = British Thermal Unit  
 EPA = US Environmental Protection Agency  
 ft = feet  
 ID = identification  
 lb = pound  
 mg/kg = milligrams per kilogram  
 mg/L = milligrams per liter  
 N = primary sample  
 NWTPH = Northwest Total Petroleum Hydrocarbon  
 TCLP = Toxicity Characteristic Leaching Procedure

**Table 2  
Landfill Gas Monitoring Field Measurements  
Transportation Corridor  
Yakima, Washington**

Monitoring Point	Methane (pbv)				Carbon Dioxide (pbv)				Oxygen (pbv)				Balance Gasses (pbv)				Static Pressure (inches of water)			
	10/13/16	11/16/16	12/21/16	12/29/16	10/13/16	11/16/16	12/21/16	12/29/16	10/13/16	11/16/16	12/21/16	12/29/16	10/13/16	11/16/16	12/21/16	12/29/16	10/13/16	11/16/16	12/21/16	12/29/16
GP-5	17.4	11.0	8.7	9.4	23.0	17.5	16.9	17.2	0.0	0.7	0.0	0.3	59.6	70.9	74.4	73.10	0.03	-0.03	-0.02	0.01
GP-11	24.3	28.1	24.7	24.9	31.3	34.3	32.2	32.3	0.0	0.0	0.0	0.2	44.4	37.6	43.1	42.6	0.03	0.03	0.00	0.00
GP-18	0.0	0.0	0.0	0.0	1.6	2.0	1.5	1.5	20.3	19.3	18.9	19.9	78.0	78.7	79.6	78.5	-0.02	0.02	-0.01	-0.03
GP-19	59.4	58.5	61.9	61.9	40.5	41.5	38.1	37.8	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.05	-0.02	0.01	0.05
GP-28	0.0	0.0	0.0	0.0	19.6	18.8	11.7	11.5	3.3	4.8	9.9	10.2	77.1	76.4	78.3	78.2	-0.02	-0.01	-0.01	-0.01
GP-32	0.0	0.0	0.0	0.0	1.5	1.6	1.2	1.2	20.2	20.0	19.8	20.2	78.3	78.4	79.1	78.5	0.00	0.00	0.02	0.02
GP-33	0.0	0.0	0.0	0.0	9.8	10.8	10.0	10.4	7.3	5.6	4.6	6.5	82.9	83.6	85.4	83.0	0.00	-0.02	0.01	-0.01
GP-34	1.0	0.0	0.0	0.0	7.0	12.9	3.2	3.6	0.0	0.2	16.9	17.5	92.0	86.8	79.9	78.8	-0.01	-0.01	0.00	-0.01
GP-35	10.1	14.9	20.1	20.4	23.5	24.7	25.0	25.6	0.0	0.0	0.0	0.2	66.4	60.4	54.8	53.8	-0.03	0.04	-0.55	0.04
GP-36	19.0	9.9	16.9	11.9	32.6	27.5	26.3	22.0	0.0	0.0	0.0	0.3	48.4	62.5	56.8	65.8	0.00	-0.04	-0.01	-0.01
GP-37	3.8	2.7	1.4	1.3	23.8	25.7	21.7	21.3	0.0	0.0	0.0	0.2	72.4	71.6	76.9	77.2	0.01	0.02	-0.22	0.01
GP-38	60.8	58.8	60.8	58.0	38.1	41.2	39.2	39.1	0.0	0.0	0.0	0.3	1.1	0.0	0.0	2.6	-0.01	-0.02	0.00	0.06
GP-39	61.8	61.1	64.2	63.8	38.2	38.9	35.8	35.8	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.05	-0.04	0.05	12.84
GP-40	58.3	59.0	58.5	60.9	38.9	41.0	33.8	37.1	0.0	0.0	0.0	0.2	2.9	0.0	7.7	1.8	0.12	0.07	0.11	0.09
GP-41	69.2	68.3	57.7	72.4	30.3	31.7	22.9	27.3	0.0	0.0	0.0	0.2	0.6	0.0	19.4	1.8	0.12	0.01	0.11	0.11
GP-42	48.2	63.5	59.3	54.0	36.7	35.9	30.5	29.5	0.0	0.0	0.0	0.3	15.1	0.9	10.2	16.2	0.05	0.02	0.04	9.90
GP-43	60.0	60.6	65.4	65.6	40.0	39.4	34.6	34.1	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.02	-0.05	0.00	0.00
GP-44	0.0	0.0	0.0	0.0	2.3	3.6	3.0	3.0	19.1	17.5	16.6	18.0	78.6	78.9	80.4	78.9	-0.02	0.02	0.00	0.01
Ambient	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	21.7	21.1	19.2	20.9	78.1	78.8	80.7	78.8	0.00	0.01	0.00	0.00

pbv = percent by volume



**Table 3**  
**Landfill Gas Monitoring Data - Analytical Results**  
**Transportation Corridor**  
**Yakima, Washington**

Analyte	Cas No	Sample ID, Laboratory ID, Sample Date, and Results									
		Ambient-11162016 P1605444-003 11/16/2016	Ambient-12292016 P1700001-001 12/29/2016	GP-38-11162016 P1605444-005 11/16/2016	GP-38-12292016 P1700001-002 12/29/2016	GP-39-11162016 P1605444-004 11/16/2016	GP-39-12292016 P1700001-003 12/29/2016	GP-41-11162016 P1605444-002 11/16/2016	GP-41-12292016 P1700001-005 12/29/2016	GP-43-11162016 P1605444-001 11/16/2016	GP-43-12292016 P1700001-004 12/29/2016
<b>ASTM D1946 (% v/v)</b>											
Oxygen	7782-44-7	<b>22.0</b>	<b>22.2</b>	<b>1.72</b>	<b>0.286</b>	0.13 U	0.22 U	<b>0.254</b>	<b>0.376</b>	<b>7.30</b>	<b>0.380</b>
Nitrogen	7727-37-9	<b>77.9</b>	<b>77.8</b>	<b>8.71</b>	<b>5.76</b>	<b>0.668</b>	<b>1.18</b>	<b>10.2</b>	<b>4.02</b>	<b>26.2</b>	<b>2.82</b>
Carbon Monoxide	630-08-0	0.12 U	0.22 U	0.15 U	0.22 U	0.13 U	0.22 U	0.15 U	0.23 U	0.14 U	0.22 U
Methane	74-82-8	0.12 U	0.22 U	<b>55.1</b>	<b>57.9</b>	<b>64.0</b>	<b>66.0</b>	<b>57.5</b>	<b>70.5</b>	<b>42.6</b>	<b>65.9</b>
Carbon Dioxide	124-38-9	0.12 U	0.22 U	<b>34.4</b>	<b>36.0</b>	<b>35.2</b>	<b>32.6</b>	<b>32.0</b>	<b>25.1</b>	<b>23.9</b>	<b>30.8</b>
<b>EPA 25C Modified (ppmV)</b>											
Total Gaseous Nonmethane Organics (TGNMO) as Methane		1.2 U	2.2 U	<b>220</b>	<b>250</b>	<b>630</b>	<b>600</b>	<b>640</b>	<b>310</b>	<b>350</b>	<b>230</b>
<b>ASTM D 5504-12 (µg/m3)</b>											
Hydrogen Sulfide	7783-06-4	8.3 U	15 U	10 U	<b>3,400</b>	<b>14,000</b>	<b>12,000</b>	10 U	<b>640</b>	<b>10,000</b>	<b>5,100</b>
Carbonyl Sulfide	463-58-1	15 U	27 U	<b>63</b>	27 U	16 U	27 U	18 U	28 U	17 U	27 U
Methyl Mercaptan	74-93-1	12 U	22 U	14 U	<b>38</b>	<b>37</b>	22 U	14 U	23 U	<b>59</b>	<b>30</b>
Ethyl Mercaptan	75-08-1	15 U	28 U	19 U	27 U	<b>39</b>	<b>28</b>	19 U	29 U	<b>45</b>	28 U
Dimethyl Sulfide	75-18-3	15 U	28 U	19 U	27 U	17 U	28 U	19 U	29 U	<b>47</b>	<b>110</b>
Carbon Disulfide	75-15-0	9.3 U	17 U	11 U	17 U	10 U	17 U	11 U	<b>110</b>	11 U	17 U
Isopropyl Mercaptan	75-33-2	19 U	34 U	23 U	34 U	21 U	34 U	23 U	36 U	21 U	34 U
tert-Butyl Mercaptan	75-66-1	22 U	41 U	27 U	40 U	25 U	40 U	27 U	42 U	25 U	41 U
n-Propyl Mercaptan	107-03-9	19 U	34 U	23 U	34 U	21 U	34 U	23 U	36 U	21 U	34 U
Ethyl Methyl Sulfide	624-89-5	19 U	34 U	23 U	34 U	21 U	34 U	23 U	36 U	21 U	34 U
Thiophene	110-02-1	20 U	38 U	25 U	37 U	23 U	38 U	25 U	39 U	24 U	38 U
Isobutyl Mercaptan	513-44-0	22 U	41 U	27 U	40 U	25 U	40 U	27 U	42 U	25 U	41 U
Diethyl Sulfide	352-93-2	22 U	41 U	27 U	40 U	25 U	40 U	27 U	42 U	25 U	41 U
n-Butyl Mercaptan	109-79-5	22 U	41 U	27 U	40 U	25 U	40 U	27 U	42 U	25 U	41 U
Dimethyl Disulfide	624-92-0	11 U	21 U	14 U	21 U	13 U	21 U	14 U	22 U	13 U	21 U
3-Methylthiophene	616-44-4	24 U	44 U	29 U	43 U	27 U	44 U	29 U	46 U	28 U	44 U
Tetrahydrothiophene	110-01-0	21 U	40 U	26 U	39 U	24 U	39 U	26 U	41 U	25 U	40 U
2,5-Dimethylthiophene	638-02-8	27 U	50 U	33 U	50 U	31 U	50 U	34 U	53 U	32 U	51 U
2-Ethylthiophene	872-55-9	27 U	50 U	33 U	50 U	31 U	50 U	34 U	53 U	32 U	51 U
Diethyl Disulfide	110-81-6	15 U	27 U	18 U	27 U	17 U	27 U	18 U	29 U	17 U	28 U
<b>EPA TO-15 Modified (µg/m<sup>3</sup>)</b>											
Propene	115-07-1	<b>1.3</b>	<b>3.4</b>	<b>800</b>	<b>870</b>	<b>800</b>	<b>1,200</b>	<b>500</b>	<b>1,500</b>	<b>800</b>	<b>1,200</b>
Dichlorodifluoromethane (CFC 12)	75-71-8	<b>2.2</b>	<b>2.1</b>	<b>110</b>	<b>53</b>	<b>970</b>	<b>1,100</b>	<b>1,100</b>	<b>4,100</b>	<b>1,600</b>	<b>1,500</b>
Chloromethane	74-87-3	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,2-Dichloro-1,1,2,2-Tetrafluoroethane (CFC 114)	76-14-2	0.60 U	1.1 U	<b>1,400</b>	<b>1,100</b>	<b>1,100</b>	<b>1,300</b>	<b>980</b>	<b>2,900</b>	<b>980</b>	<b>1,200</b>
Vinyl Chloride	75-01-4	0.60 U	1.1 U	<b>90</b>	<b>78</b>	<b>6,600</b>	<b>11,000</b>	<b>3,700</b>	<b>9,400</b>	<b>3,900</b>	<b>5,400</b>
1,3-Butadiene	106-99-0	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Bromomethane	74-83-9	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Chloroethane	75-00-3	0.60 U	1.1 U	37 U	<b>26</b>	170 U	<b>83</b>	150 U	57 U	69 U	37 U
Ethanol	64-17-5	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	690 U	370 U
Acetonitrile	75-05-8	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U

**Table 3**  
**Landfill Gas Monitoring Data - Analytical Results**  
**Transportation Corridor**  
**Yakima, Washington**

Analyte	Cas No	Sample ID, Laboratory ID, Sample Date, and Results									
		Ambient-11162016 P1605444-003 11/16/2016	Ambient-12292016 P1700001-001 12/29/2016	GP-38-11162016 P1605444-005 11/16/2016	GP-38-12292016 P1700001-002 12/29/2016	GP-39-11162016 P1605444-004 11/16/2016	GP-39-12292016 P1700001-003 12/29/2016	GP-41-11162016 P1605444-002 11/16/2016	GP-41-12292016 P1700001-005 12/29/2016	GP-43-11162016 P1605444-001 11/16/2016	GP-43-12292016 P1700001-004 12/29/2016
Acrolein	107-02-8	2.4 U	4.4 U	150 U	43 U	670 U	220 U	590 U	230 U	280 U	150 U
Acetone	67-64-1	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	<b>4,200</b>	<b>970</b>
Trichlorofluoromethane	75-69-4	<b>1.1</b>	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	<b>510</b>	<b>430</b>
2-Propanol (Isopropyl Alcohol)	67-63-0	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	<b>1,700</b>	370 U
Acrylonitrile	107-13-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,1-Dichloroethene	75-35-4	0.60 U	1.1 U	37 U	<b>11</b>	170 U	55 U	150 U	57 U	<b>99</b>	<b>81</b>
Methylene Chloride	75-09-2	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	<b>110</b>	<b>85</b>
3-Chloro-1-propene (Allyl Chloride)	107-05-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Trichlorotrifluoroethane	76-13-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Carbon Disulfide	75-15-0	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	690 U	370 U
trans-1,2-Dichloroethene	156-60-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	<b>150</b>	<b>120</b>
1,1-Dichloroethane	75-34-3	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Methyl tert-Butyl Ether	1634-04-4	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Vinyl Acetate	108-05-4	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	690 U	370 U
2-Butanone (MEK)	78-93-3	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	<b>5,500</b>	<b>1,500</b>
cis-1,2-Dichloroethene	156-59-2	0.60 U	1.1 U	37 U	<b>21</b>	<b>1,500</b>	<b>380</b>	<b>970</b>	<b>97</b>	<b>5,100</b>	<b>2,800</b>
Ethyl Acetate	141-78-6	1.2 U	<b>3.3</b>	73 U	22 U	340 U	110 U	290 U	110 U	140 U	74 U
n-Hexane	110-54-3	0.60 U	1.1 U	<b>830</b>	<b>920</b>	<b>820</b>	<b>840</b>	<b>400</b>	<b>620</b>	<b>660</b>	<b>580</b>
Chloroform	67-66-3	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Tetrahydrofuran (THF)	109-99-9	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	<b>1,100</b>	<b>910</b>
1,2-Dichloroethane	107-06-2	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,1,1-Trichloroethane	71-55-6	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Benzene	71-43-2	<b>0.60</b>	1.1 U	<b>78</b>	<b>70</b>	<b>410</b>	<b>450</b>	<b>220</b>	<b>490</b>	<b>370</b>	<b>340</b>
Carbon Tetrachloride	56-23-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Cyclohexane	110-82-7	1.2 U	2.2 U	<b>1,800</b>	<b>2,200</b>	<b>2,800</b>	<b>3,000</b>	<b>320</b>	<b>410</b>	<b>580</b>	<b>500</b>
1,2-Dichloropropane	78-87-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Bromodichloromethane	75-27-4	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Trichloroethene	79-01-6	0.60 U	1.1 U	37 U	<b>19</b>	170 U	<b>77</b>	150 U	57 U	<b>460</b>	<b>450</b>
1,4-Dioxane	123-91-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Methyl Methacrylate	80-62-6	1.2 U	2.2 U	73 U	22 U	340 U	110 U	290 U	110 U	140 U	74 U
n-Heptane	142-82-5	0.60 U	1.1 U	<b>2,200</b>	<b>3,100</b>	<b>2,000</b>	<b>2,400</b>	<b>490</b>	<b>920</b>	<b>2,000</b>	<b>1,900</b>
cis-1,3-Dichloropropene	10061-01-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
4-Methyl-2-pentanone	108-10-1	0.60 U	1.1 U	37 U	11 U	170 U	<b>78</b>	150 U	57 U	<b>1,000</b>	<b>630</b>
trans-1,3-Dichloropropene	10061-02-6	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,1,2-Trichloroethane	79-00-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Toluene	108-88-3	<b>2.2</b>	1.1 U	<b>110</b>	<b>54</b>	<b>1,900</b>	<b>1,400</b>	<b>260</b>	<b>550</b>	<b>8,400</b>	<b>6,300</b>
2-Hexanone	591-78-6	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Dibromochloromethane	124-48-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,2-Dibromoethane	106-93-4	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
n-Butyl Acetate	123-86-4	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
n-Octane	111-65-9	0.60 U	1.1 U	<b>490</b>	<b>260</b>	<b>1,700</b>	<b>1,900</b>	<b>320</b>	<b>1,800</b>	<b>1,800</b>	<b>1,500</b>

**Table 3**  
**Landfill Gas Monitoring Data - Analytical Results**  
**Transportation Corridor**  
**Yakima, Washington**

Analyte	Cas No	Sample ID, Laboratory ID, Sample Date, and Results									
		Ambient-11162016 P1605444-003 11/16/2016	Ambient-12292016 P1700001-001 12/29/2016	GP-38-11162016 P1605444-005 11/16/2016	GP-38-12292016 P1700001-002 12/29/2016	GP-39-11162016 P1605444-004 11/16/2016	GP-39-12292016 P1700001-003 12/29/2016	GP-41-11162016 P1605444-002 11/16/2016	GP-41-12292016 P1700001-005 12/29/2016	GP-43-11162016 P1605444-001 11/16/2016	GP-43-12292016 P1700001-004 12/29/2016
Tetrachloroethene	127-18-4	0.60 U	1.1 U	37 U	11 U	170 U	<b>67</b>	<b>230</b>	57 U	<b>810</b>	<b>640</b>
Chlorobenzene	108-90-7	0.60 U	1.1 U	37 U	<b>190</b>	170 U	55 U	150 U	57 U	<b>96</b>	37 U
Ethylbenzene	100-41-4	0.60 U	1.1 U	<b>38</b>	<b>62</b>	<b>3,800</b>	<b>4,200</b>	150 U	<b>910</b>	<b>4,500</b>	<b>3,800</b>
m,p-Xylenes	179601-23-1	1.2 U	2.2 U	<b>1,200</b>	<b>440</b>	<b>7,600</b>	<b>8,600</b>	290 U	<b>2,200</b>	<b>8,600</b>	<b>7,400</b>
Bromoform	75-25-2	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Styrene	100-42-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	<b>160</b>	<b>96</b>
o-Xylene	95-47-6	0.60 U	1.1 U	<b>430</b>	<b>130</b>	<b>2,800</b>	<b>3,200</b>	150 U	<b>910</b>	<b>2,200</b>	<b>1,800</b>
n-Nonane	111-84-2	0.60 U	1.1 U	<b>140</b>	<b>200</b>	<b>13,000</b>	<b>15,000</b>	<b>480</b>	<b>9,800</b>	<b>3,200</b>	<b>3,200</b>
1,1,2,2-Tetrachloroethane	79-34-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Cumene	98-82-8	0.60 U	1.1 U	37 U	<b>300</b>	<b>690</b>	<b>780</b>	150 U	<b>240</b>	<b>750</b>	<b>550</b>
alpha-Pinene	80-56-8	0.60 U	1.1 U	<b>110</b>	<b>65</b>	<b>1,200</b>	<b>1,300</b>	150 U	<b>1,300</b>	<b>4,100</b>	<b>4,300</b>
n-Propylbenzene	103-65-1	0.60 U	1.1 U	37 U	<b>170</b>	<b>1,000</b>	<b>1,300</b>	150 U	<b>240</b>	<b>690</b>	<b>560</b>
4-Ethyltoluene	622-96-8	0.60 U	1.1 U	<b>51</b>	<b>28</b>	<b>470</b>	<b>570</b>	150 U	<b>91</b>	<b>290</b>	<b>260</b>
1,3,5-Trimethylbenzene	108-67-8	0.60 U	1.1 U	<b>220</b>	<b>110</b>	<b>1,500</b>	<b>1,800</b>	150 U	<b>520</b>	<b>550</b>	<b>450</b>
1,2,4-Trimethylbenzene	95-63-6	0.60 U	1.1 U	<b>260</b>	<b>270</b>	<b>3,400</b>	<b>3,800</b>	150 U	<b>920</b>	<b>1,500</b>	<b>1,300</b>
Benzyl Chloride	100-44-7	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,3-Dichlorobenzene	541-73-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,4-Dichlorobenzene	106-46-7	0.60 U	1.1 U	<b>61</b>	<b>100</b>	170 U	<b>69</b>	150 U	57 U	69 U	37 U
1,2-Dichlorobenzene	95-50-1	0.60 U	1.1 U	37 U	<b>22</b>	170 U	<b>79</b>	150 U	<b>76</b>	69 U	37 U
d-Limonene	5989-27-5	0.60 U	1.1 U	37 U	11 U	<b>620</b>	<b>620</b>	150 U	<b>90</b>	<b>8,000</b>	<b>6,900</b>
1,2-Dibromo-3-chloropropane	96-12-8	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,2,4-Trichlorobenzene	120-82-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Naphthalene	91-20-3	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Hexachlorobutadiene	87-68-3	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U

Nondetected compound show the method detection limit (MDL) as the reporting limit.

J = Indicates the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

J1 = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.

U = Indicates the compound was not detected at the reported concentration.

Bold = Detected compound.

Box = Exceedance of screening level.

NA = Not analyzed.

EPA = U.S. Environmental Protection Agency

µg/m³ = micrograms per cubic meter

SIM = selected ion monitoring

# Test Pit Boring Logs

# Soil Classification System

	MAJOR DIVISIONS	GRAPHIC SYMBOL	LETTER SYMBOL <sup>(1)</sup>	TYPICAL DESCRIPTIONS <sup>(2)(3)</sup>
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL  (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		<b>GW</b> Well-graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		<b>GP</b> Poorly graded gravel; gravel/sand mixture(s); little or no fines
		SAND AND SANDY SOIL  (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)	
	SAND WITH FINES (Appreciable amount of fines)			<b>GC</b> Clayey gravel; gravel/sand/clay mixture(s)
				<b>SW</b> Well-graded sand; gravelly sand; little or no fines
		<b>SP</b> Poorly graded sand; gravelly sand; little or no fines		
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY  (Liquid limit less than 50)		<b>SM</b> Silty sand; sand/silt mixture(s)	
			<b>SC</b> Clayey sand; sand/clay mixture(s)	
			<b>ML</b> Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity	
	SILT AND CLAY  (Liquid limit greater than 50)		<b>CL</b> Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay	
			<b>OL</b> Organic silt; organic, silty clay of low plasticity	
			<b>MH</b> Inorganic silt; micaceous or diatomaceous fine sand	
			<b>CH</b> Inorganic clay of high plasticity; fat clay	
	<b>OH</b> Organic clay of medium to high plasticity; organic silt			
HIGHLY ORGANIC SOIL		<b>PT</b> Peat; humus; swamp soil with high organic content		

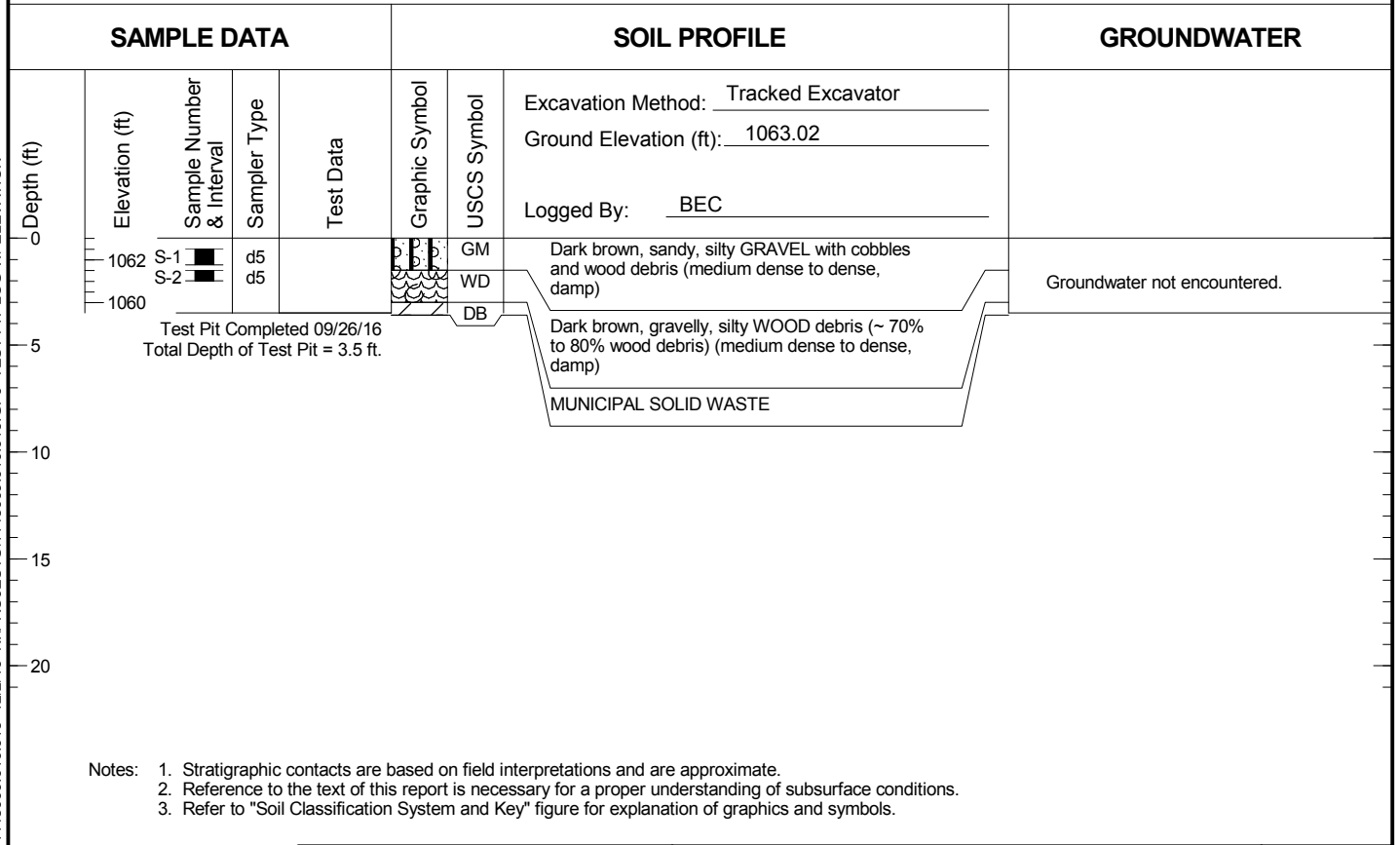
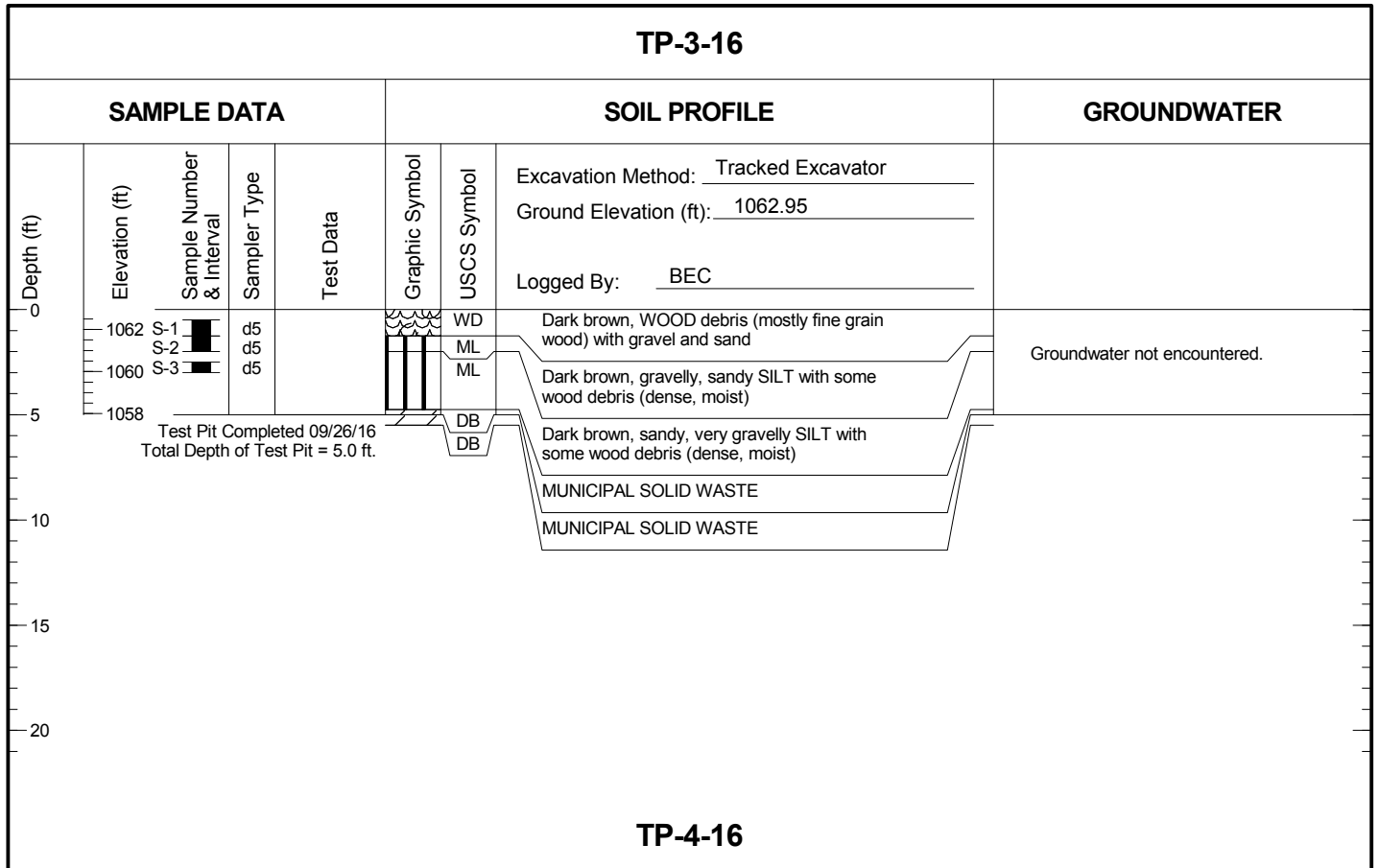
OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		<b>AC or PC</b>	Asphalt concrete pavement or Portland cement pavement
ROCK		<b>RK</b>	Rock (See Rock Classification)
WOOD		<b>WD</b>	Wood, lumber, wood chips
DEBRIS		<b>DB</b>	Construction debris, garbage

- Notes:
- USCS letter symbols correspond to symbols used by the Unified Soil Classification System and ASTM classification methods. Dual letter symbols (e.g., SP-SM for sand or gravel) indicate soil with an estimated 5-15% fines. Multiple letter symbols (e.g., ML/CL) indicate borderline or multiple soil classifications.
  - Soil descriptions are based on the general approach presented in the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the Standard Test Method for Classification of Soils for Engineering Purposes, as outlined in ASTM D 2487.
  - Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:
    - Primary Constituent: > 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
    - Secondary Constituents: > 30% and ≤ 50% - "very gravelly," "very sandy," "very silty," etc.  
> 15% and ≤ 30% - "gravelly," "sandy," "silty," etc.
    - Additional Constituents: > 5% and ≤ 15% - "with gravel," "with sand," "with silt," etc.  
≤ 5% - "with trace gravel," "with trace sand," "with trace silt," etc., or not noted.
  - Soil density or consistency descriptions are based on judgement using a combination of sampler penetration blow counts, drilling or excavating conditions, field tests, and laboratory tests, as appropriate.

Drilling and Sampling Key		Field and Lab Test Data																																																				
SAMPLER TYPE	SAMPLE NUMBER & INTERVAL																																																					
<table border="0" style="width: 100%;"> <tr> <th style="text-align: left;">Code</th> <th style="text-align: left;">Description</th> </tr> <tr><td>a</td><td>3.25-inch O.D., 2.42-inch I.D. Split Spoon</td></tr> <tr><td>b</td><td>2.00-inch O.D., 1.50-inch I.D. Split Spoon</td></tr> <tr><td>c</td><td>Shelby Tube</td></tr> <tr><td>d</td><td>Grab Sample</td></tr> <tr><td>e</td><td>Single-Tube Core Barrel</td></tr> <tr><td>f</td><td>Double-Tube Core Barrel</td></tr> <tr><td>g</td><td>2.50-inch O.D., 2.00-inch I.D. WSDOT</td></tr> <tr><td>h</td><td>3.00-inch O.D., 2.375-inch I.D. Mod. California</td></tr> <tr><td>i</td><td>Other - See text if applicable</td></tr> <tr><td>1</td><td>300-lb Hammer, 30-inch Drop</td></tr> <tr><td>2</td><td>140-lb Hammer, 30-inch Drop</td></tr> <tr><td>3</td><td>Pushed</td></tr> <tr><td>4</td><td>Vibrocore (Rotasonic/Geoprobe)</td></tr> <tr><td>5</td><td>Other - See text if applicable</td></tr> </table>	Code	Description	a	3.25-inch O.D., 2.42-inch I.D. Split Spoon	b	2.00-inch O.D., 1.50-inch I.D. Split Spoon	c	Shelby Tube	d	Grab Sample	e	Single-Tube Core Barrel	f	Double-Tube Core Barrel	g	2.50-inch O.D., 2.00-inch I.D. WSDOT	h	3.00-inch O.D., 2.375-inch I.D. Mod. California	i	Other - See text if applicable	1	300-lb Hammer, 30-inch Drop	2	140-lb Hammer, 30-inch Drop	3	Pushed	4	Vibrocore (Rotasonic/Geoprobe)	5	Other - See text if applicable		<table border="0" style="width: 100%;"> <tr> <th style="text-align: left;">Code</th> <th style="text-align: left;">Description</th> </tr> <tr><td>PP = 1.0</td><td>Pocket Penetrometer, tsf</td></tr> <tr><td>TV = 0.5</td><td>Torvane, tsf</td></tr> <tr><td>PID = 100</td><td>Photoionization Detector VOC screening, ppm</td></tr> <tr><td>W = 10</td><td>Moisture Content, %</td></tr> <tr><td>D = 120</td><td>Dry Density, pcf</td></tr> <tr><td>-200 = 60</td><td>Material smaller than No. 200 sieve, %</td></tr> <tr><td>GS</td><td>Grain Size - See separate figure for data</td></tr> <tr><td>AL</td><td>Atterberg Limits - See separate figure for data</td></tr> <tr><td>GT</td><td>Other Geotechnical Testing</td></tr> <tr><td>CA</td><td>Chemical Analysis</td></tr> </table>	Code	Description	PP = 1.0	Pocket Penetrometer, tsf	TV = 0.5	Torvane, tsf	PID = 100	Photoionization Detector VOC screening, ppm	W = 10	Moisture Content, %	D = 120	Dry Density, pcf	-200 = 60	Material smaller than No. 200 sieve, %	GS	Grain Size - See separate figure for data	AL	Atterberg Limits - See separate figure for data	GT	Other Geotechnical Testing	CA	Chemical Analysis
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Approximate water level at time of drilling (ATD)																																																						
Approximate water level at time other than ATD																																																						



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

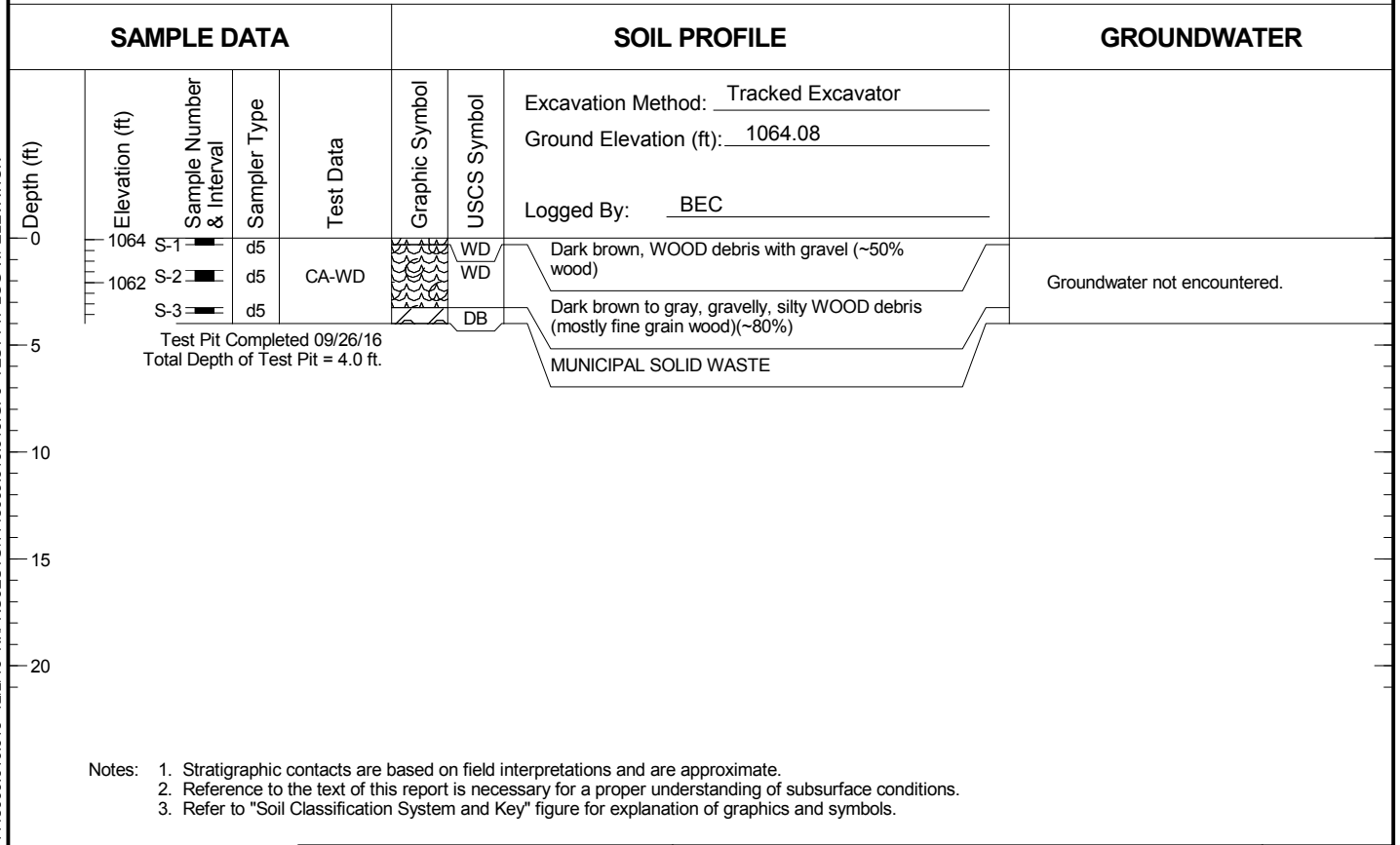
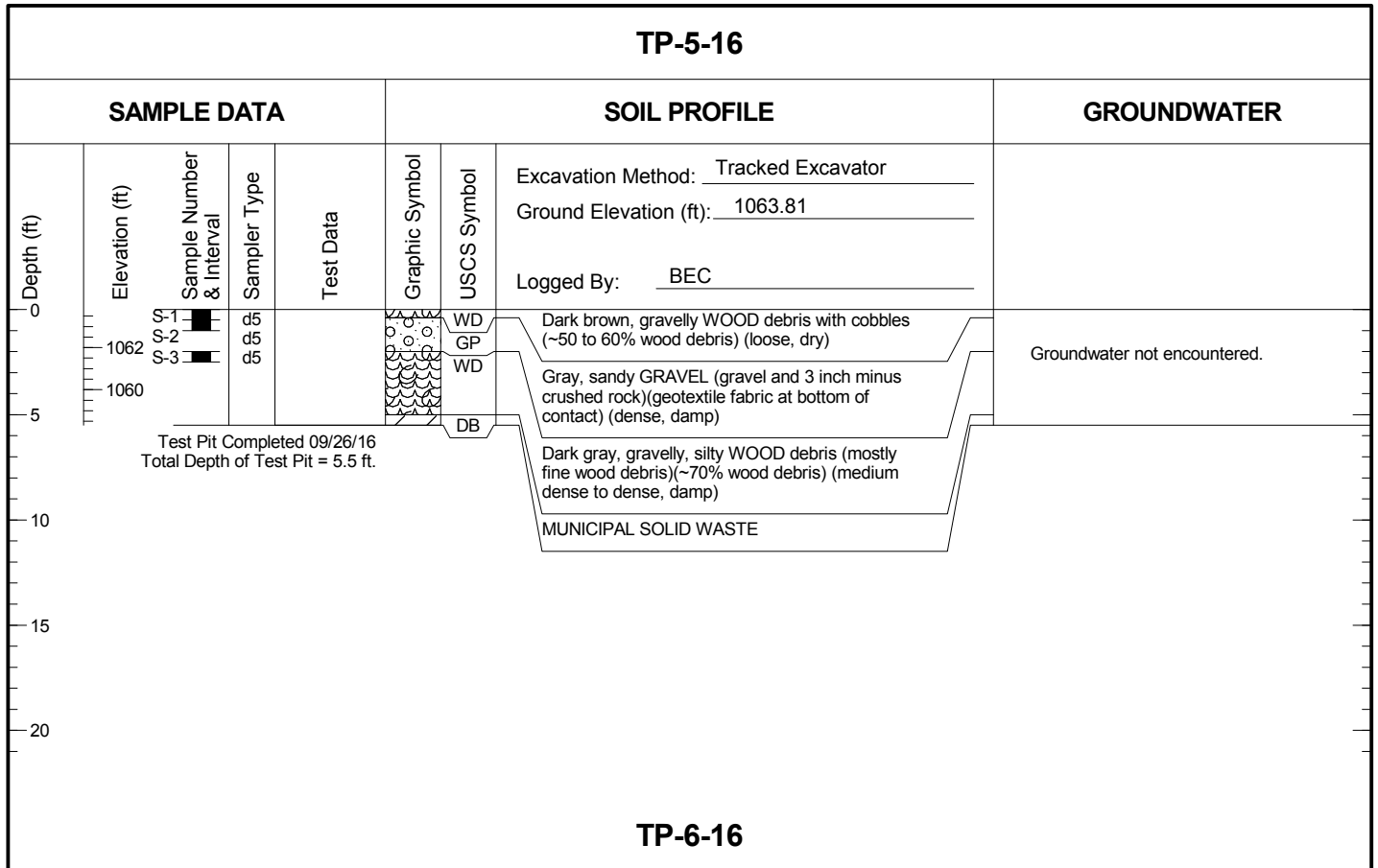


Transportation Corridor Project  
Yakima, Washington

Log of Test Pits

Figure  
**A-3**

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION



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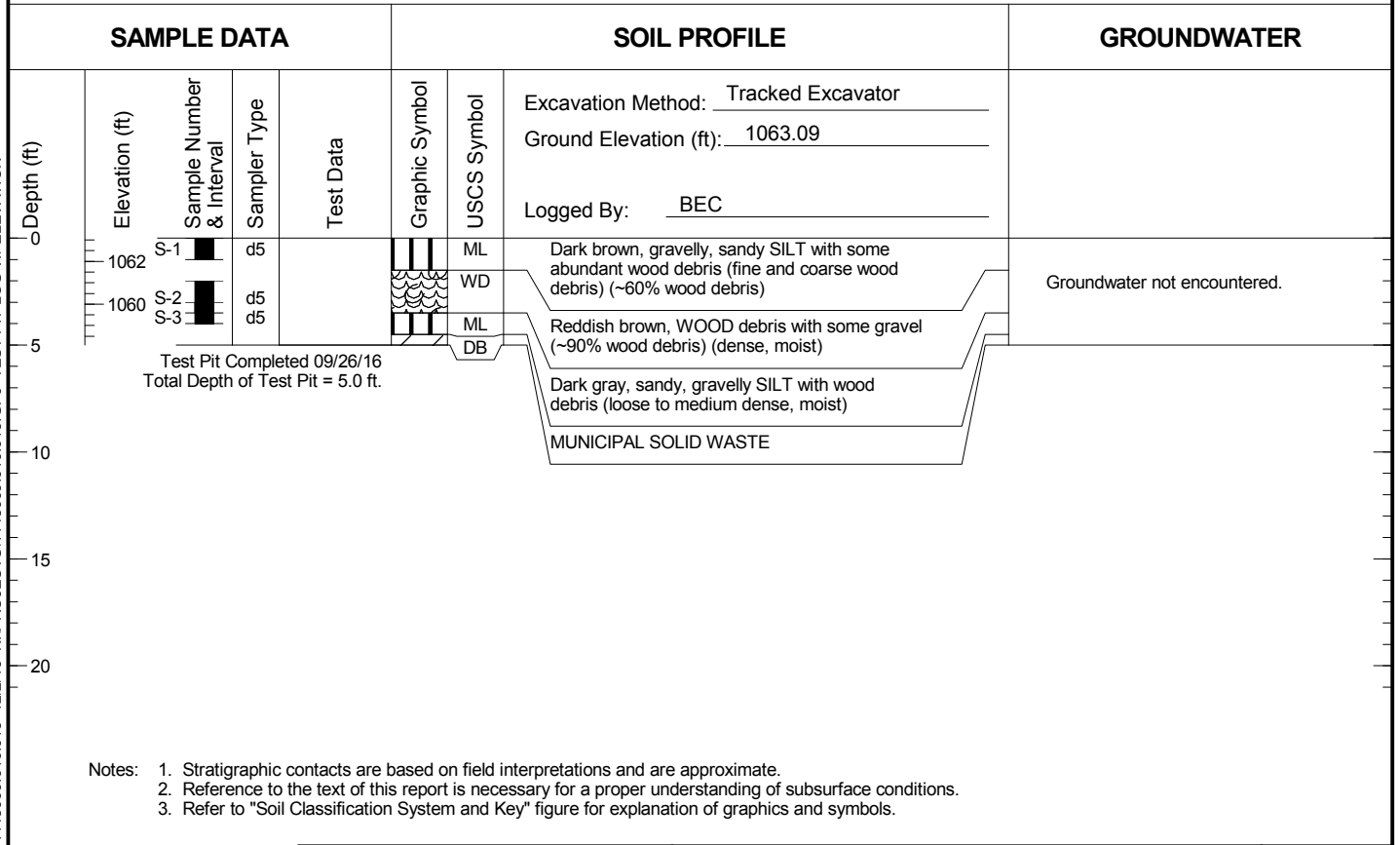
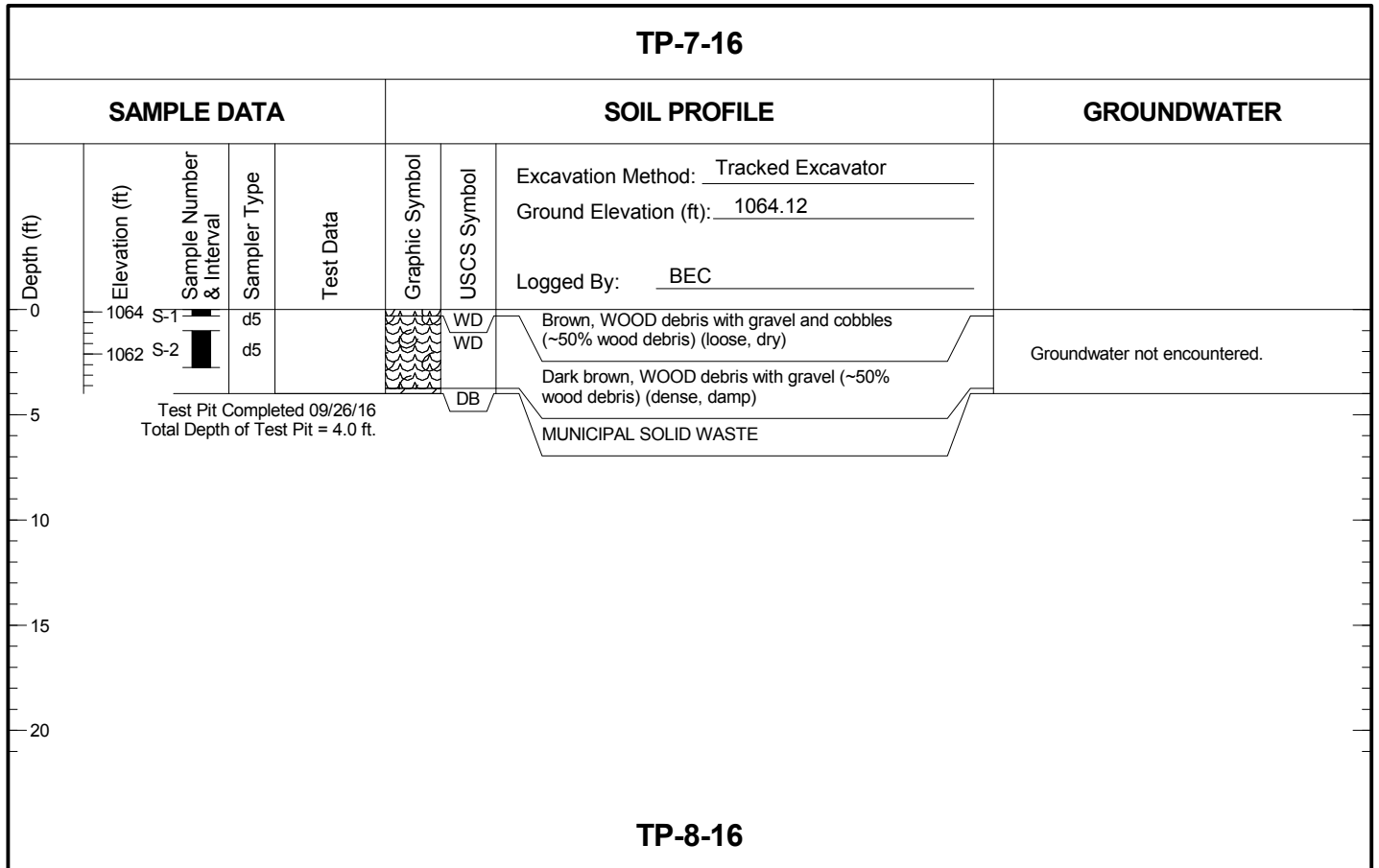
Transportation Corridor Project  
Yakima, Washington

Log of Test Pits

Figure  
**A-4**



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1. Stratigraphic contacts are based on field interpretations and are approximate.
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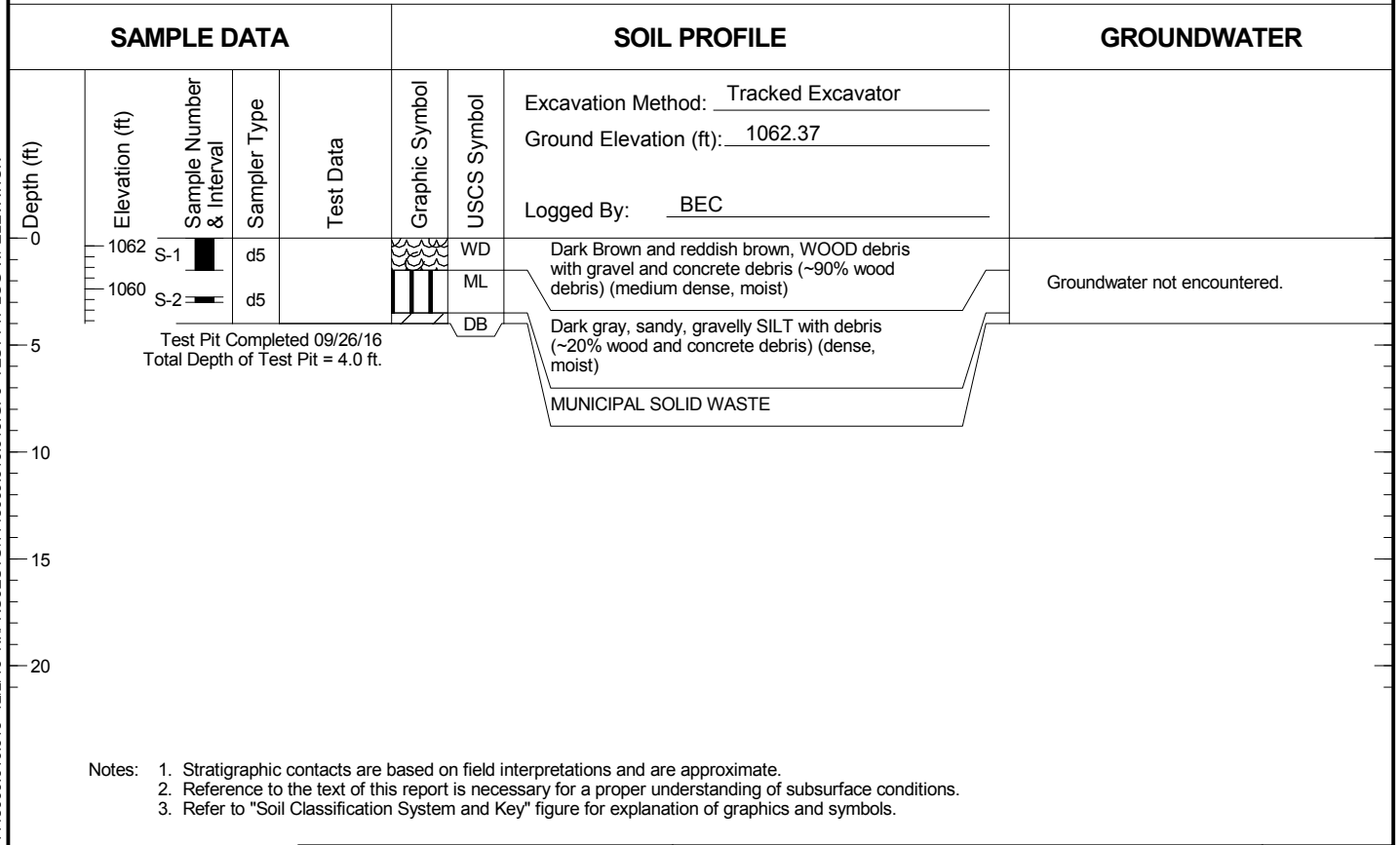
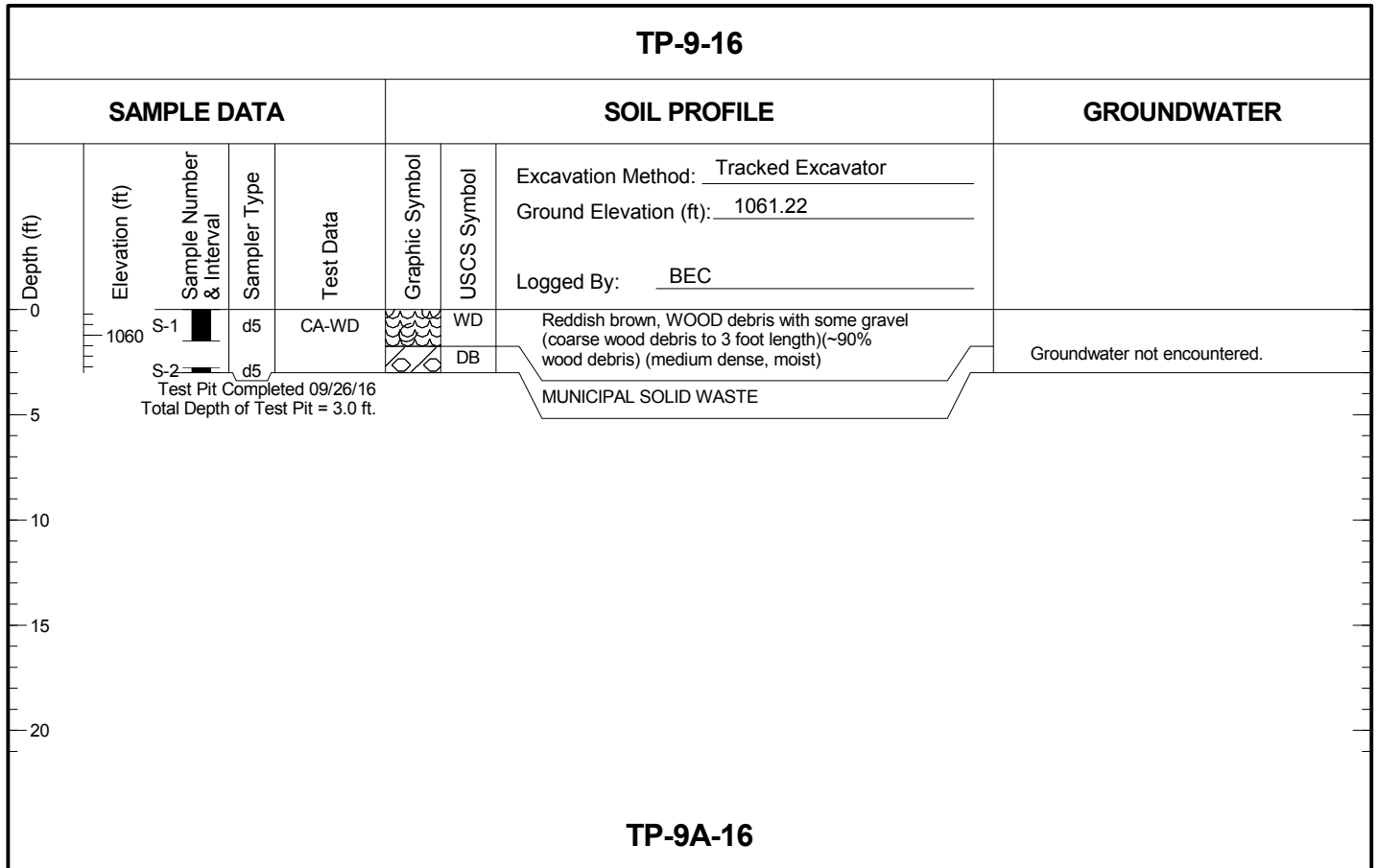


Transportation Corridor Project  
 Yakima, Washington

Log of Test Pits

Figure  
**A-5**

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION



- Notes:
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  2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
  3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.



Transportation Corridor Project  
Yakima, Washington

Log of Test Pits

Figure  
**A-6**

### TP-9B-16

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: <u>Tracked Excavator</u> Ground Elevation (ft): <u>1064.69</u>  Logged By: <u>BEC</u>
	1064	S-1 0-5	d5	CA-WD		GM	Brown, sandy, very silty GRAVEL with abundant wood debris (dense, dry to damp)
1062	S-2	d5	WD			Brown, gravelly, sandy WOOD debris (dense, moist)	
1060	S-3	d5	WD			Brown, WOOD debris (~70% shavings and 30% sawdust size wood debris)	
1058	S-4	d5	WD			WOOD debris (~10 to 15% bark, 25% sawdust, and 60% shaving size wood debris)	
1056	S-6	d5	WD			WOOD debris (~10 to 15% bark, 25% sawdust, and 60% shaving size wood debris)	
1052	S-6	d5	WD			WOOD debris (~10 to 15% bark, 25% sawdust, and 60% shaving size wood debris)	
1050	S-6	d5	WD	WOOD debris (~10 to 15% bark, 25% sawdust, and 60% shaving size wood debris)	Groundwater not encountered.		
Test Pit Completed 09/29/16 Total Depth of Test Pit = 16.5 ft.							

### TP-9C-16

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: <u>Tracked Excavator</u> Ground Elevation (ft): <u>1064.65</u>  Logged By: <u>BEC</u>
	1064	S-1	d5	CA-WD		WD	Brown, WOOD debris with gravel and sand (~80% bark and 15% shaving size wood debris) (dense, dry)
1062	S-2	d5	WD			Brown, WOOD debris with gravel (~90% shaving and sawdust size wood debris) (medium dense to dense, damp)	
1060	S-3	d5	WD			- numerous logs from 7 to 15 feet	
1058	S-4	d5	WD			Brown, WOOD debris (~ 80% chips and 20% shavings size wood debris)	
1056	S-5	d5	WD			Brown, WOOD debris (~ 50% sawdust and 50% shavings size wood debris)	
1052	S-6	d5	WD			Brown, WOOD debris (~ 50% sawdust and 50% shavings size wood debris)	
1050	S-6	d5	WD	Brown, WOOD debris (~ 50% sawdust and 50% shavings size wood debris)	Groundwater not encountered.		
Test Pit Completed 09/30/16 Total Depth of Test Pit = 15.0 ft.							

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

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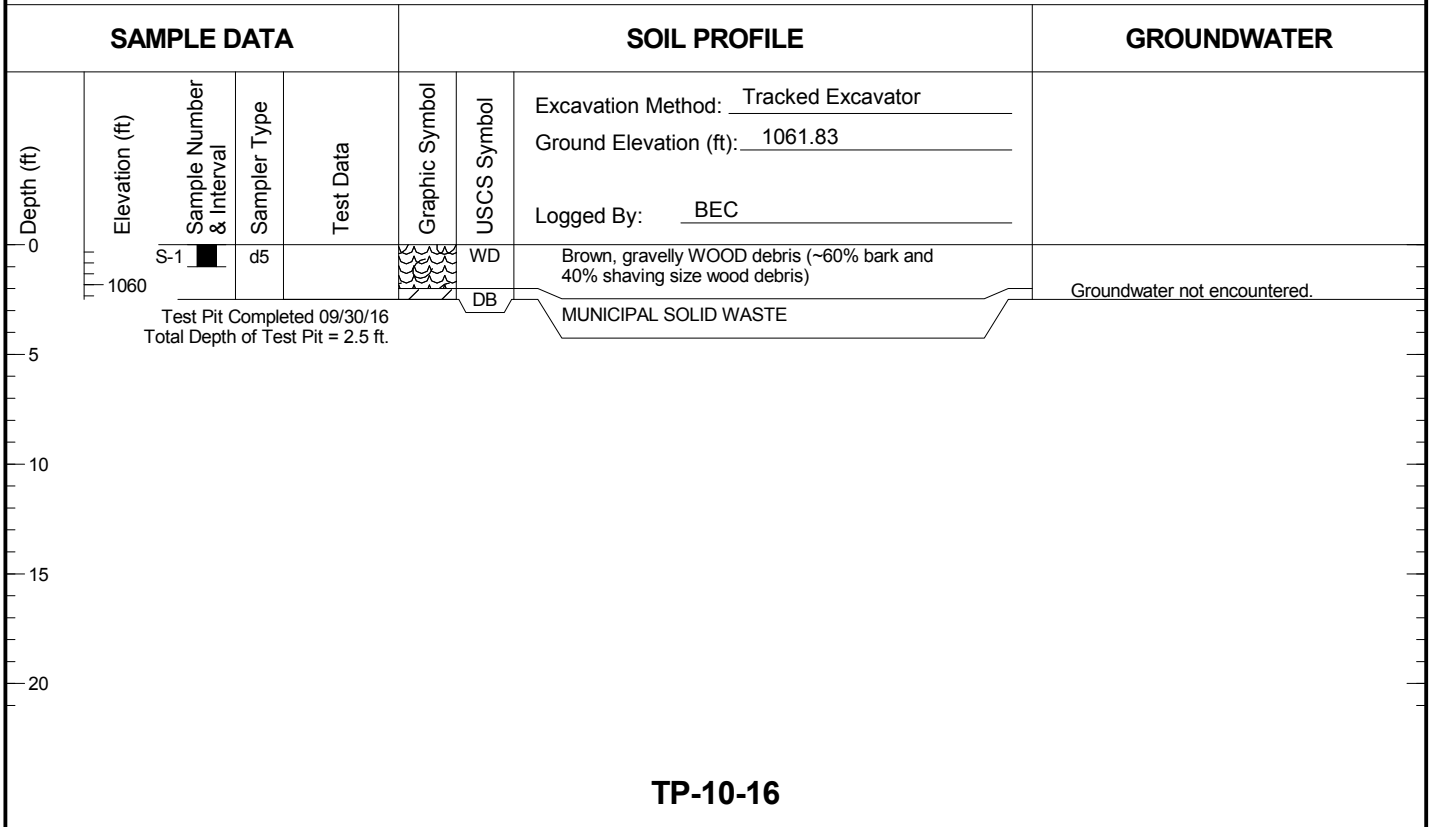


Transportation Corridor Project  
Yakima, Washington

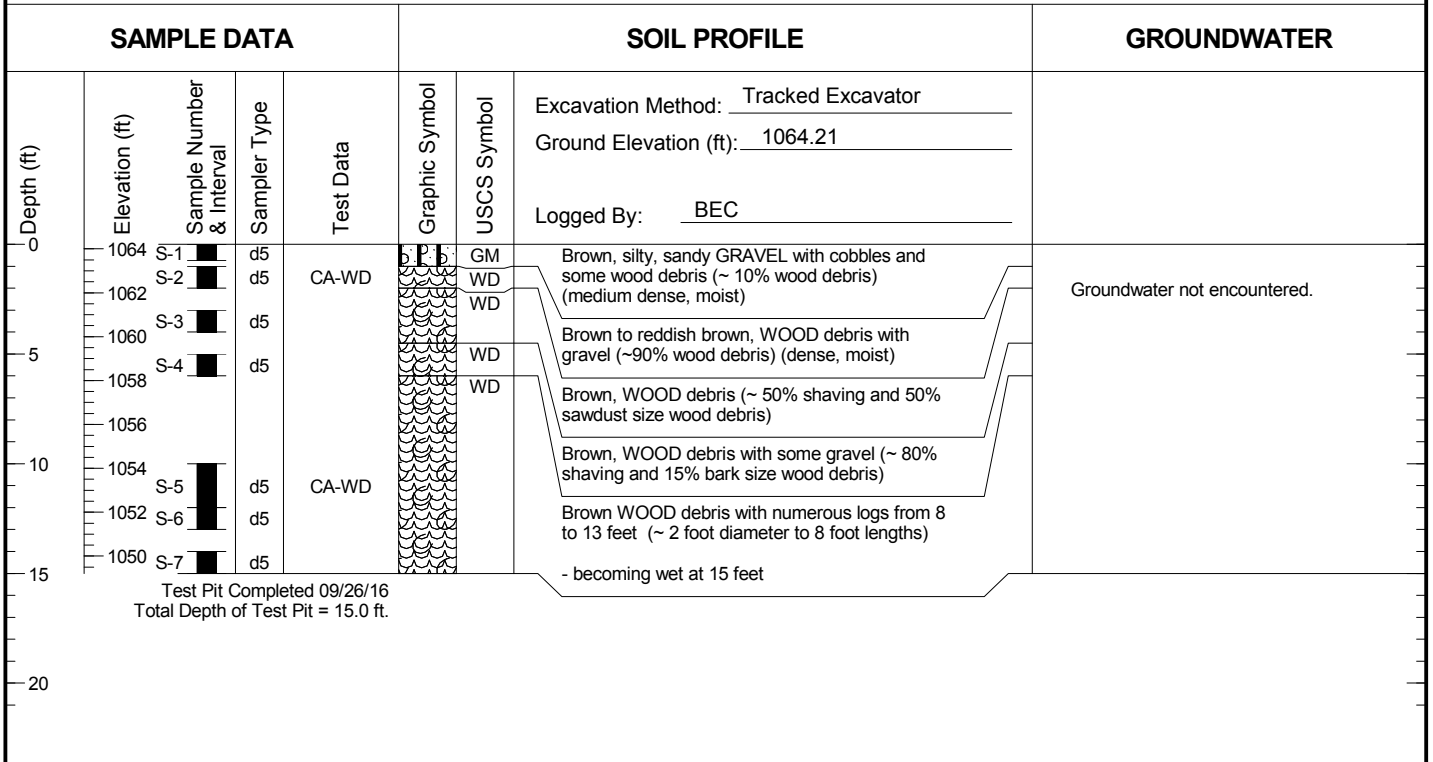
Log of Test Pits

Figure  
**A-7**

**TP-09D-16**



**TP-10-16**



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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION

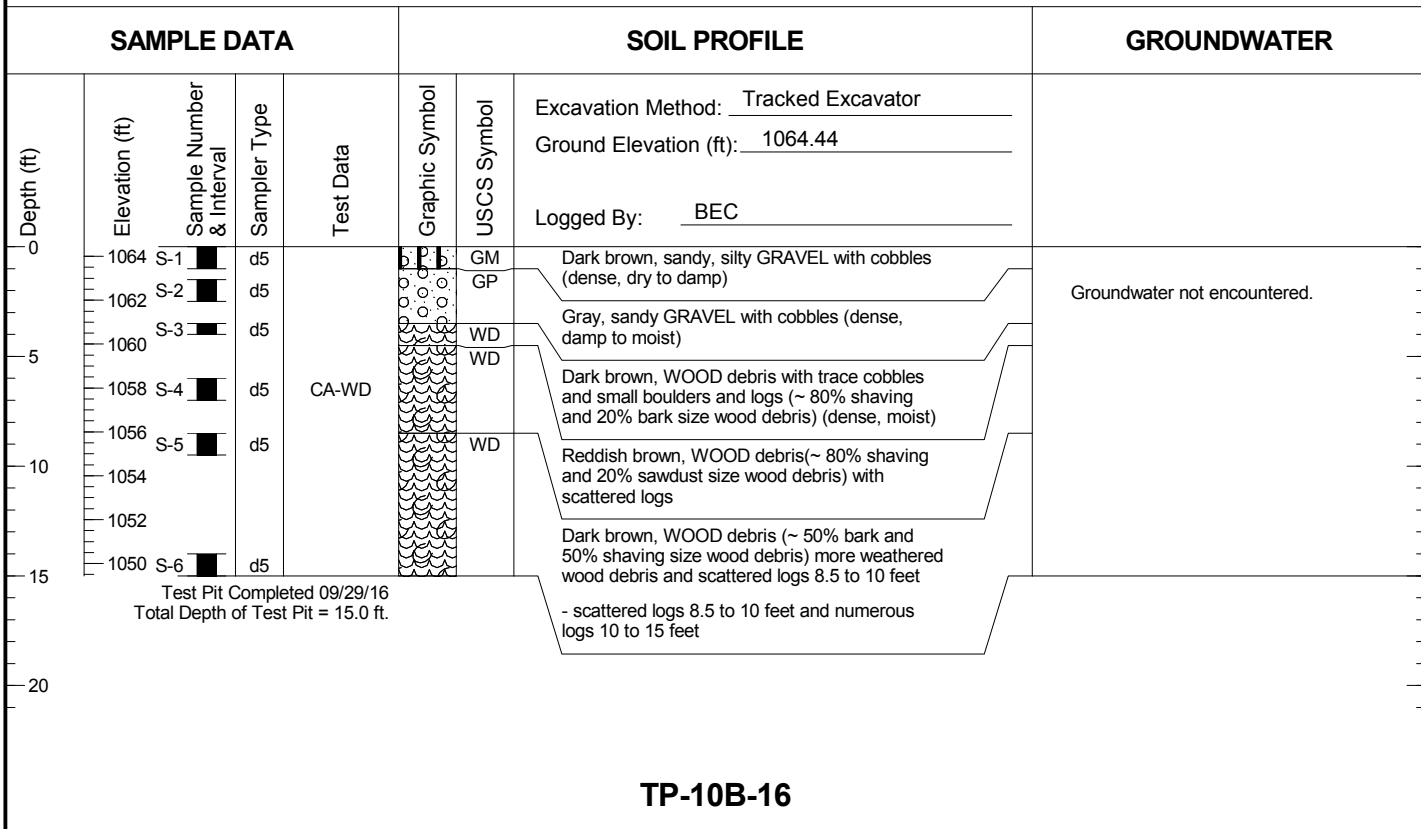


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Yakima, Washington

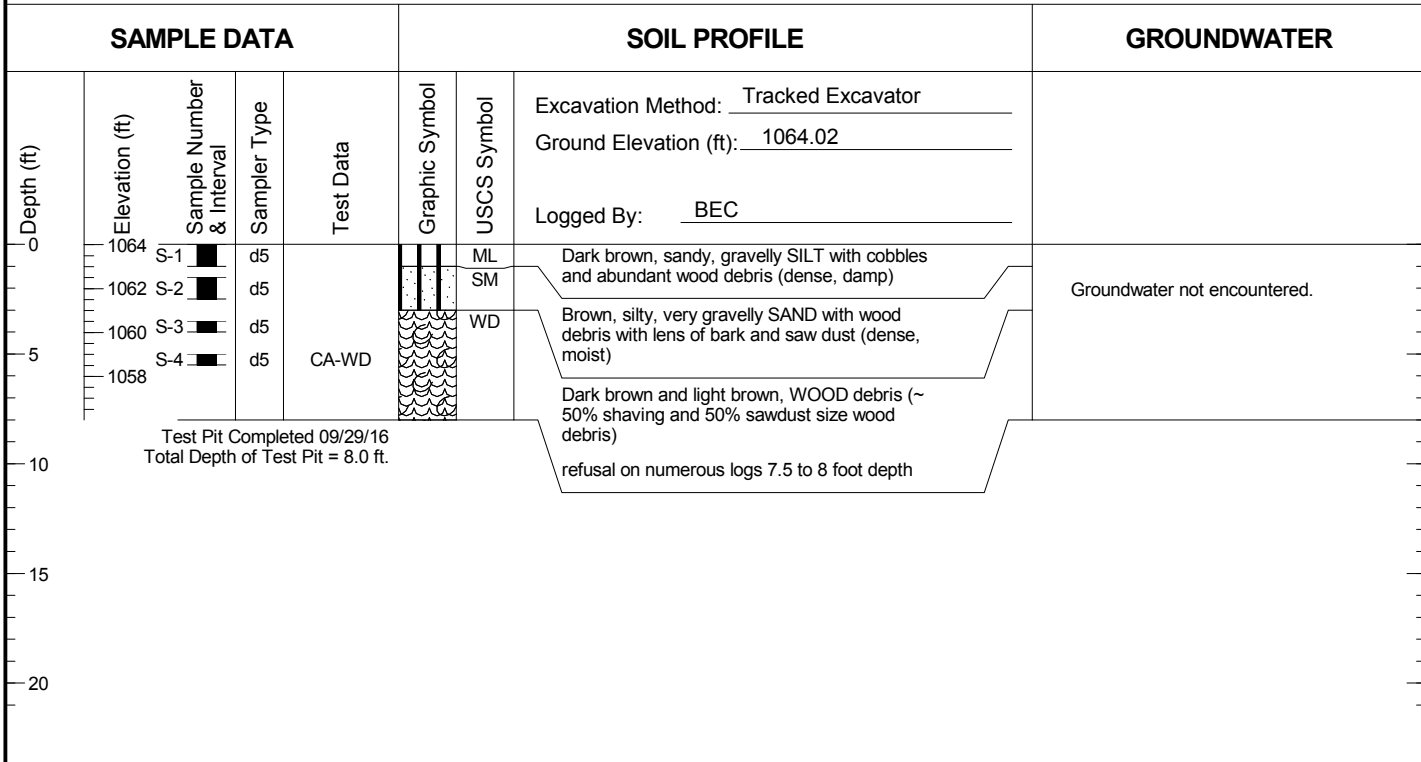
Log of Test Pits

Figure  
**A-8**

### TP-10A-16



### TP-10B-16



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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION



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Log of Test Pits

Figure  
**A-9**

### TP-11-16

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: <u>Tracked Excavator</u> Ground Elevation (ft): <u>1064.72</u>  Logged By: <u>BEC</u>
	1064	S-1	d5	CA-WD		WD	Brown, quarry spalls (6 to 8 minus) (very dense, moist)
1062	S-2	d5	WD			Dark brown, sandy, gravelly WOOD debris (~30% wood debris) (dense, moist)	
1060	S-3	d5	WD			Reddish brown, WOOD debris (mixture of coarse and fine wood size debris)	
1058	S-4	d5	WD			- numerous logs 6 to 12 feet - refusal on numerous logs	
1056	S-5	d5	WD			- numerous logs 6 to 12 feet - refusal on numerous logs	
1054						Groundwater not encountered.	
Test Pit Completed 09/26/16 Total Depth of Test Pit = 12.0 ft.							

### TP-11A-16

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Excavation Method: <u>Tracked Excavator</u> Ground Elevation (ft): <u>1065.07</u>  Logged By: <u>BEC</u>
	1064	S-1	d5	CA-WD		GM	Brown, silty, sandy GRAVEL with cobbles (9 inch minus quarry spalls) (medium dense to dense, damp)
1062	S-2	d5	WD			Brown, silty, sandy WOOD debris (~50% wood debris) (medium dense, damp)	
1060	S-3	d5	WD			Brown, WOOD debris with trace cobbles and small boulders (~60% bark and 40% shaving and sawdust size wood debris)	
1058						- logs 6 to 11 feet - refusal on logs running parallel to trench	
1056						Groundwater not encountered.	
Test Pit Completed 09/29/16 Total Depth of Test Pit = 11.0 ft.							

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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ELEVATION

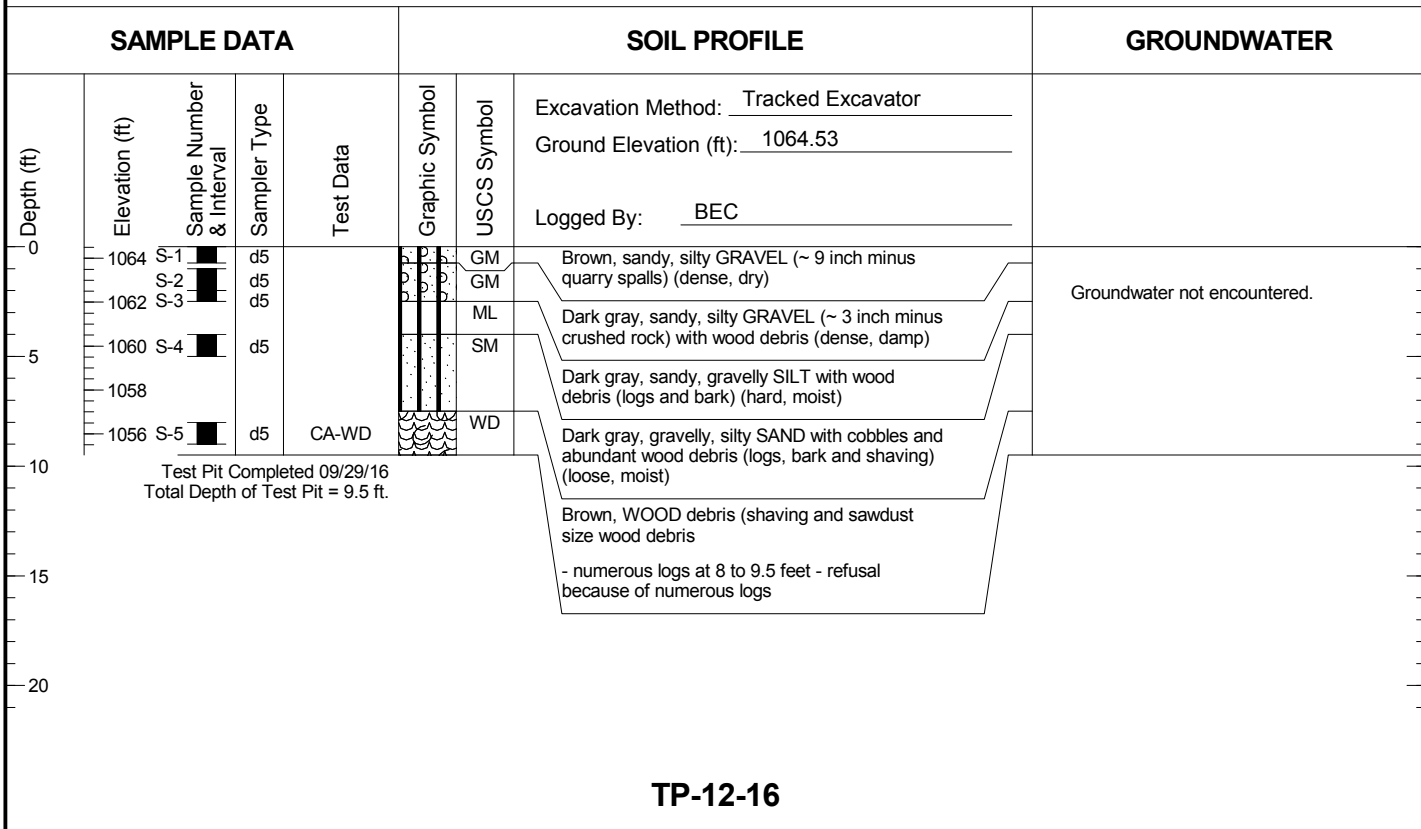


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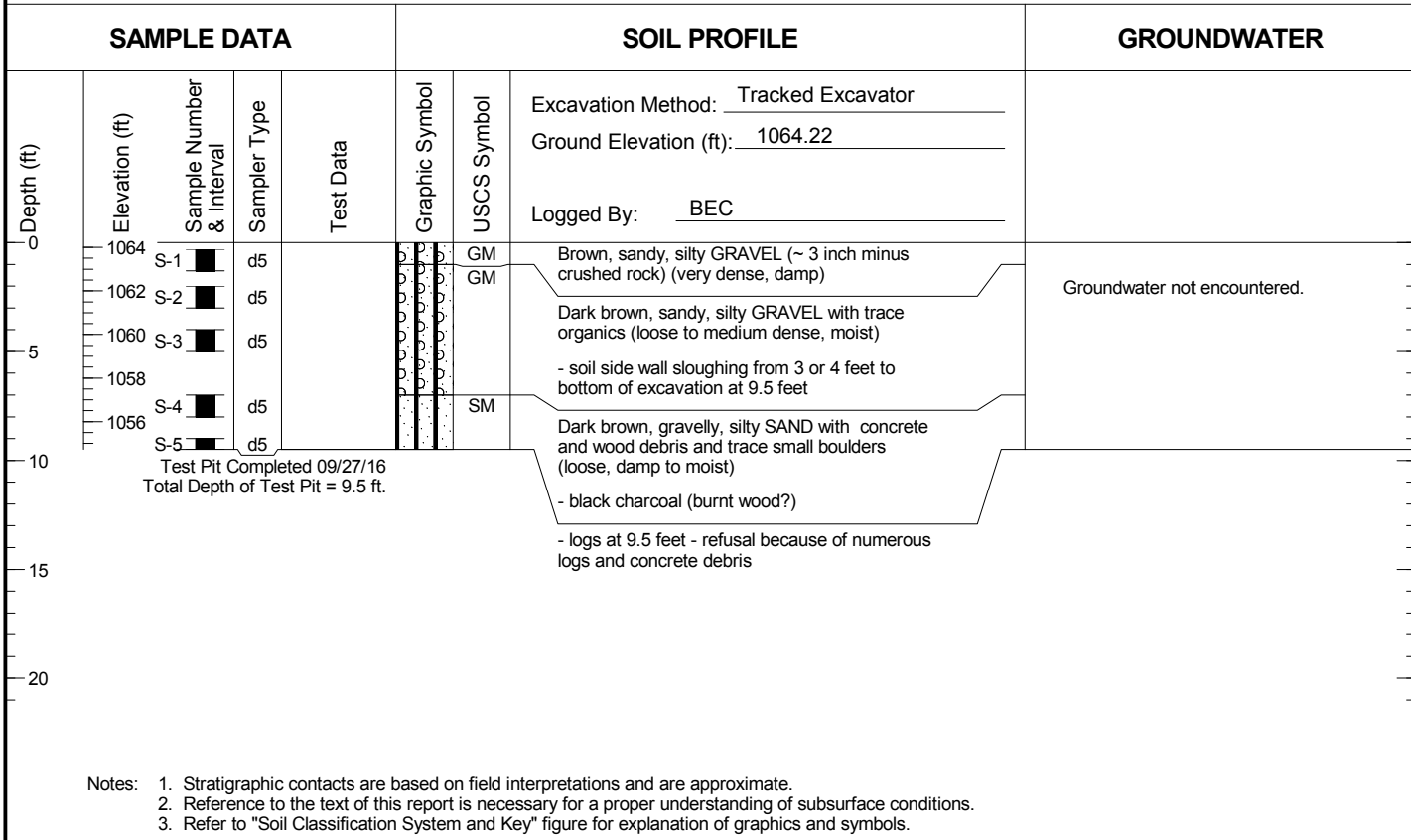
Log of Test Pits

Figure  
**A-10**

### TP-11B-16



### TP-12-16



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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION

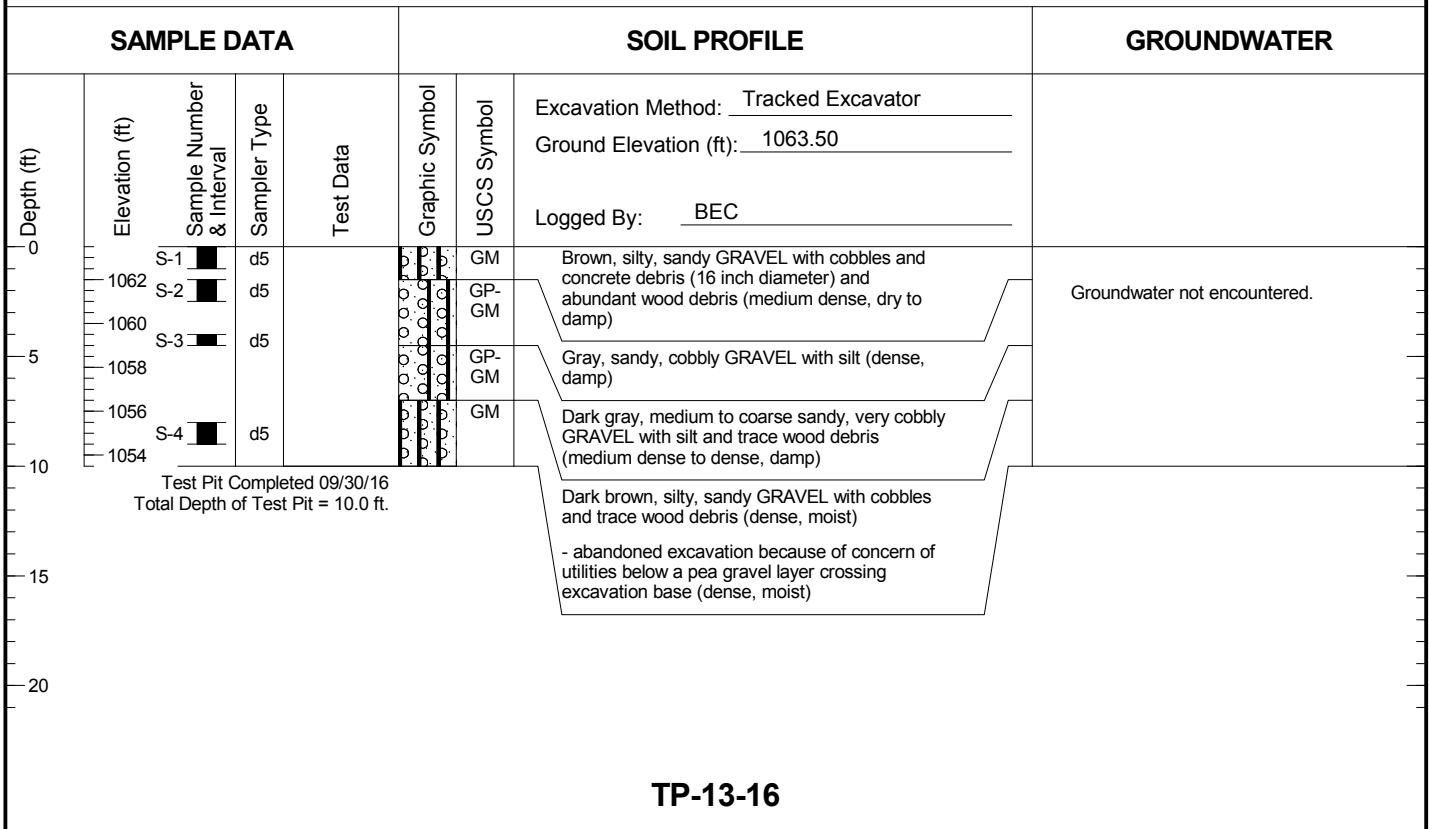


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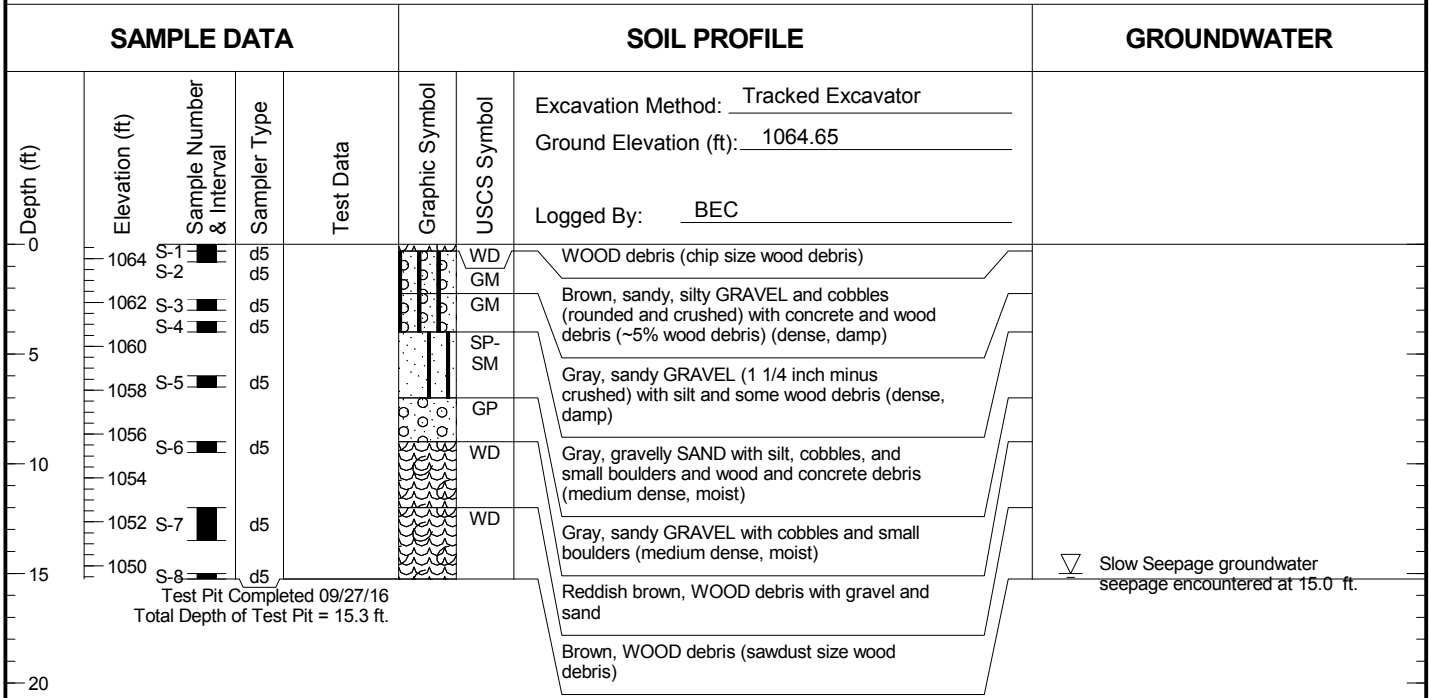
Log of Test Pits

Figure  
**A-11**

### TP-12A-16



### TP-13-16



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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ELEVATION



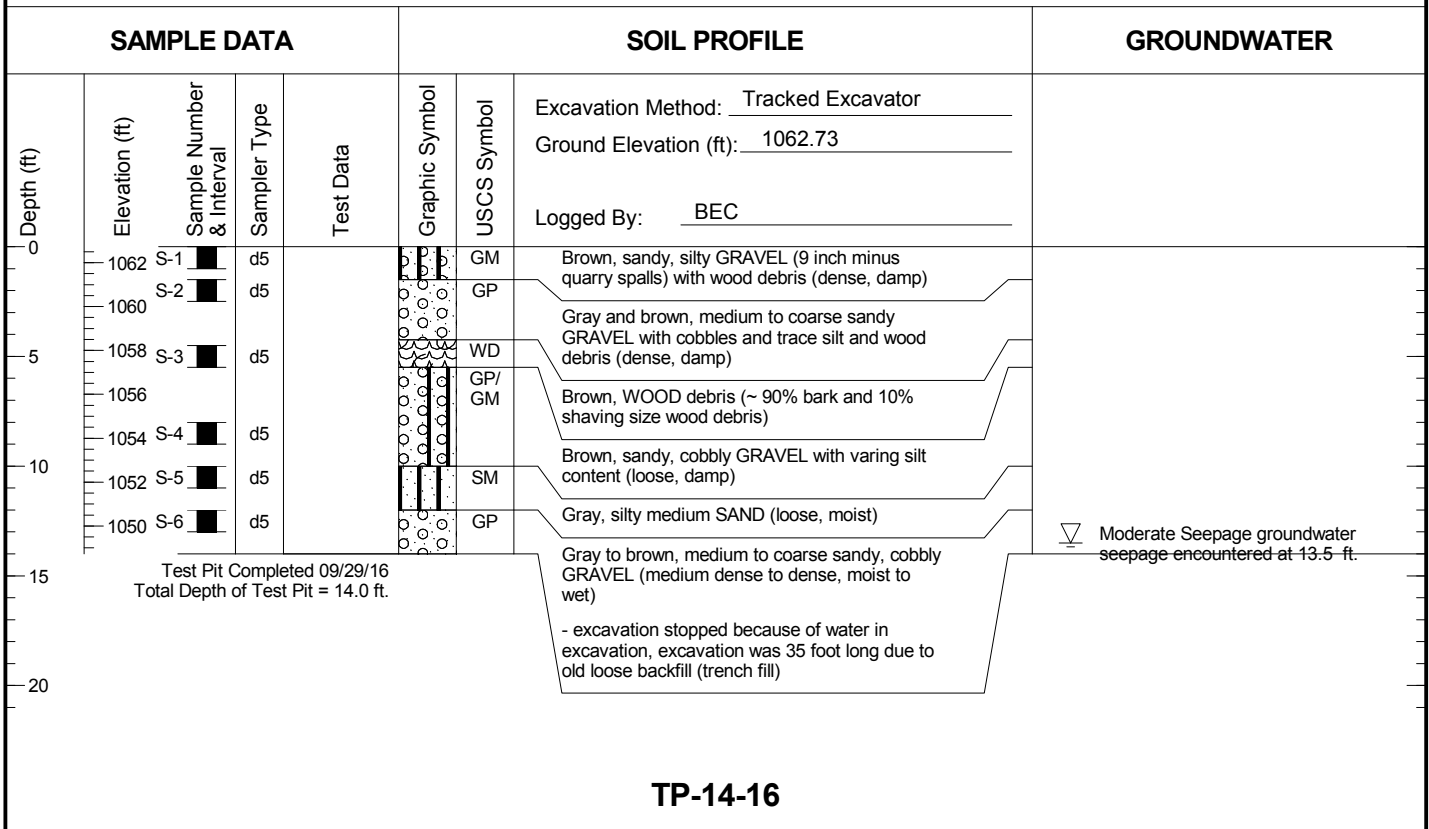
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Log of Test Pits

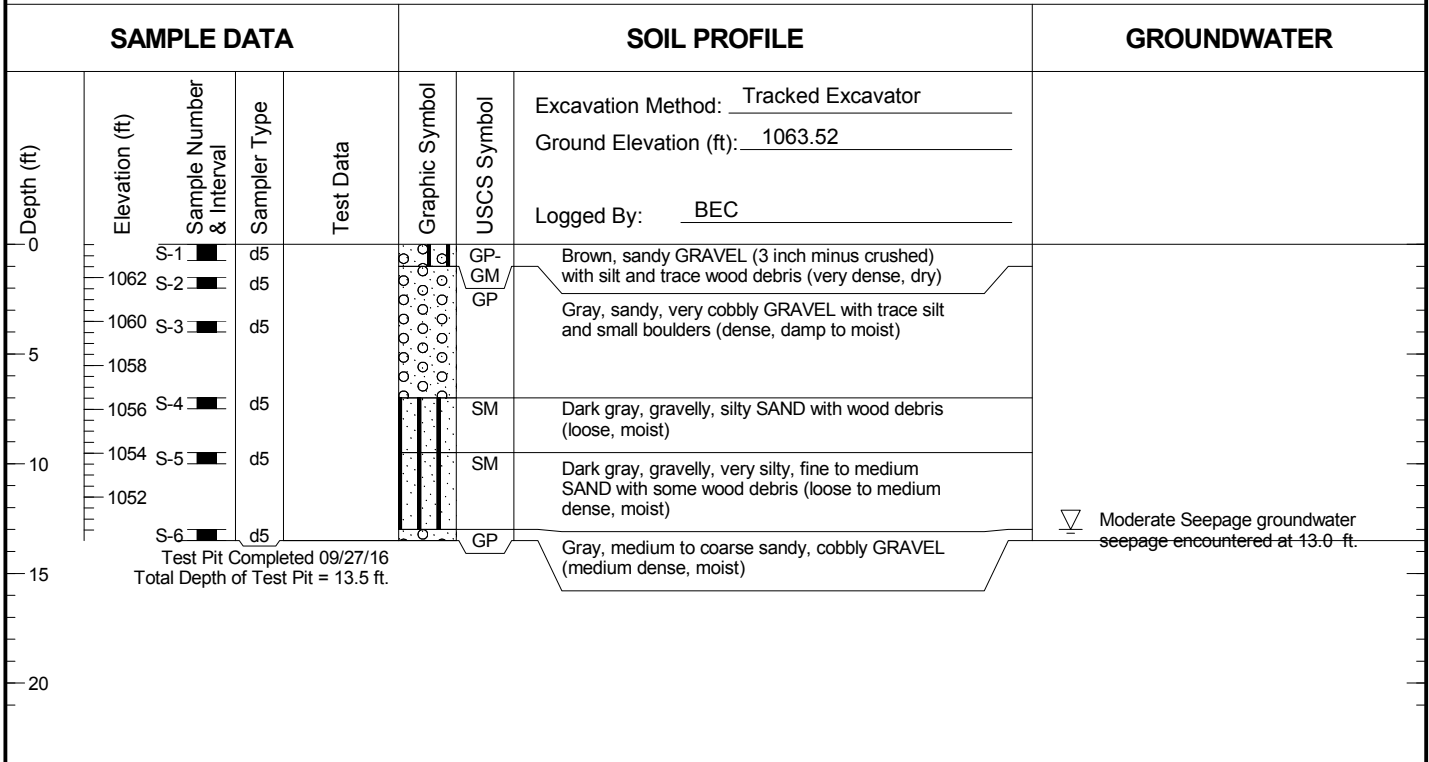
Figure  
**A-12**



## TP-13A-16



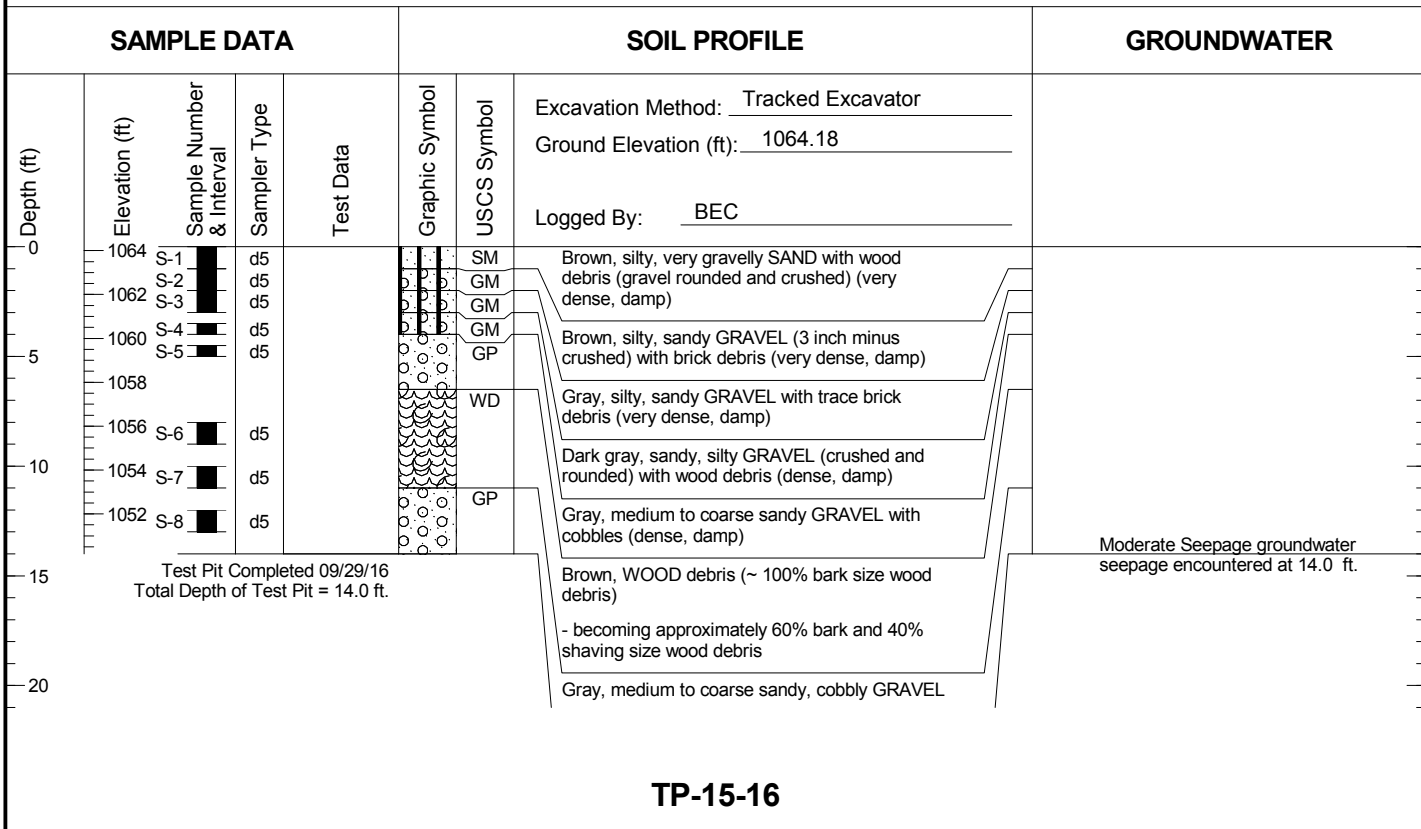
## TP-14-16



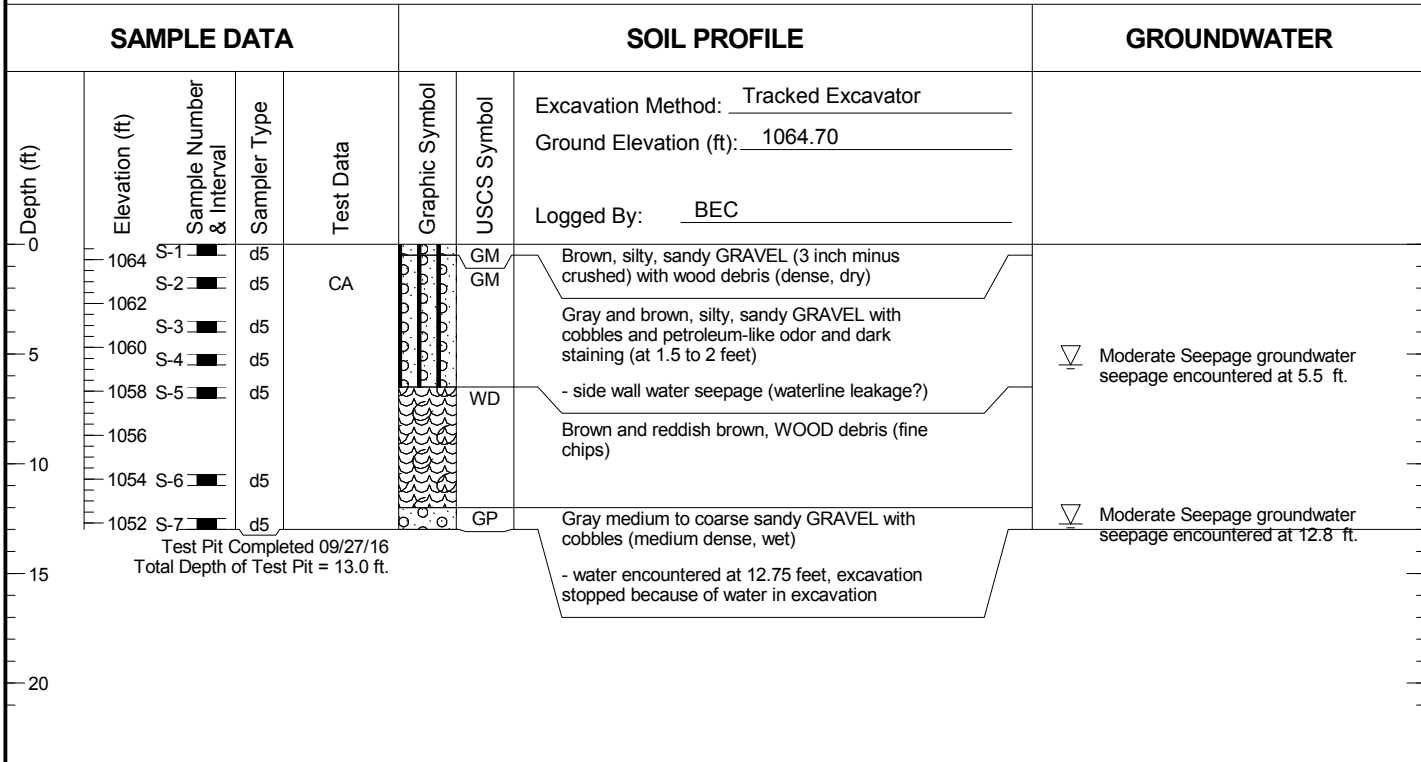
- Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
  2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
  3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION

### TP-14A-16



### TP-15-16



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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION



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Log of Test Pits

Figure  
**A-14**

### TP-16-16

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Groundwater not encountered.
	1066	S-1	d5		[Symbol]	GM	
	1064	S-2	d5		[Symbol]	GM	
	1060	S-3	d5		[Symbol]	GM	
				Excavation Method: <u>Tracked Excavator</u> Ground Elevation (ft): <u>1066.46</u>  Logged By: <u>BEC</u>			
				Brown, silty, sandy GRAVEL with cobbles and trace wood debris (dense, dry)			
				Gray, sandy, silty GRAVEL and BOULDERS (basalt rock to 3 to 4 foot length) (medium dense to dense, damp)			
				- refusal at 6.75 feet because of large boulders			
				Test Pit Completed 09/27/16 Total Depth of Test Pit = 6.8 ft.			

### TP-16A-16

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Groundwater not encountered.
	1064	S-1	d5		[Symbol]	GM	
	1064	S-2	d5		[Symbol]	GM	
	1064	S-3	d5		[Symbol]	GM	
				Excavation Method: <u>Tracked Excavator</u> Ground Elevation (ft): <u>1065.34</u>  Logged By: <u>BEC</u>			
				Light brown, sandy, GRAVEL with cobbles (medium dense to dense, damp)			
				Dark gray, sandy, silty BOULDER (basalt rock to 3 foot diameter) (medium dense to dense, damp)			
				- refusal at 2.25 feet because of large boulders			
				Test Pit Completed 09/28/16 Total Depth of Test Pit = 2.5 ft.			

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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION

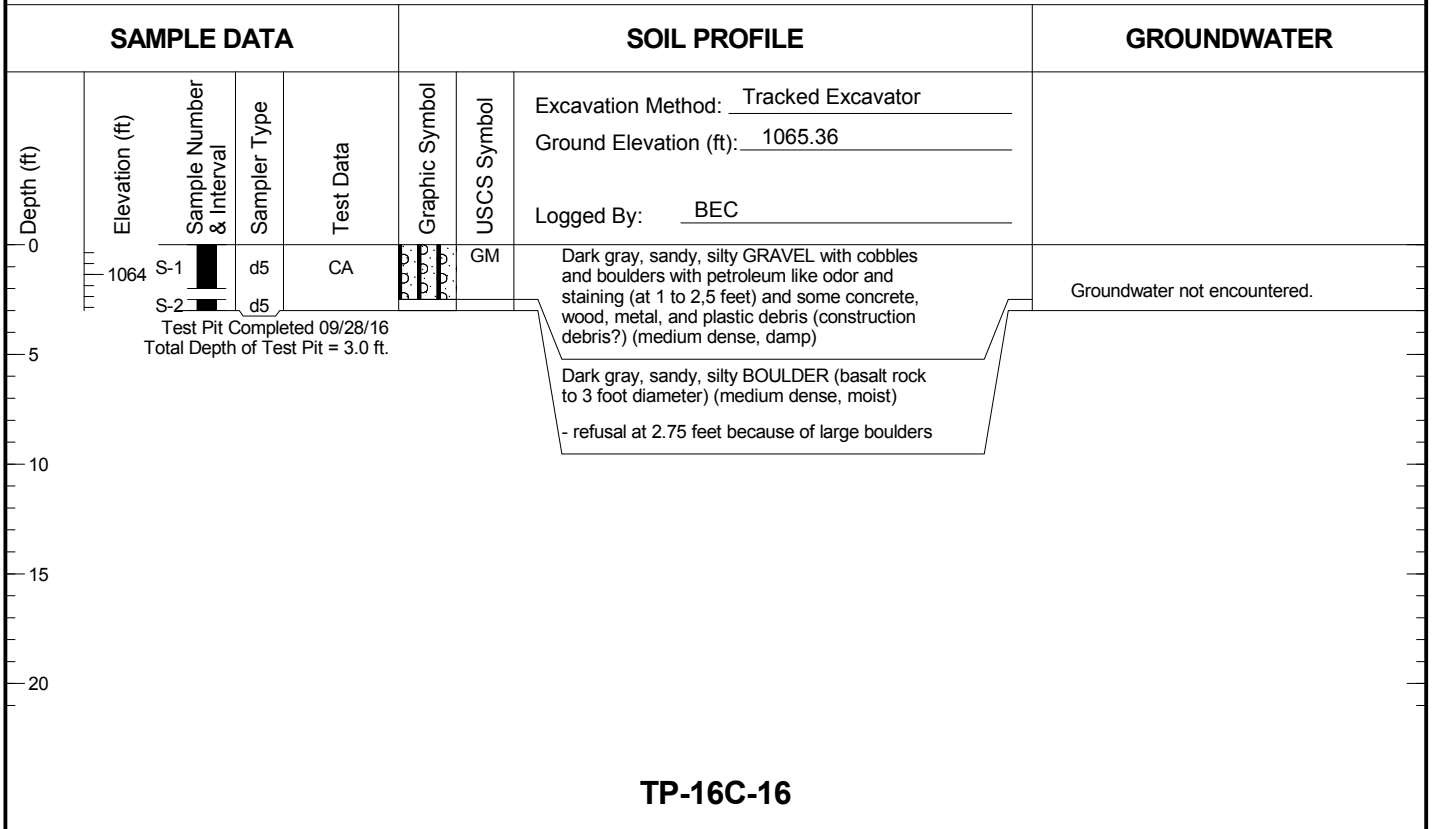


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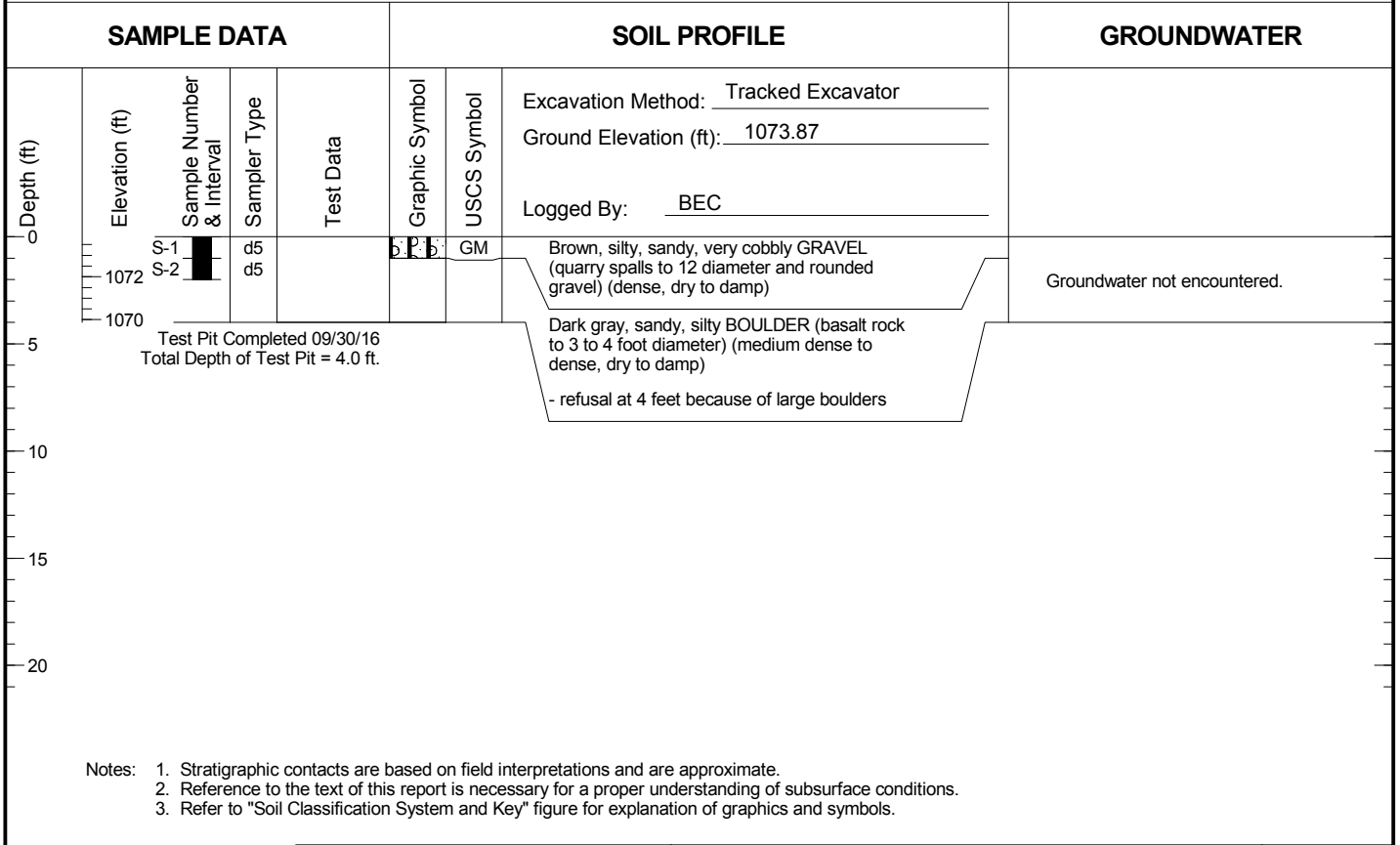
Log of Test Pits

Figure  
**A-15**

**TP-16B-16**



**TP-16C-16**



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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ELEVATION



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Log of Test Pits

Figure  
**A-16**

**TP-17-16**

SAMPLE DATA				SOIL PROFILE		GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol
	1066	S-1	d5			
				Test Pit Completed 09/27/16 Total Depth of Test Pit = 4.5 ft.		
					Excavation Method: <u>Tracked Excavator</u> Ground Elevation (ft): <u>1066.22</u> Logged By: <u>BEC</u>	
					Dark gray, sandy, silty BOULDER (basalt rock to 3 to 4 foot diameter) (medium dense to dense, dry to damp)	Groundwater not encountered.
					- refusal at 4.5 feet because of large boulders	

**TP-18-16**

SAMPLE DATA				SOIL PROFILE		GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol
	1068	S-1	d5			
				Test Pit Completed 09/27/16 Total Depth of Test Pit = 3.0 ft.		
					Excavation Method: <u>Tracked Excavator</u> Ground Elevation (ft): <u>1069.17</u> Logged By: <u>BEC</u>	
					Dark gray, sandy, silty BOULDER (basalt rock to 3 to 4 foot diameter) with wood debris and logs (dense, damp)	Groundwater not encountered.
					- refusal at 3 feet because of large boulders	

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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ELEVATION

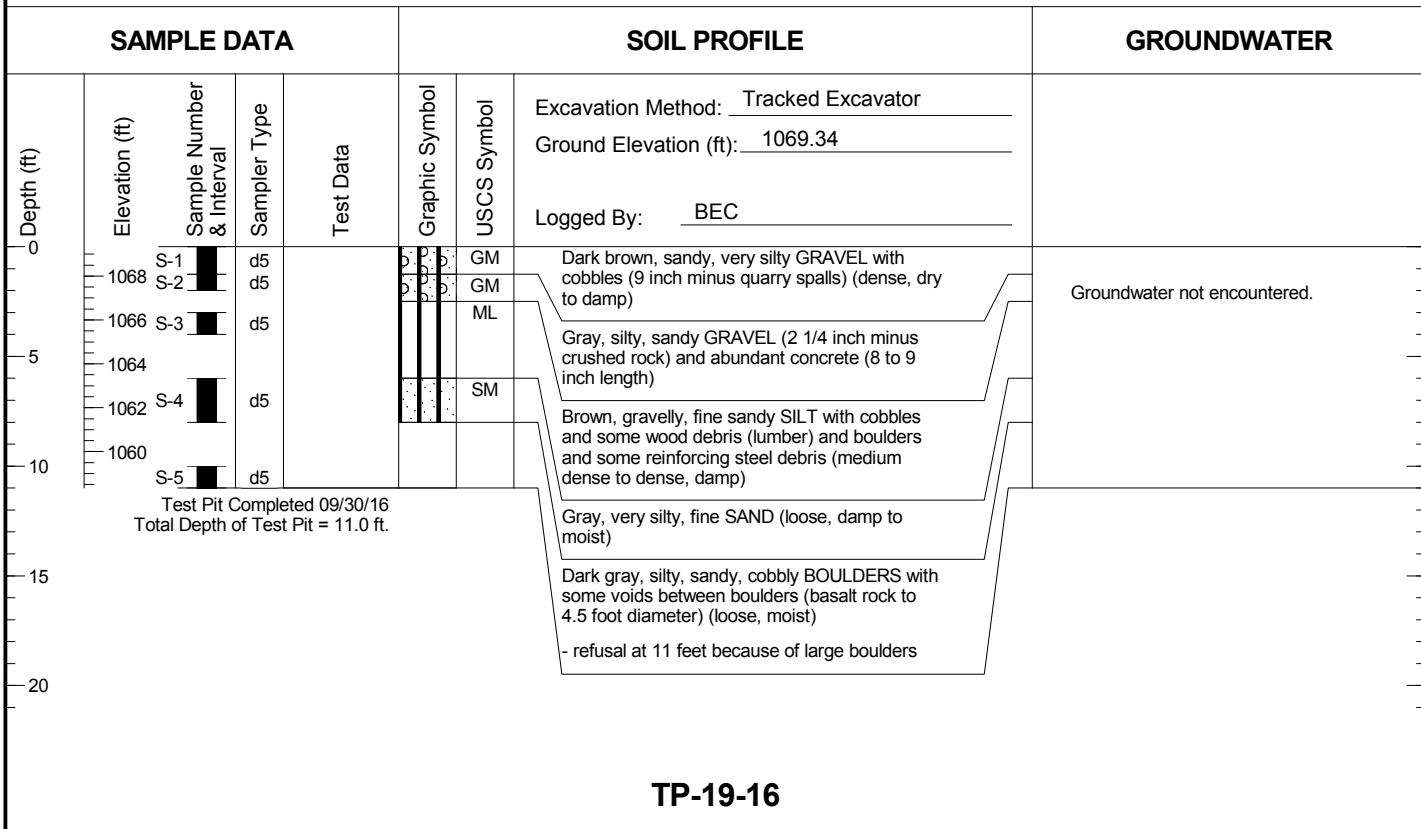


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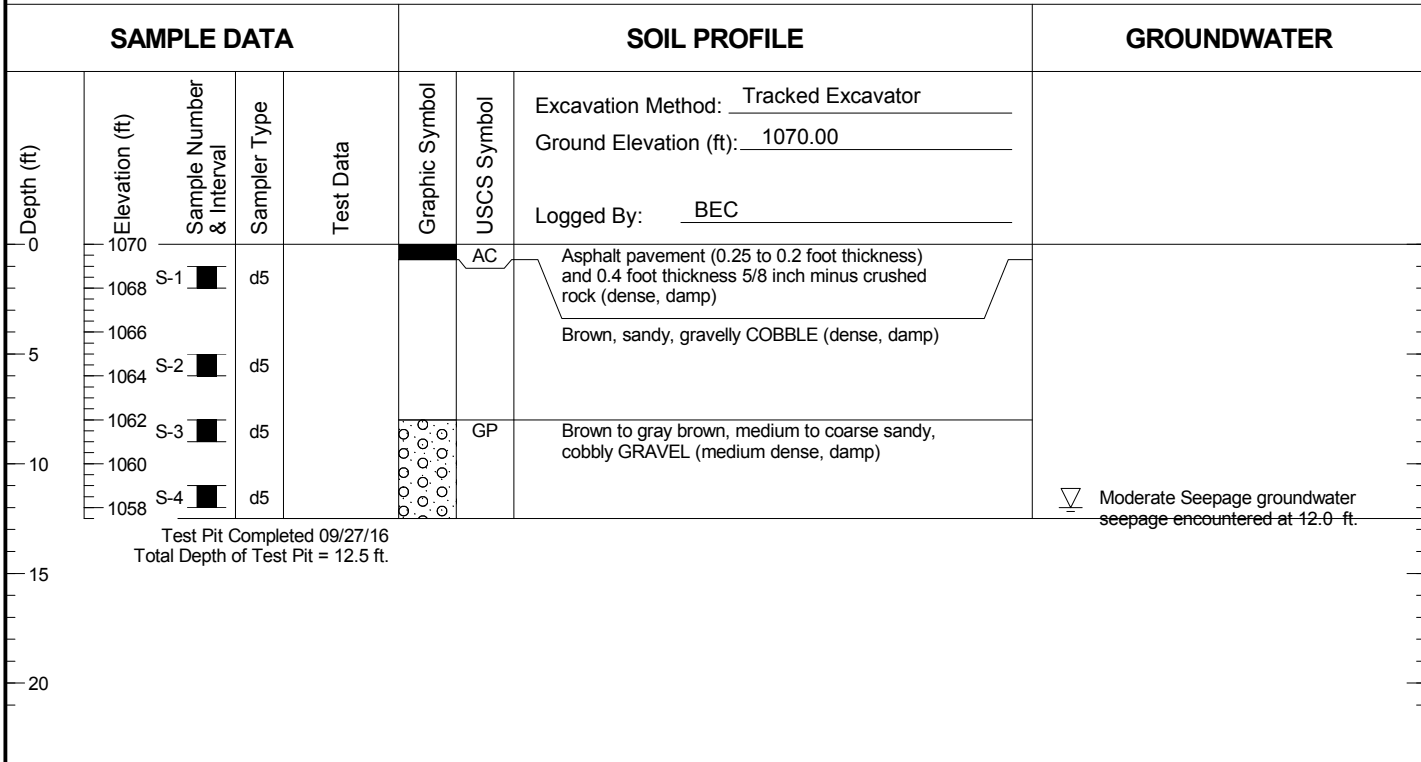
Log of Test Pits

Figure  
**A-17**

### TP-18A-16



### TP-19-16



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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION

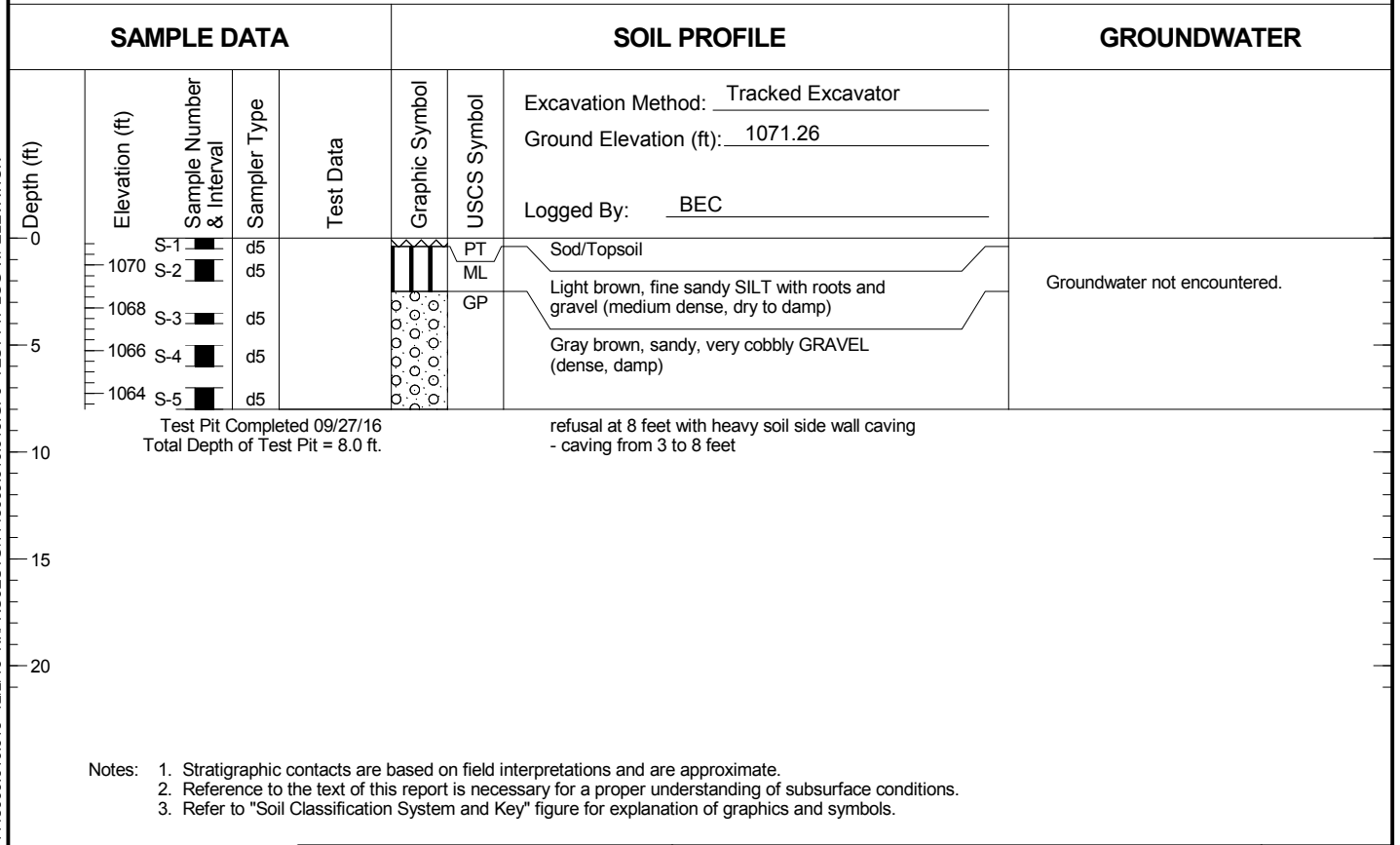
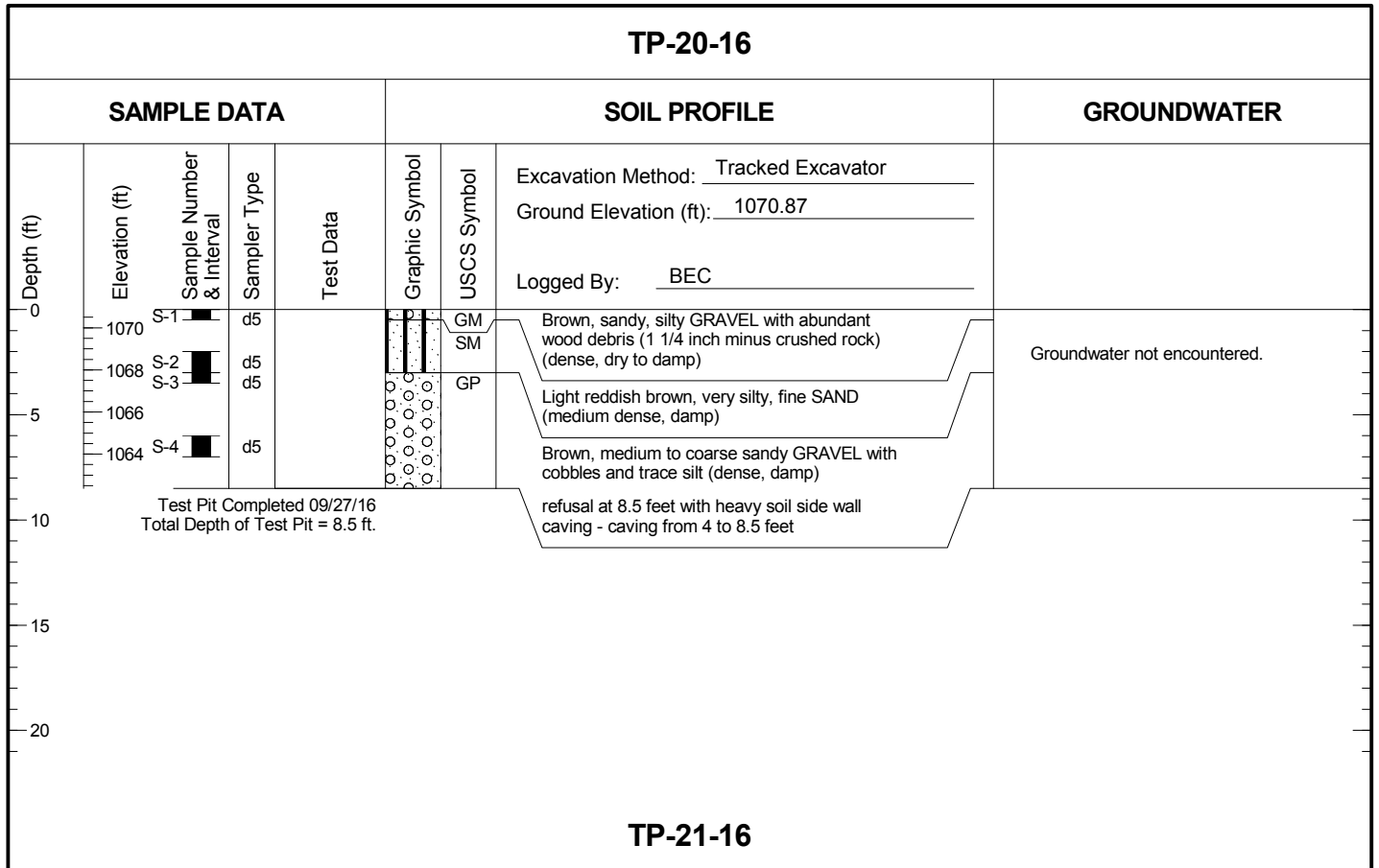


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Log of Test Pits

Figure  
**A-18**

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ELEVATION



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

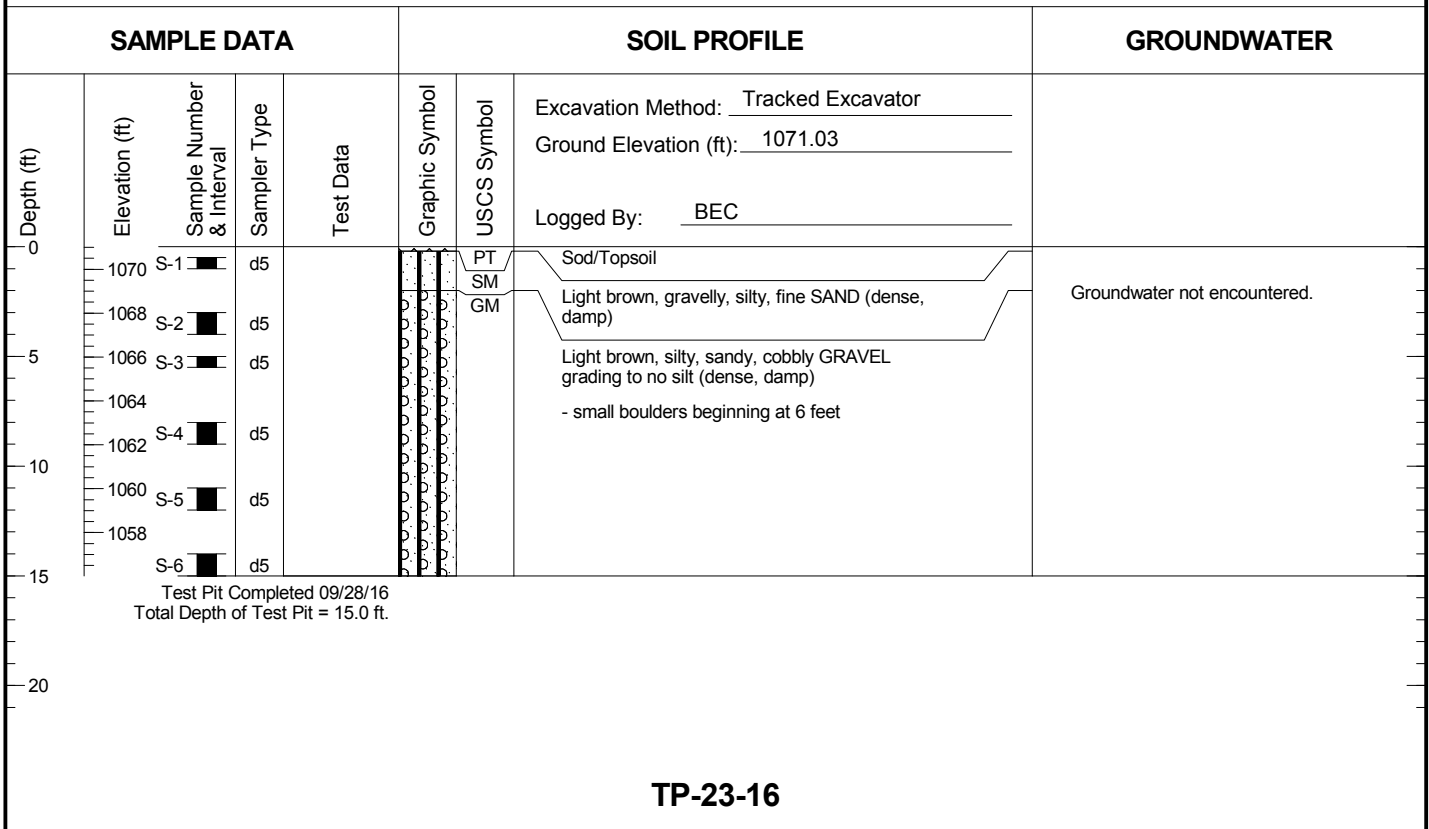


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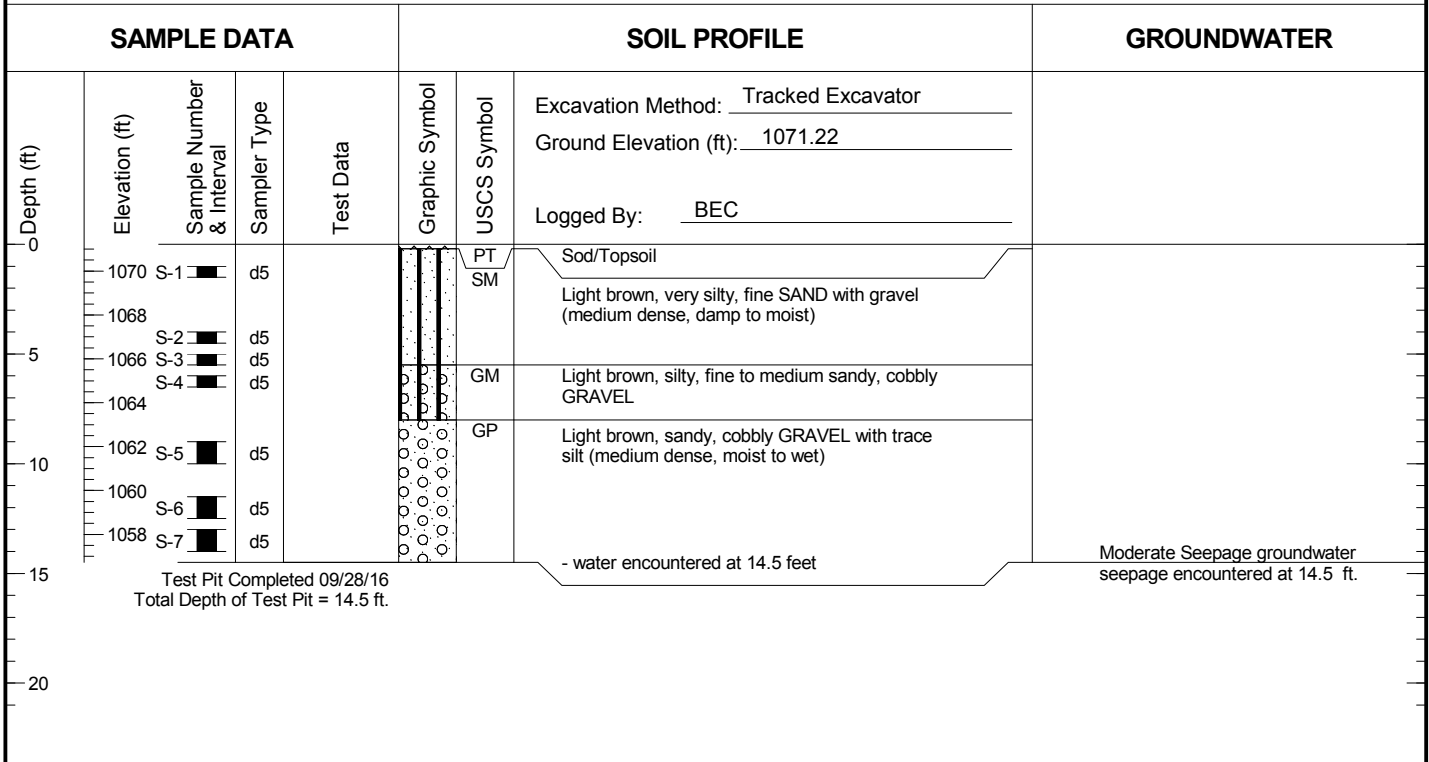
Log of Test Pits

Figure  
**A-19**

## TP-22-16



## TP-23-16

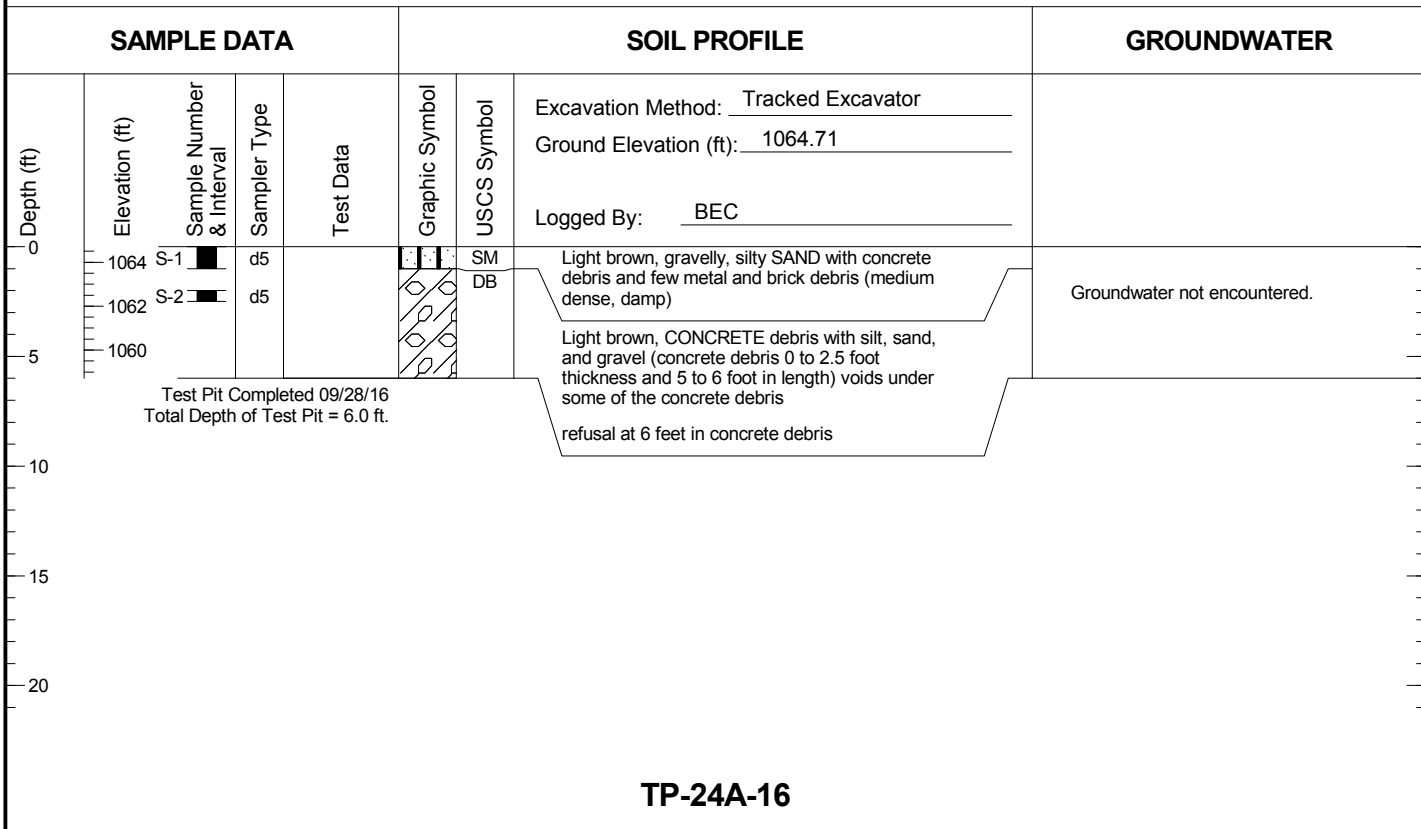


- Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
  2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
  3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

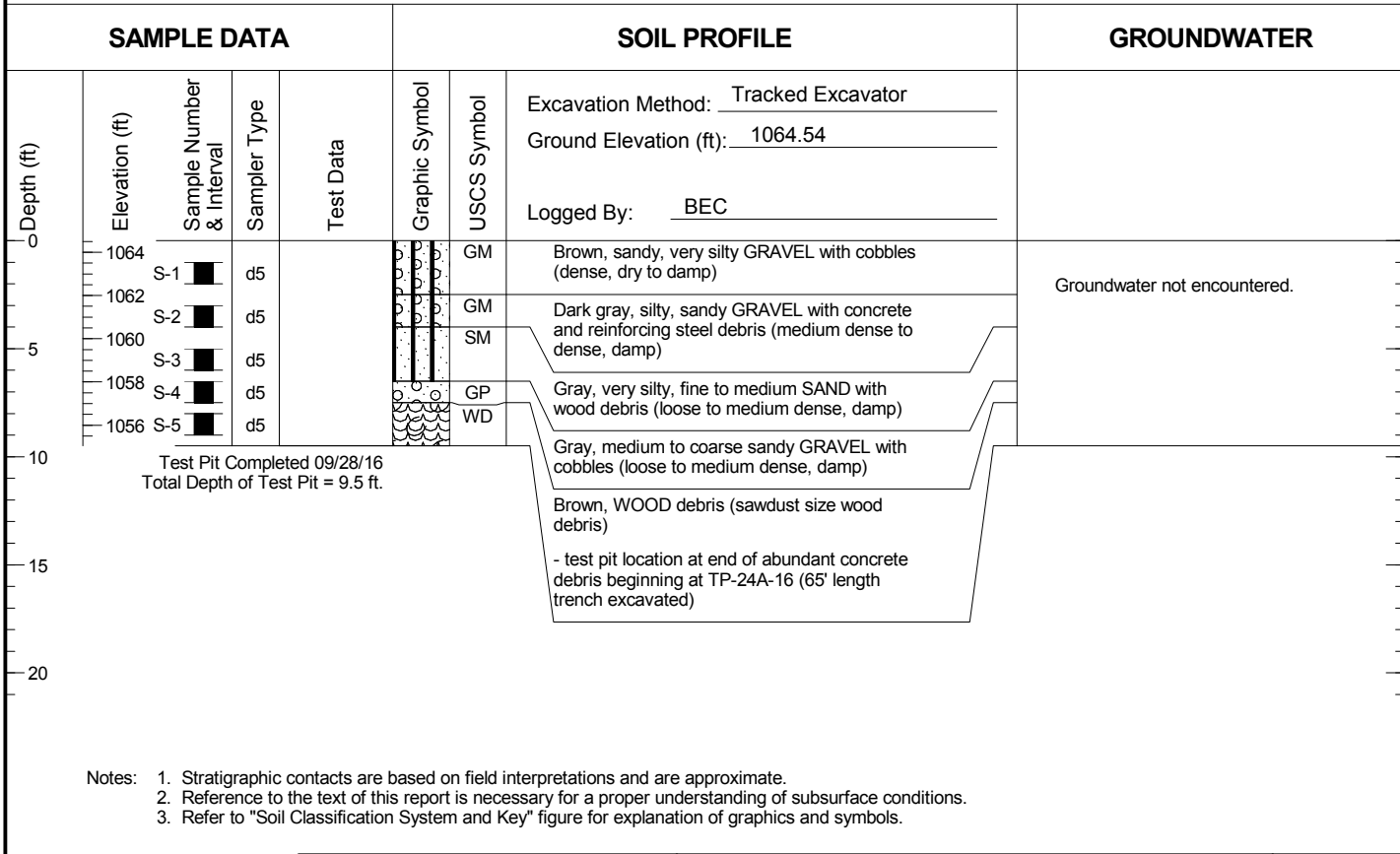
1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION



### TP-24-16



### TP-24A-16



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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION

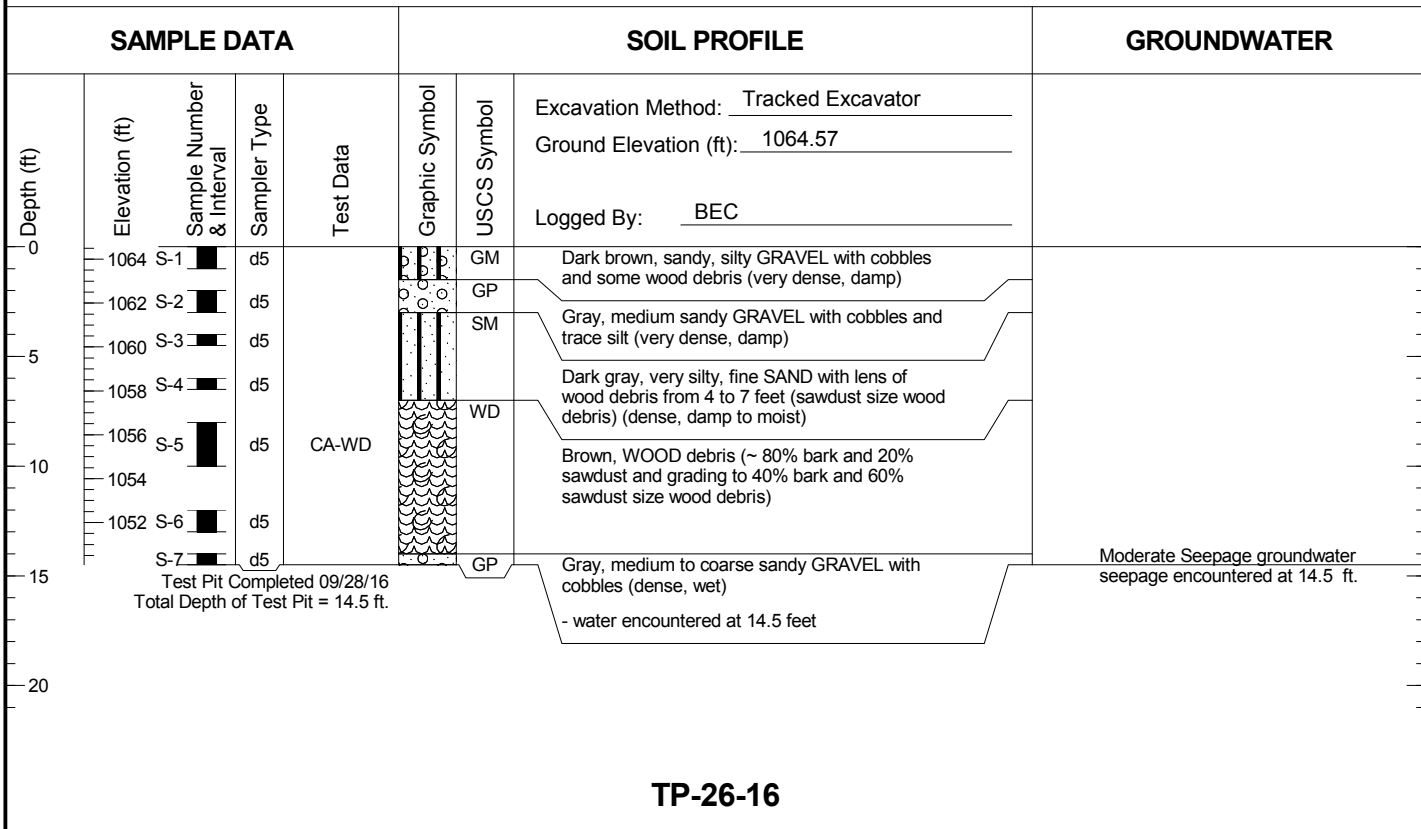


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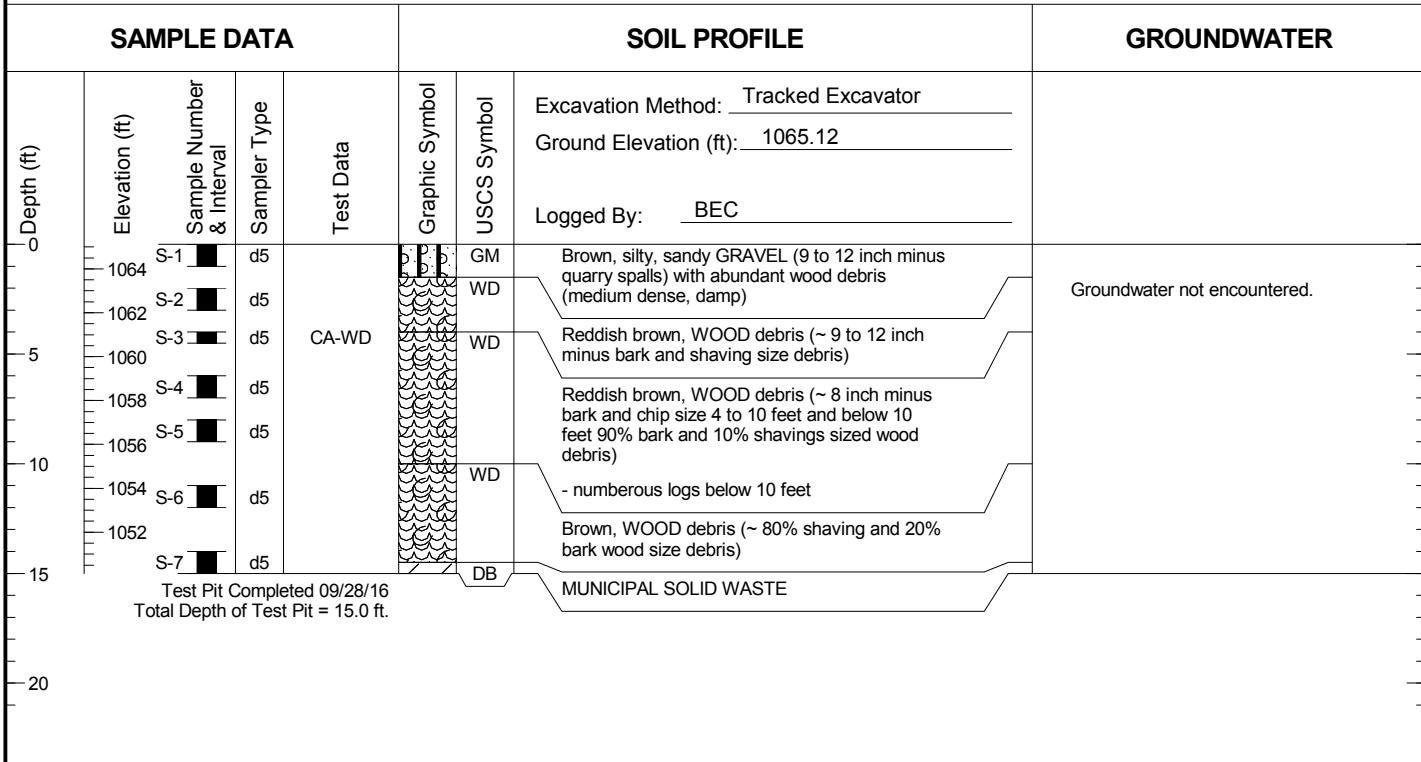
Log of Test Pits

Figure  
**A-21**

### TP-25-16



### TP-26-16



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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ELEVATION



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Log of Test Pits

Figure  
**A-22**

**TP-26A-16**

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft) 0 5 10 15	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Groundwater not encountered.
		S-1	d5	CA-WD		WD	
		S-2	d5			WD	
		S-3	d5				
		S-4	d5				
		S-5	d5			WD	
Excavation Method: <u>Tracked Excavator</u> Ground Elevation (ft): <u>1065.56</u> Logged By: <u>BEC</u>							
Brown, gravelly, sandy WOOD debris (~80% bark and shaving wood debris) with layers of gray and brown sandy GRAVEL (9 inch minus quarry spalls) with wood debris (medium dense, moist)							
Brown, WOOD debris (~ 80% bark and 20% shaving at 6 feet 50% bark and 50% shaving size wood debris) - logs at 9 to 15 feet							
Brown, WOOD debris (~ 50% sawdust and 50% shaving size wood debris)							
Test Pit Completed 09/30/16 Total Depth of Test Pit = 15.0 ft.							

**TP-26B-16**

SAMPLE DATA				SOIL PROFILE			GROUNDWATER			
Depth (ft) 0 5 10 15 20	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Groundwater not encountered.			
		S-1	d5	CA-WD		GM				
		S-2	d5			WD				
		S-3	d5							
	Excavation Method: <u>Tracked Excavator</u> Ground Elevation (ft): <u>1065.49</u> Logged By: <u>BEC</u>									
	Brown, silty, sandy GRAVEL (9 inch minus quarry spalls with some rounded gravel) (medium dense, moist)									
Gray brown, silty, gravelly COBBLE (12 inch minus quarry spalls) (medium dense, moist)										
Reddish brown, WOOD debris (~ 50% bark and 50% shaving size wood debris)										
MUNICIPAL SOLID WASTE										
Test Pit Completed 09/30/16 Total Depth of Test Pit = 8.5 ft.										

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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION




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Log of Test Pits

Figure  
**A-23**

**TP-27-16**

SAMPLE DATA				SOIL PROFILE		GROUNDWATER		
Depth (ft) 0 5 10 15 20	Elevation (ft) 1060 1058	Sample Number & Interval S-1	Sampler Type d5	Test Data	Graphic Symbol 	USCS Symbol WD	Excavation Method: <u>Tracked Excavator</u> Ground Elevation (ft): <u>1060.29</u> Logged By: <u>BEC</u>	Groundwater not encountered.
	Test Pit Completed 09/28/16 Total Depth of Test Pit = 3.0 ft.				DB	MUNICIPAL SOLID WASTE		

**TP-28-16**

SAMPLE DATA				SOIL PROFILE		GROUNDWATER		
Depth (ft) 0 5 10 15 20	Elevation (ft) 1060	Sample Number & Interval S-1	Sampler Type d5	Test Data CA-WD	Graphic Symbol 	USCS Symbol WD	Excavation Method: <u>Tracked Excavator</u> Ground Elevation (ft): <u>1061.00</u> Logged By: <u>BEC</u>	Groundwater not encountered.
	Test Pit Completed 09/28/16 Total Depth of Test Pit = 2.0 ft.				DB	MUNICIPAL SOLID WASTE		

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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION

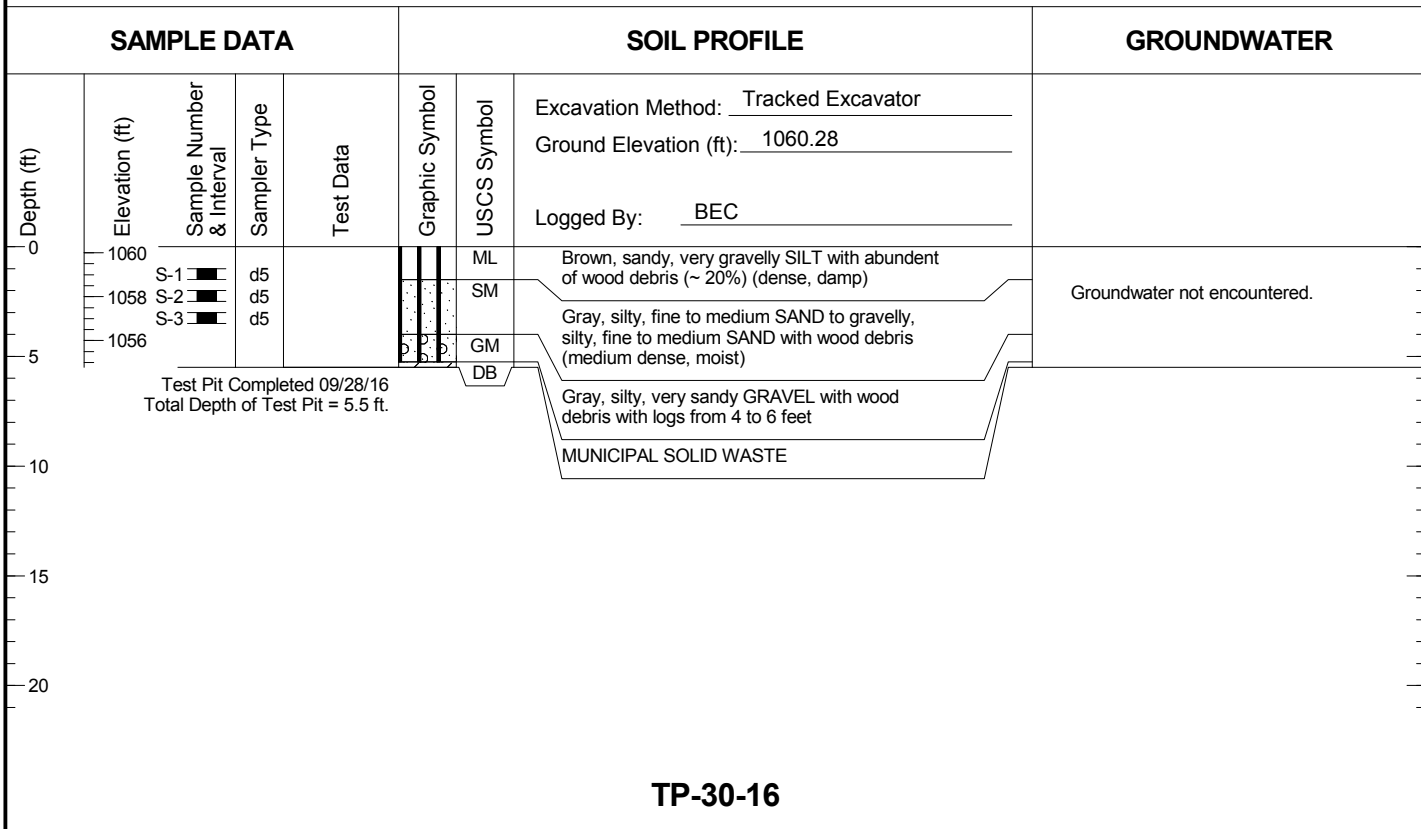


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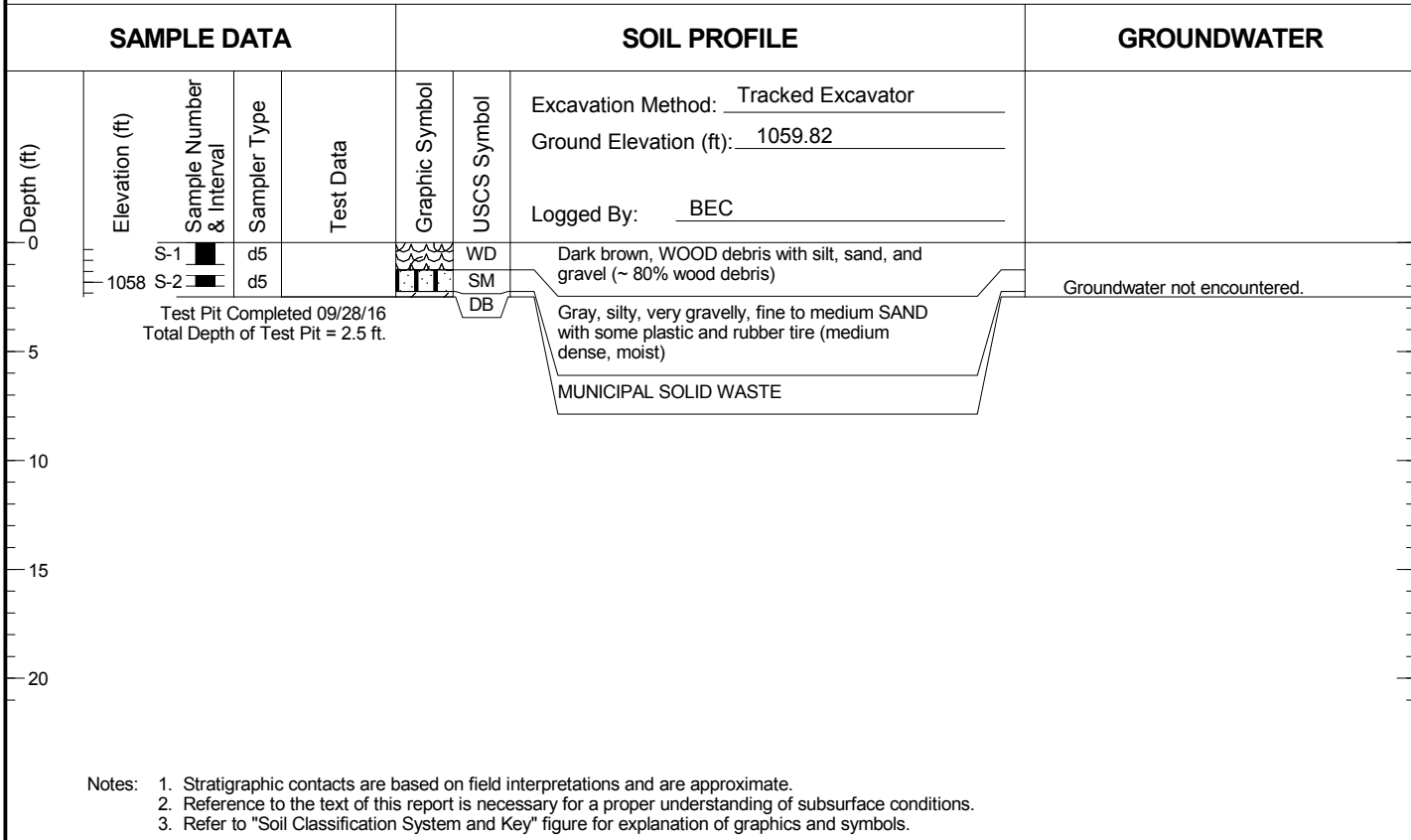
Log of Test Pits

Figure  
**A-24**

### TP-29-16



### TP-30-16



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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION

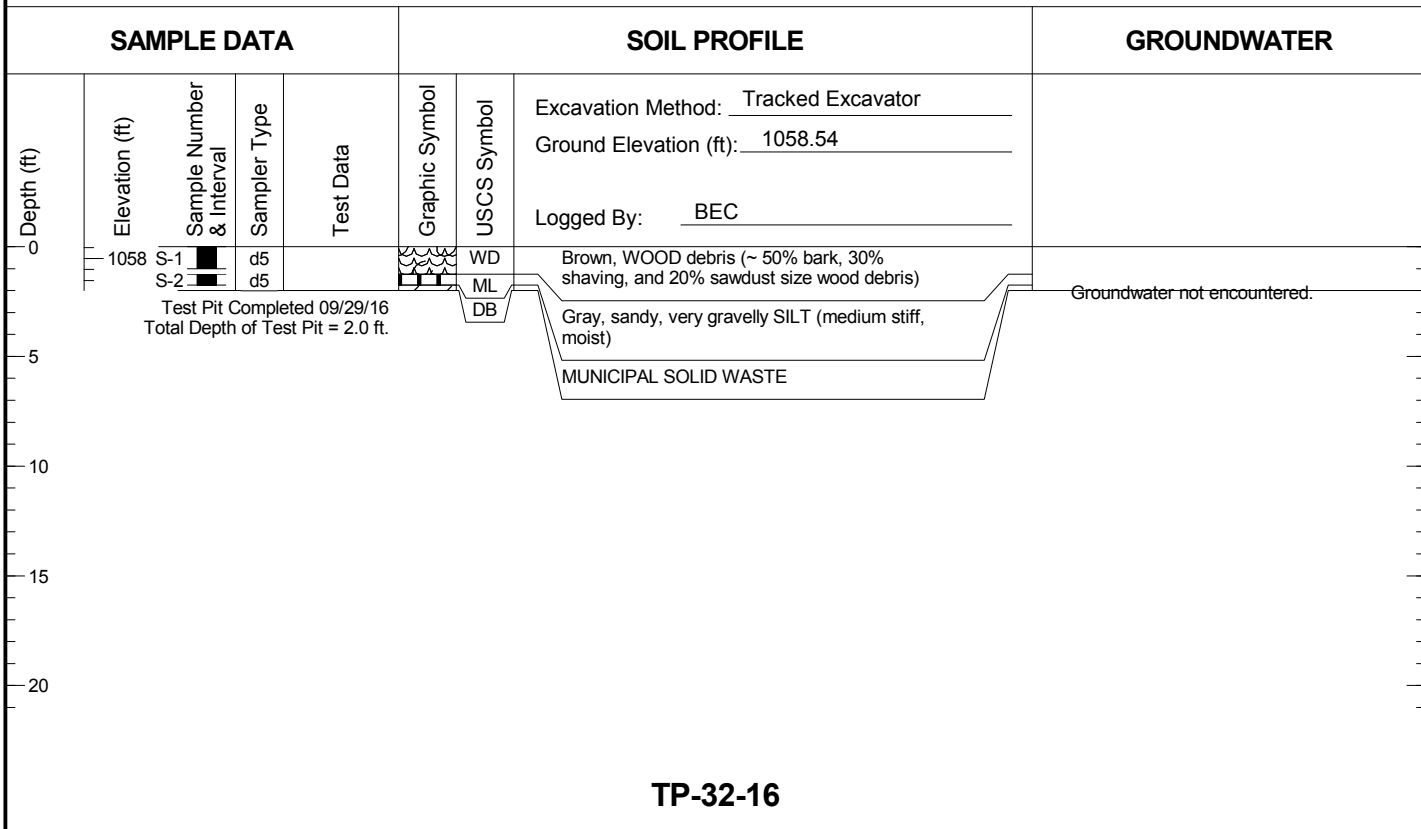


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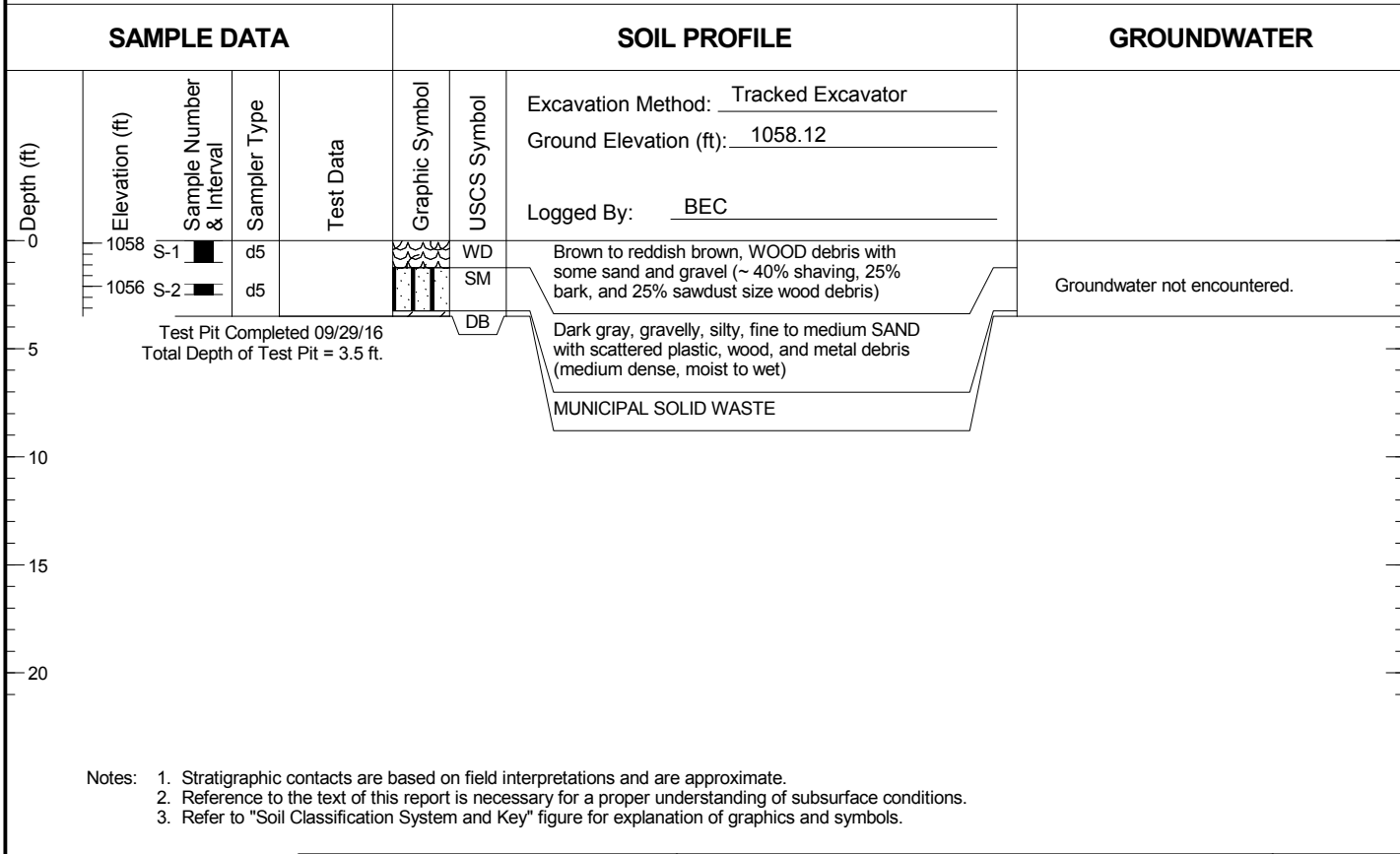
Log of Test Pits

Figure  
**A-25**

### TP-31-16



### TP-32-16



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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION

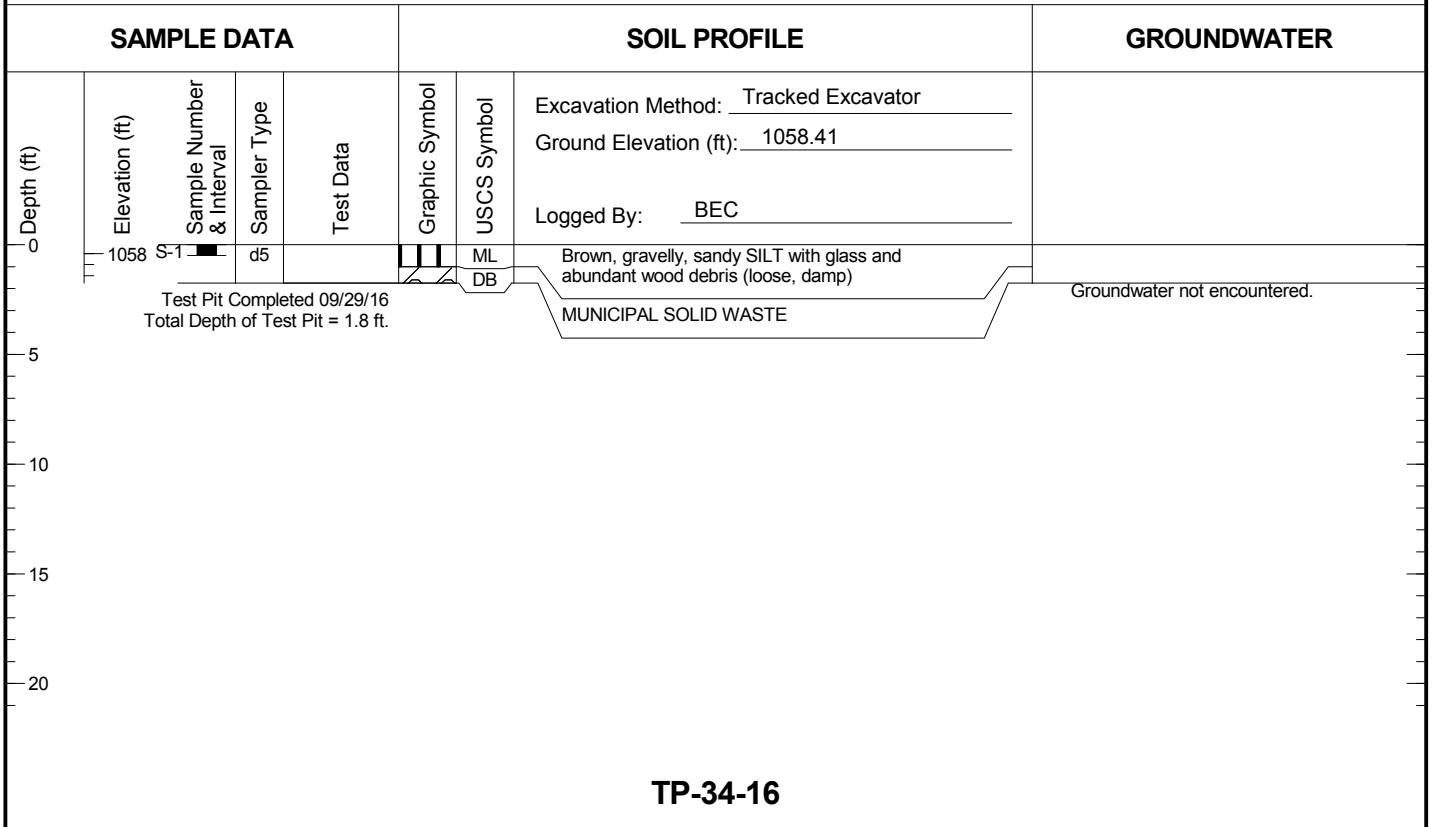


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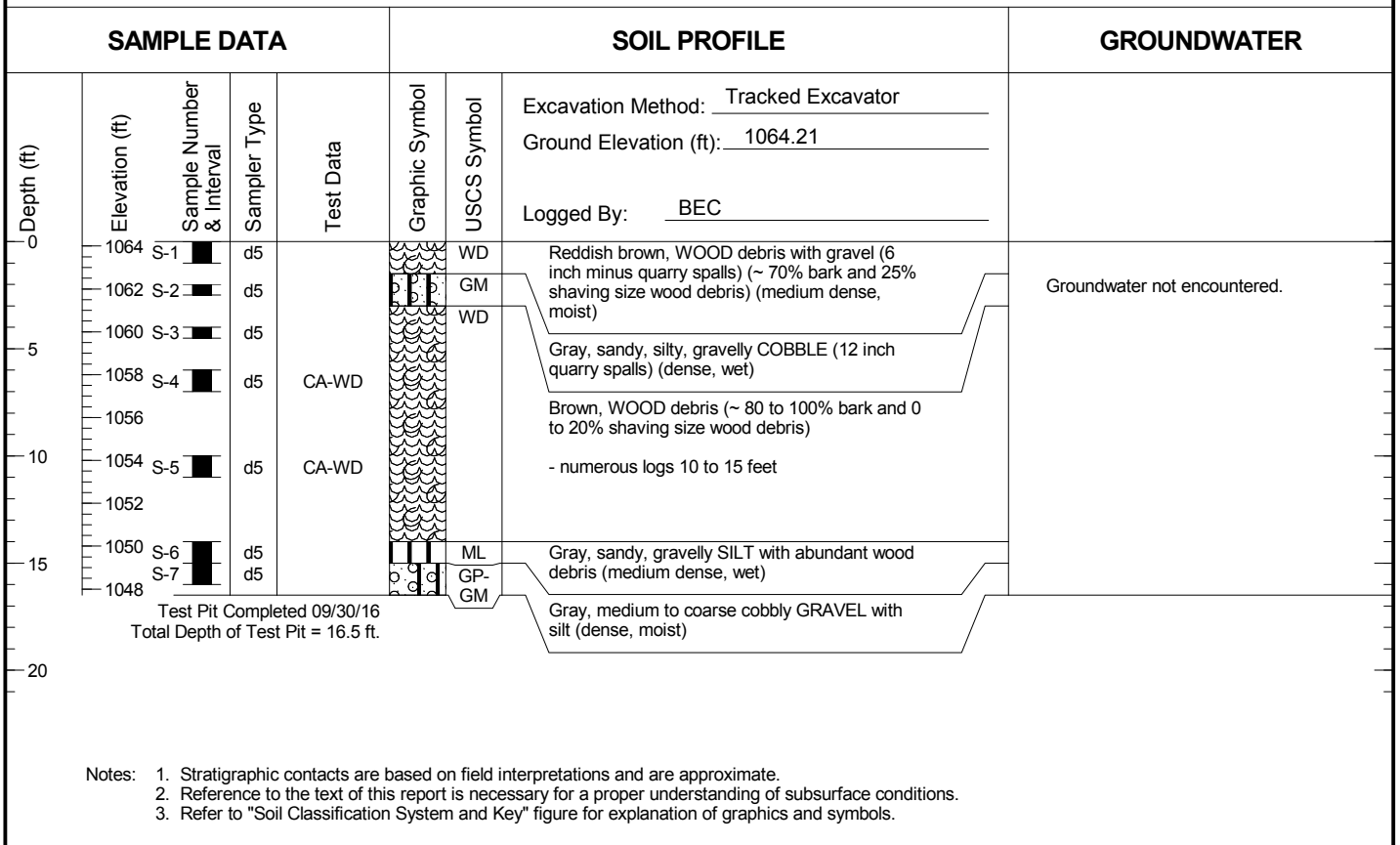
Log of Test Pits

Figure  
**A-26**

### TP-33-16






### TP-34-16



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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION

**TP-34A-16**

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation (ft)	Sample Number & Interval	Sampler Type	Test Data	Graphic Symbol	USCS Symbol	Groundwater not encountered.
	1058	S-1	d5	CA-WD		WD	
5	1056	Test Pit Completed 09/30/16 Total Depth of Test Pit = 3.5 ft.			 	Gray, medium to coarse sandy GRAVEL with cobbles (medium dense, moist)  MUNICIPAL SOLID WASTE	

Excavation Method: Tracked Excavator  
 Ground Elevation (ft): 1058.82  
 Logged By: BEC

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ TEST PIT LOG W/ ELEVATION

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



Transportation Corridor Project  
 Yakima, Washington



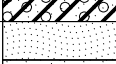









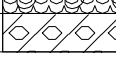
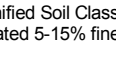
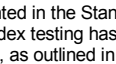
Log of Test Pits



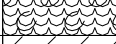

Figure  
**A-28**



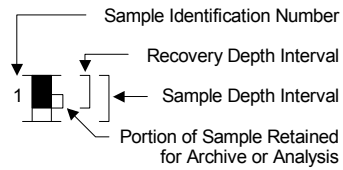


# Landfill Gas Probes Logs

# Soil Classification System

	MAJOR DIVISIONS	GRAPHIC SYMBOL	USCS LETTER SYMBOL <sup>(1)</sup>	TYPICAL DESCRIPTIONS <sup>(2)(3)</sup>
COARSE-GRAINED SOIL <small>(More than 50% of material is larger than No. 200 sieve size)</small>	GRAVEL AND GRAVELLY SOIL  <small>(More than 50% of coarse fraction retained on No. 4 sieve)</small>	CLEAN GRAVEL <small>(Little or no fines)</small>		<b>GW</b> Well-graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES <small>(Appreciable amount of fines)</small>		<b>GP</b> Poorly graded gravel; gravel/sand mixture(s); little or no fines
	SAND AND SANDY SOIL  <small>(More than 50% of coarse fraction passed through No. 4 sieve)</small>	CLEAN SAND <small>(Little or no fines)</small>		<b>GM</b> Silty gravel; gravel/sand/silt mixture(s)
		SAND WITH FINES <small>(Appreciable amount of fines)</small>		<b>GC</b> Clayey gravel; gravel/sand/clay mixture(s)
		CLEAN SAND <small>(Little or no fines)</small>		<b>SW</b> Well-graded sand; gravelly sand; little or no fines
		SAND WITH FINES <small>(Appreciable amount of fines)</small>		<b>SP</b> Poorly graded sand; gravelly sand; little or no fines
FINE-GRAINED SOIL <small>(More than 50% of material is smaller than No. 200 sieve size)</small>	SILT AND CLAY  <small>(Liquid limit less than 50)</small>		<b>SM</b> Silty sand; sand/silt mixture(s)	
			<b>SC</b> Clayey sand; sand/clay mixture(s)	
			<b>ML</b> Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity	
	SILT AND CLAY  <small>(Liquid limit greater than 50)</small>		<b>CL</b> Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay	
			<b>OL</b> Organic silt; organic, silty clay of low plasticity	
			<b>MH</b> Inorganic silt; micaceous or diatomaceous fine sand	
	HIGHLY ORGANIC SOIL		<b>CH</b> Inorganic clay of high plasticity; fat clay	
			<b>OH</b> Organic clay of medium to high plasticity; organic silt	
	<b>PT</b> Peat; humus; swamp soil with high organic content			

OTHER MATERIALS	GRAPHIC SYMBOL	USCS LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		<b>AC or PC</b>	Asphalt concrete pavement or Portland cement pavement
ROCK		<b>RK</b>	Rock (See Rock Classification)
WOOD		<b>WD</b>	Wood, lumber, wood chips
DEBRIS		<b>DB</b>	Construction debris, garbage

- Notes:
- USCS letter symbols correspond to symbols used by the Unified Soil Classification System and ASTM classification methods. Dual letter symbols (e.g., SP-SM for sand or gravel) indicate soil with an estimated 5-15% fines. Multiple letter symbols (e.g., ML/CL) indicate borderline or multiple soil classifications.
  - Soil descriptions are based on the general approach presented in the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the Standard Test Method for Classification of Soils for Engineering Purposes, as outlined in ASTM D 2487.
  - Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:
    - Primary Constituent: > 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
    - Secondary Constituents: > 30% and ≤ 50% - "very gravelly," "very sandy," "very silty," etc.
    - > 15% and ≤ 30% - "gravelly," "sandy," "silty," etc.
    - Additional Constituents: > 5% and ≤ 15% - "with gravel," "with sand," "with silt," etc.
    - ≤ 5% - "with trace gravel," "with trace sand," "with trace silt," etc., or not noted.
  - Soil density or consistency descriptions are based on judgement using a combination of sampler penetration blow counts, drilling or excavating conditions, field tests, and laboratory tests, as appropriate.

Drilling and Sampling Key		Field and Lab Test Data																																																				
SAMPLER TYPE	SAMPLE NUMBER & INTERVAL																																																					
<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Code</th> <th style="text-align: left;">Description</th> </tr> <tr><td>a</td><td>3.25-inch O.D., 2.42-inch I.D. Split Spoon</td></tr> <tr><td>b</td><td>2.00-inch O.D., 1.50-inch I.D. Split Spoon</td></tr> <tr><td>c</td><td>Shelby Tube</td></tr> <tr><td>d</td><td>Grab Sample</td></tr> <tr><td>e</td><td>Single-Tube Core Barrel</td></tr> <tr><td>f</td><td>Double-Tube Core Barrel</td></tr> <tr><td>g</td><td>2.50-inch O.D., 2.00-inch I.D. WSDOT</td></tr> <tr><td>h</td><td>3.00-inch O.D., 2.375-inch I.D. Mod. California</td></tr> <tr><td>i</td><td>Other - See text if applicable</td></tr> <tr><td>1</td><td>300-lb Hammer, 30-inch Drop</td></tr> <tr><td>2</td><td>140-lb Hammer, 30-inch Drop</td></tr> <tr><td>3</td><td>Pushed</td></tr> <tr><td>4</td><td>Vibrocore (Rotasonic/Geoprobe)</td></tr> <tr><td>5</td><td>Other - See text if applicable</td></tr> </table>	Code	Description	a	3.25-inch O.D., 2.42-inch I.D. Split Spoon	b	2.00-inch O.D., 1.50-inch I.D. Split Spoon	c	Shelby Tube	d	Grab Sample	e	Single-Tube Core Barrel	f	Double-Tube Core Barrel	g	2.50-inch O.D., 2.00-inch I.D. WSDOT	h	3.00-inch O.D., 2.375-inch I.D. Mod. California	i	Other - See text if applicable	1	300-lb Hammer, 30-inch Drop	2	140-lb Hammer, 30-inch Drop	3	Pushed	4	Vibrocore (Rotasonic/Geoprobe)	5	Other - See text if applicable		<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Code</th> <th style="text-align: left;">Description</th> </tr> <tr><td>PP = 1.0</td><td>Pocket Penetrometer, tsf</td></tr> <tr><td>TV = 0.5</td><td>Torvane, tsf</td></tr> <tr><td>PID = 100</td><td>Photoionization Detector VOC screening, ppm</td></tr> <tr><td>W = 10</td><td>Moisture Content, %</td></tr> <tr><td>D = 120</td><td>Dry Density, pcf</td></tr> <tr><td>-200 = 60</td><td>Material smaller than No. 200 sieve, %</td></tr> <tr><td>GS</td><td>Grain Size - See separate figure for data</td></tr> <tr><td>AL</td><td>Atterberg Limits - See separate figure for data</td></tr> <tr><td>GT</td><td>Other Geotechnical Testing</td></tr> <tr><td>CA</td><td>Chemical Analysis</td></tr> </table>	Code	Description	PP = 1.0	Pocket Penetrometer, tsf	TV = 0.5	Torvane, tsf	PID = 100	Photoionization Detector VOC screening, ppm	W = 10	Moisture Content, %	D = 120	Dry Density, pcf	-200 = 60	Material smaller than No. 200 sieve, %	GS	Grain Size - See separate figure for data	AL	Atterberg Limits - See separate figure for data	GT	Other Geotechnical Testing	CA	Chemical Analysis
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AL	Atterberg Limits - See separate figure for data																																																					
GT	Other Geotechnical Testing																																																					
CA	Chemical Analysis																																																					
<b>Groundwater</b>																																																						
		Approximate water level at time of drilling (ATD)																																																				
		Approximate water level at time other than ATD																																																				

# GP-32

SAMPLE DATA						SOIL PROFILE		GROUNDWATER	
Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Drilling Method: <u>Hollow-stem Auger</u>	Monitoring Well Detail (DOE#: BJY282)
								Ground Elevation (ft): <u>1071.53</u>	
0						[Dotted pattern]	SP-SM	SAND with cobbles and silt with increasing cobbles at 6 feet (unable to collect SS samples)	Water Level
2	1070								8 in
4	1068								Protective well monument, concrete seal
6	1066								Bentonite chips
8	1064								Pea gravel backfill
10	1062								1/2 diameter schedule, 40 PVC screen (0.030 inch slot)

Boring Completed 10/12/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/12/16  
Total Depth of Monitoring Well = 10.0 ft.

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG W/ ELEVATION

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

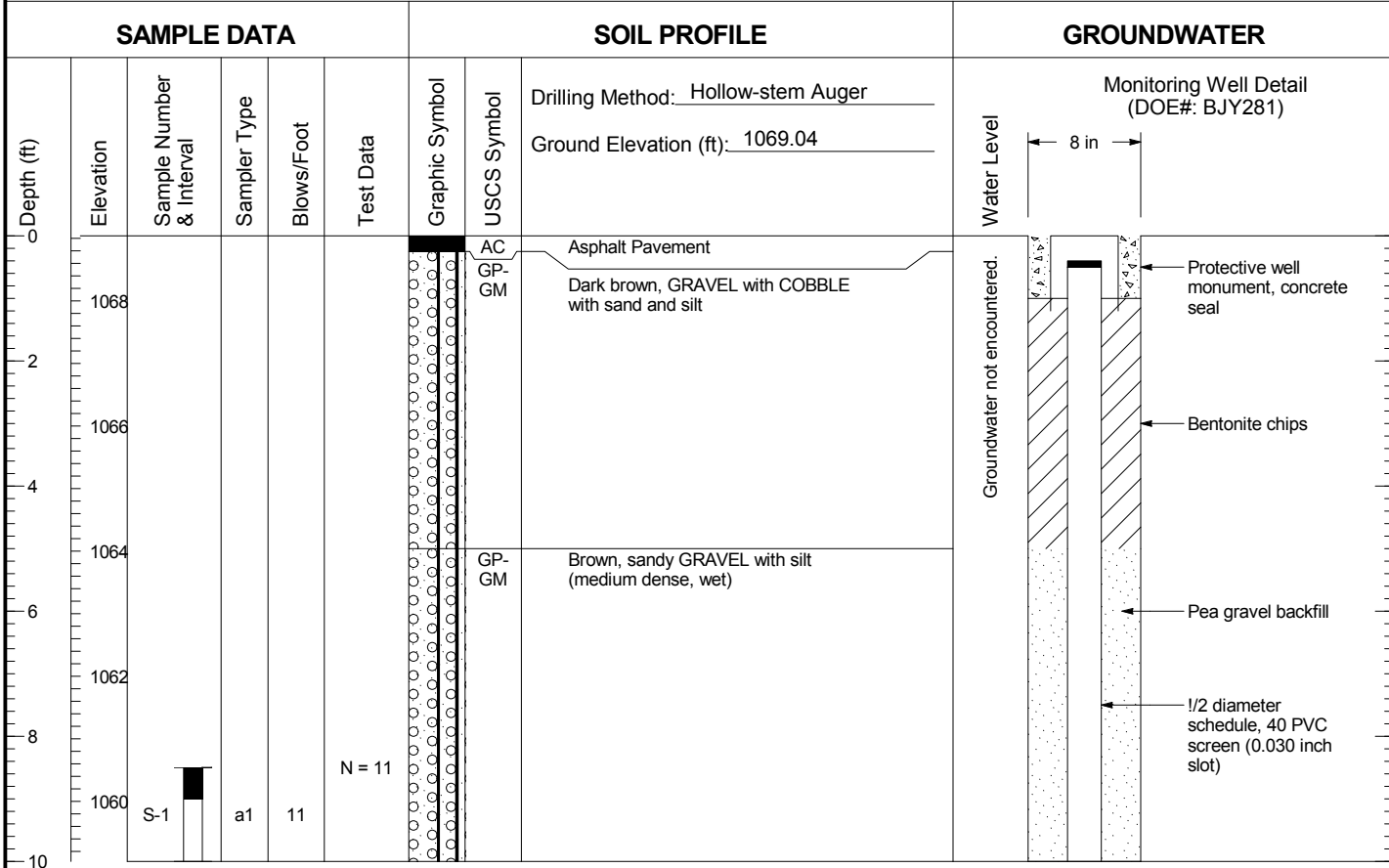


Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-32

Figure  
**B-2**

# GP-33



Boring Completed 10/12/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/12/16  
Total Depth of Monitoring Well = 10.0 ft.

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG W/ ELEVATION

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

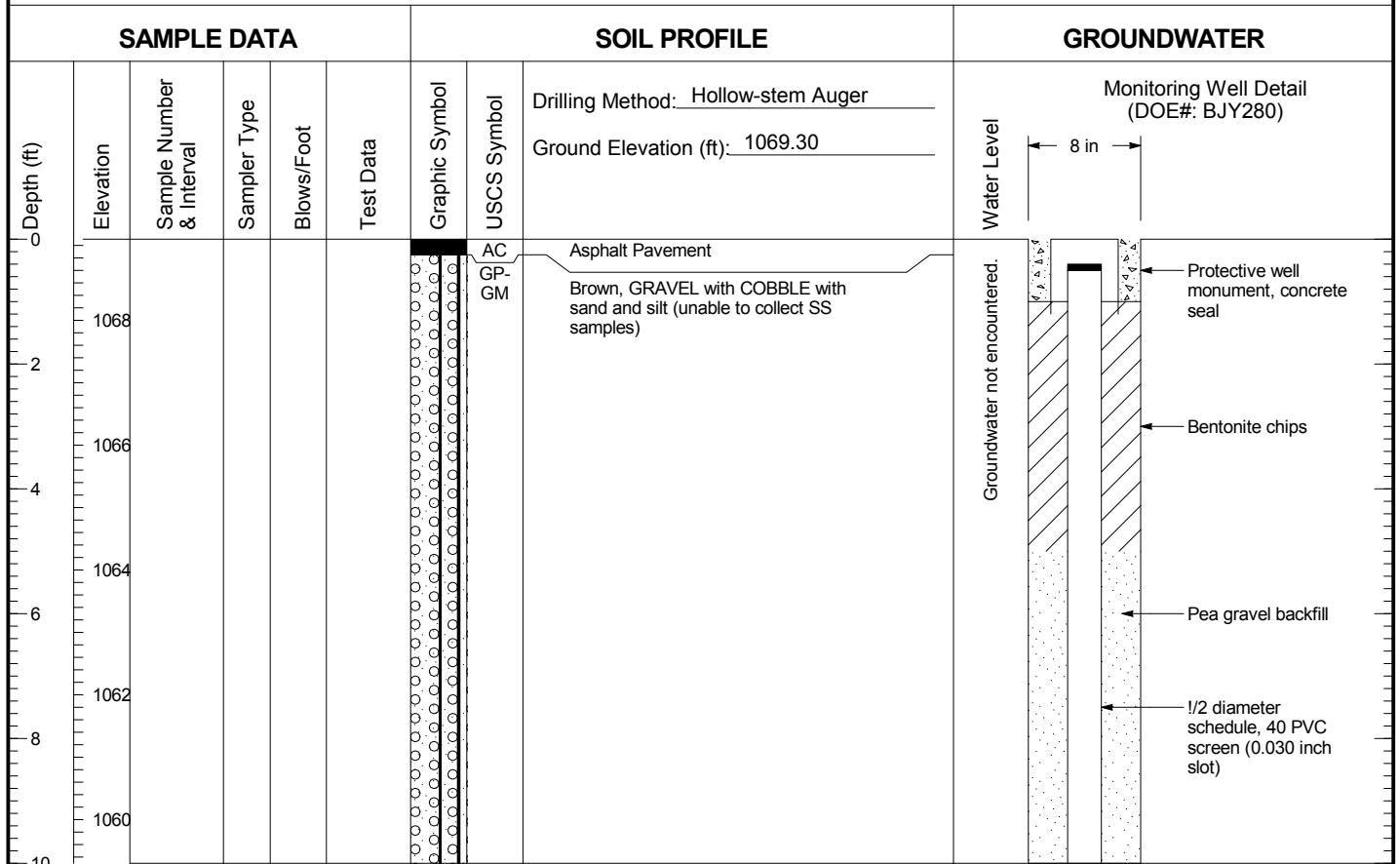


Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-33

Figure  
**B-3**

# GP-34



Boring Completed 10/12/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/12/16  
Total Depth of Monitoring Well = 10.0 ft.

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG W/ ELEVATION

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

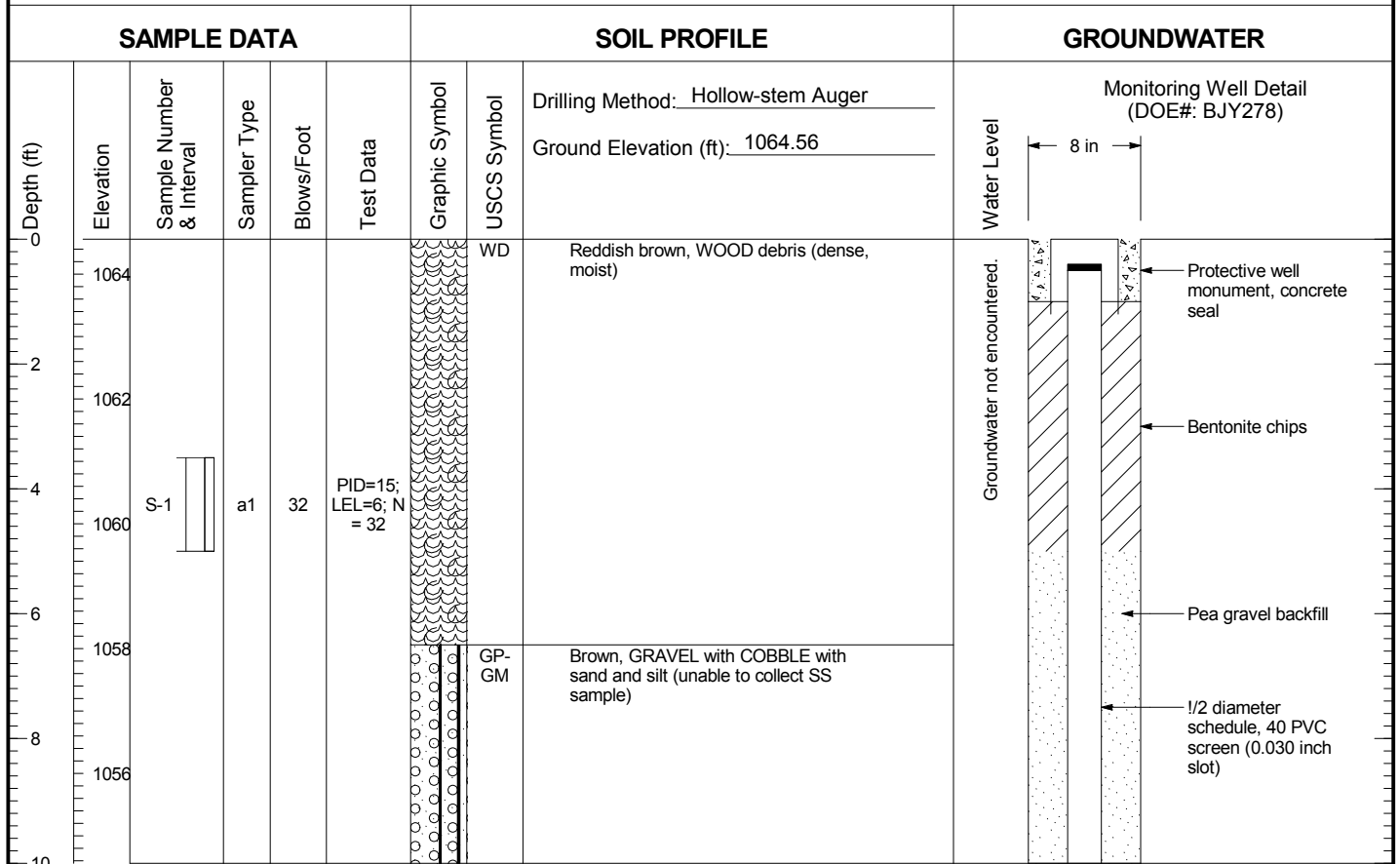


Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-34

Figure  
**B-4**

# GP-35



Drilling Method: Hollow-stem Auger  
 Ground Elevation (ft): 1064.56

Boring Completed 10/11/16  
 Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16  
 Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG W/ ELEVATION

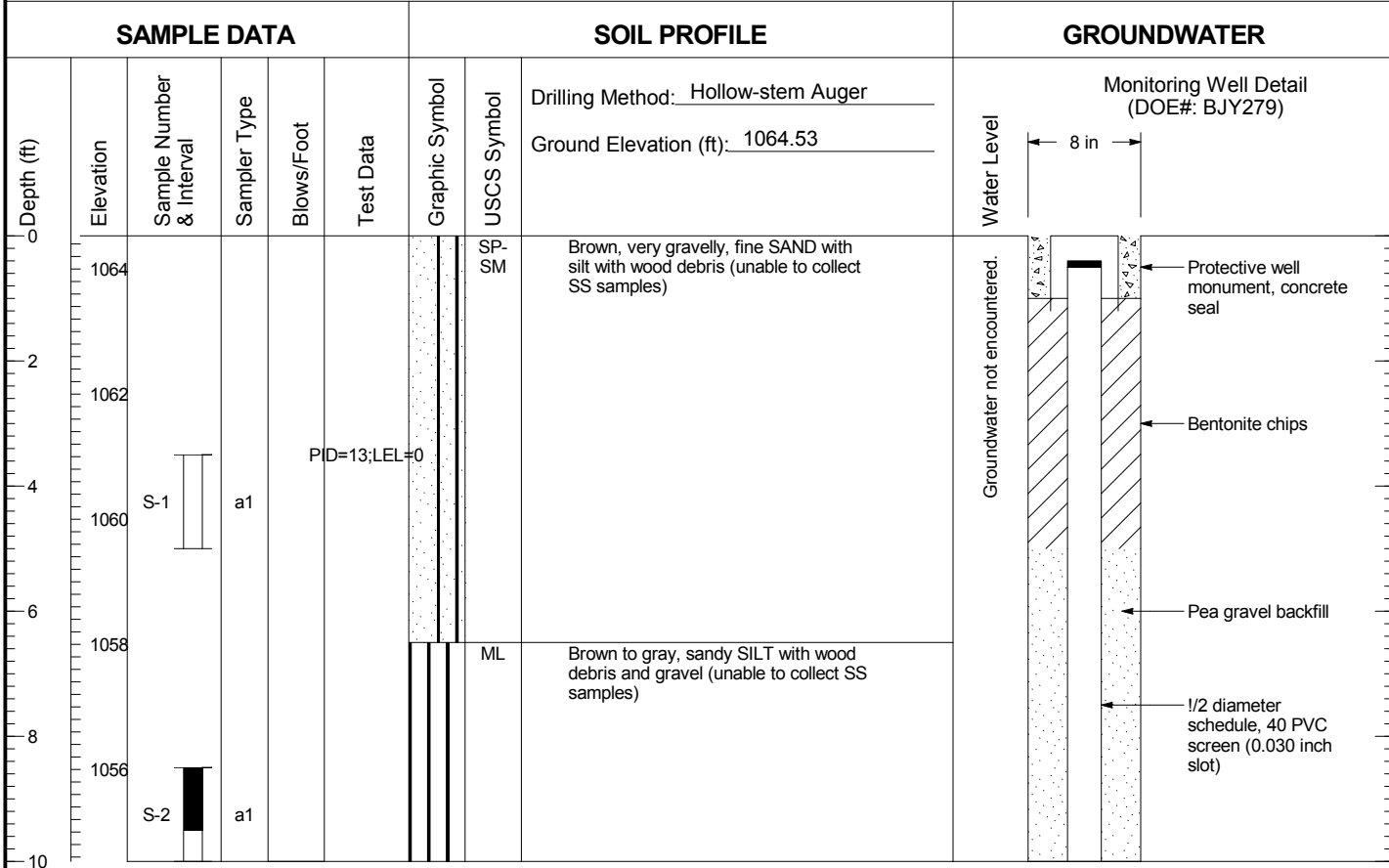


Transportation Corridor Project  
 Yakima, Washington

Log of Monitoring Well GP-35

Figure  
**B-5**

# GP-36



Boring Completed 10/12/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/12/16  
Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG W/ ELEVATION





Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-36

Figure  
**B-6**

# GP-37

SAMPLE DATA						SOIL PROFILE		GROUNDWATER
Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Monitoring Well Detail (DOE#: BJY277)  Water Level 8 in
	1064	S-1	a1	15	PID=1;LEL=5 N = 15		WD	
1056	S-2	a1	9	PID=10.4;LEL=7 N = 5		WD	Brown, WOOD debris (fine to coarse size) (loose to medium dense, damp)	

Boring Completed 10/11/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16  
Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG W/ ELEVATION



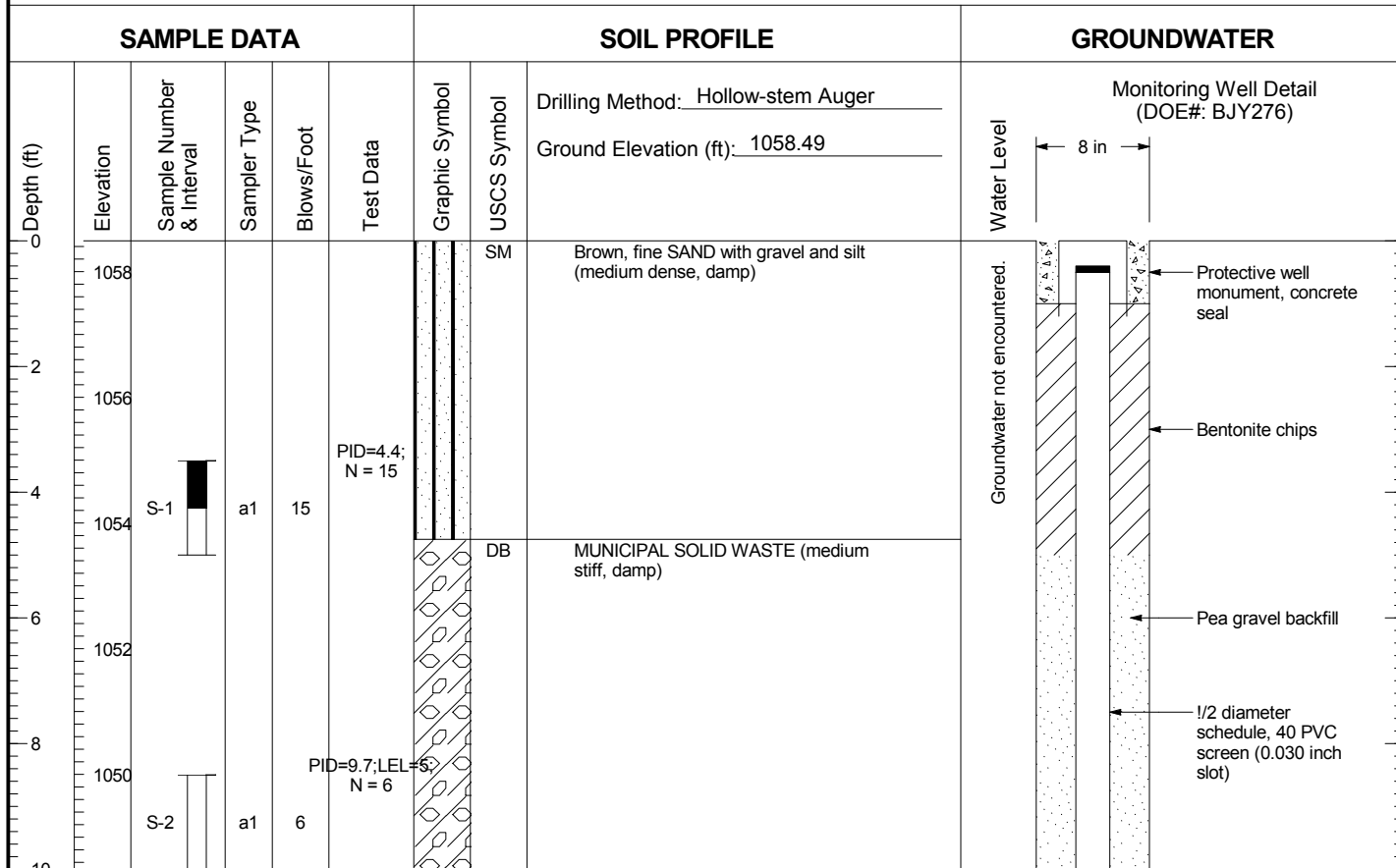
Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-37

Figure  
**B-7**



# GP-38



Boring Completed 10/11/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16  
Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG W/ ELEVATION

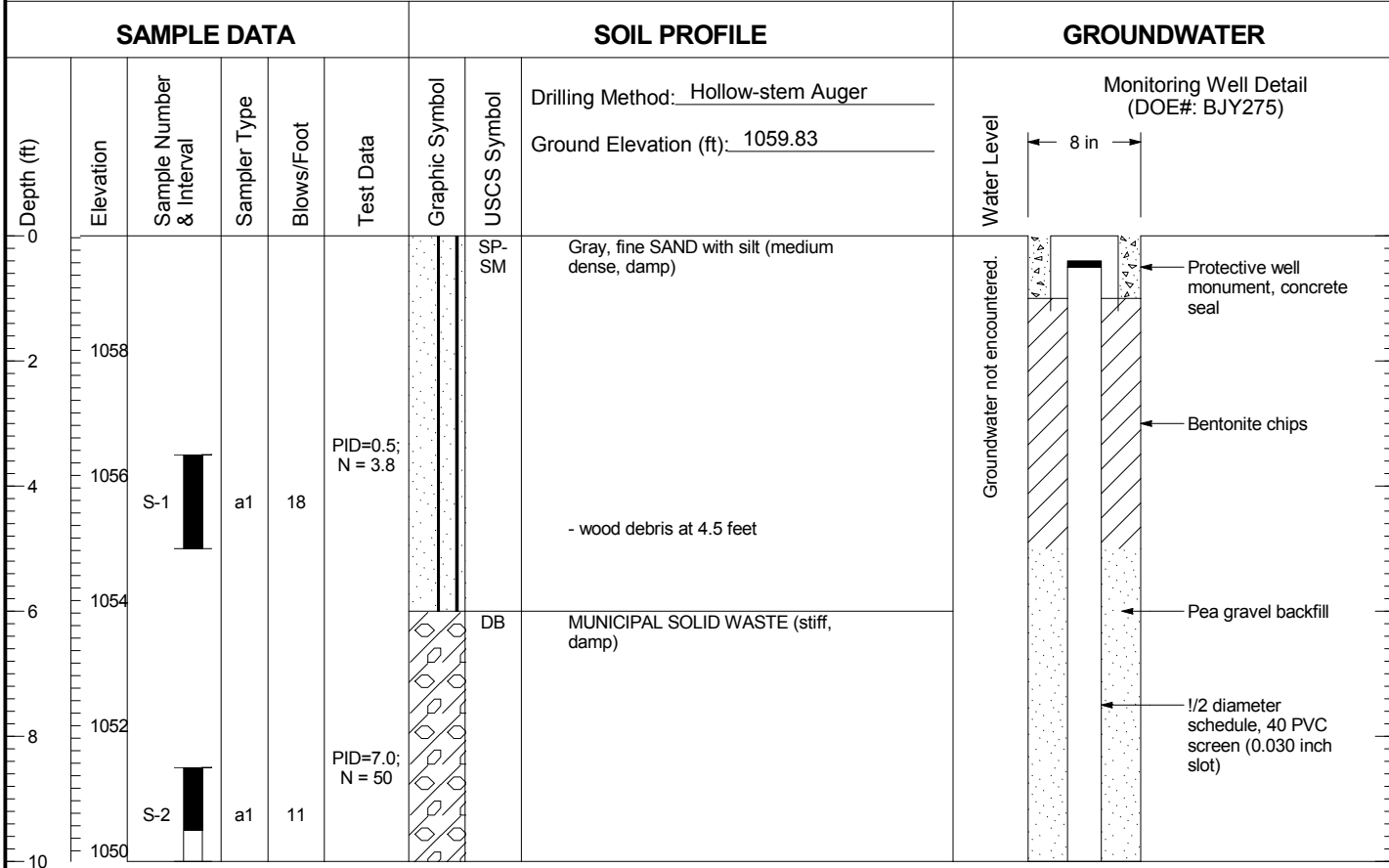


Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-38

Figure  
**B-8**

# GP-39



Boring Completed 10/11/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16  
Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG W/ ELEVATION



Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-39

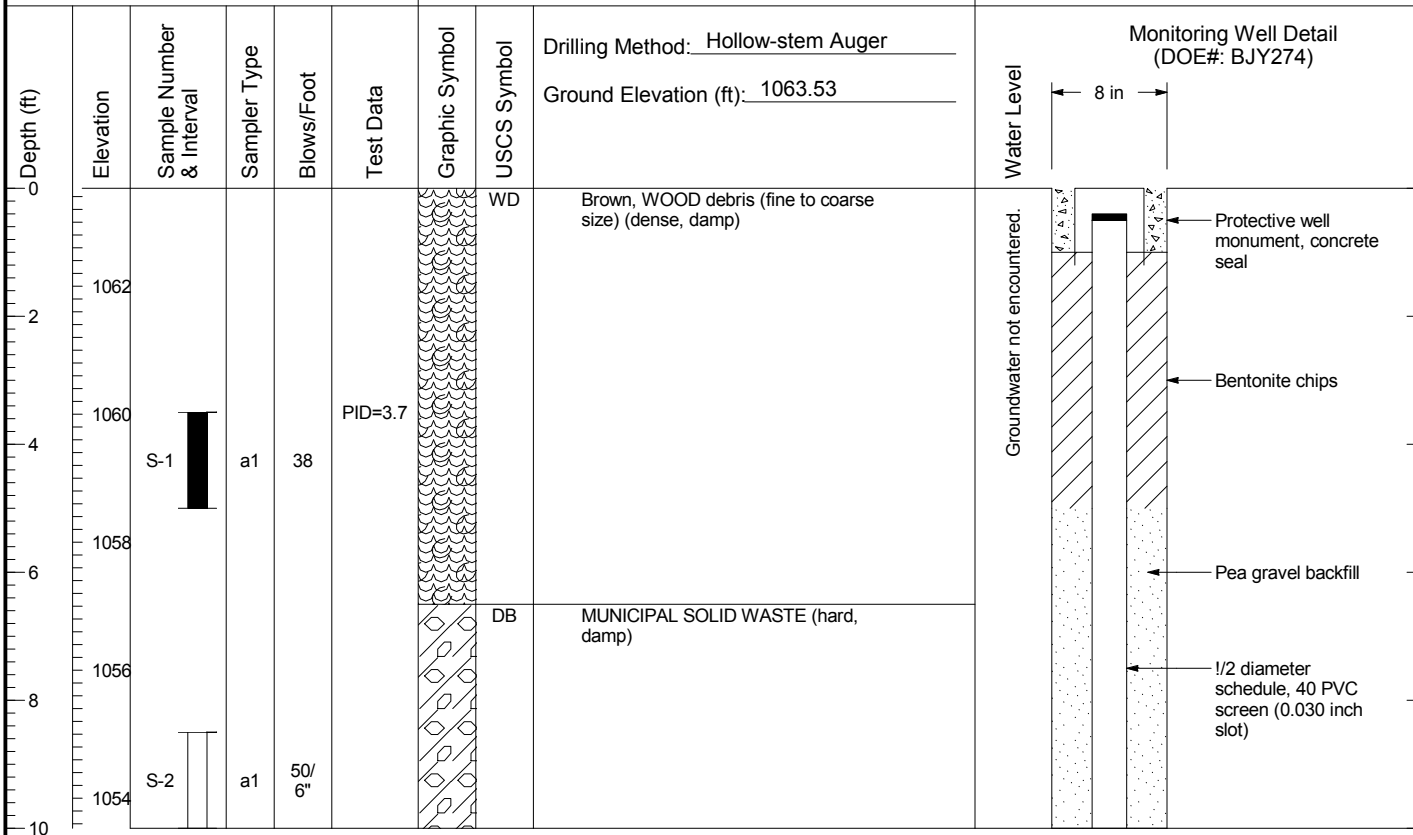
Figure  
**B-9**

# GP-40

## SAMPLE DATA

## SOIL PROFILE

## GROUNDWATER



Boring Completed 10/11/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16  
Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG W/ ELEVATION



Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-40

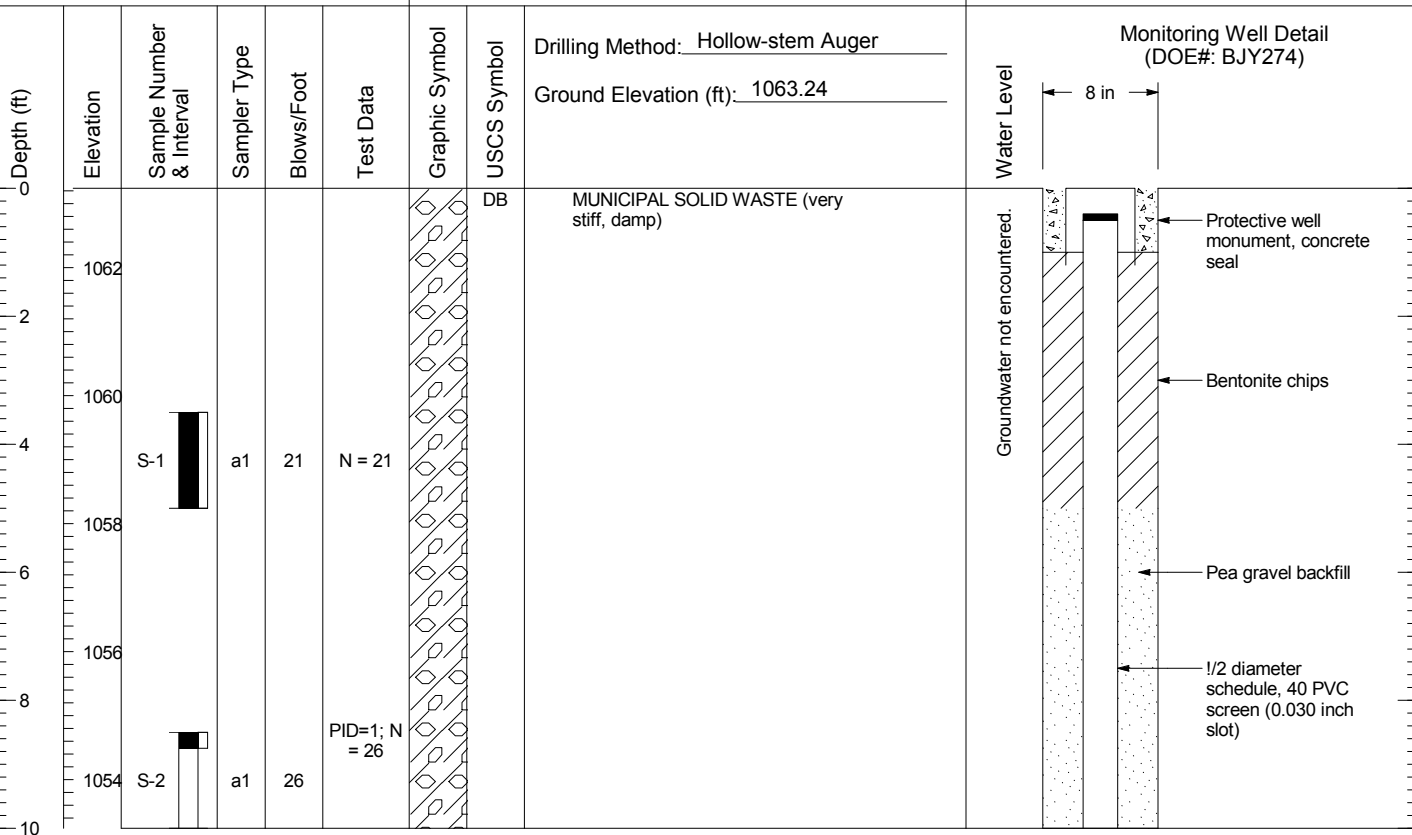
Figure  
**B-10**

# GP-41

## SAMPLE DATA

## SOIL PROFILE

## GROUNDWATER



Boring Completed 10/10/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/10/16  
Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG W/ ELEVATION



Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-41

Figure  
**B-11**

# GP-42

SAMPLE DATA						SOIL PROFILE		GROUNDWATER	
Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Drilling Method: <u>Hollow-stem Auger</u>	Monitoring Well Detail (DOE#: BJY272)
	Ground Elevation (ft): <u>1063.03</u>							Water Level	
0	1062					SM	Brown, SAND with silt and gravel to very silty, fine SAND with wood debris (medium dense, damp)	Groundwater not encountered.	8 in
2	1060							Protective well monument, concrete seal	
4	1058	S-1	a1	11	N = 11			Bentonite chips	
6	1056							Pea gravel backfill	
8	1054	S-2	a1	20	N = 20	SP-SM	Gray, SAND with silt and gravel (medium dense, damp)	1/2 diameter schedule, 40 PVC screen (0.030 inch slot)	
10									

Boring Completed 10/11/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16  
Total Depth of Monitoring Well = 10.0 ft.

- Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
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1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG W/ ELEVATION



Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-42

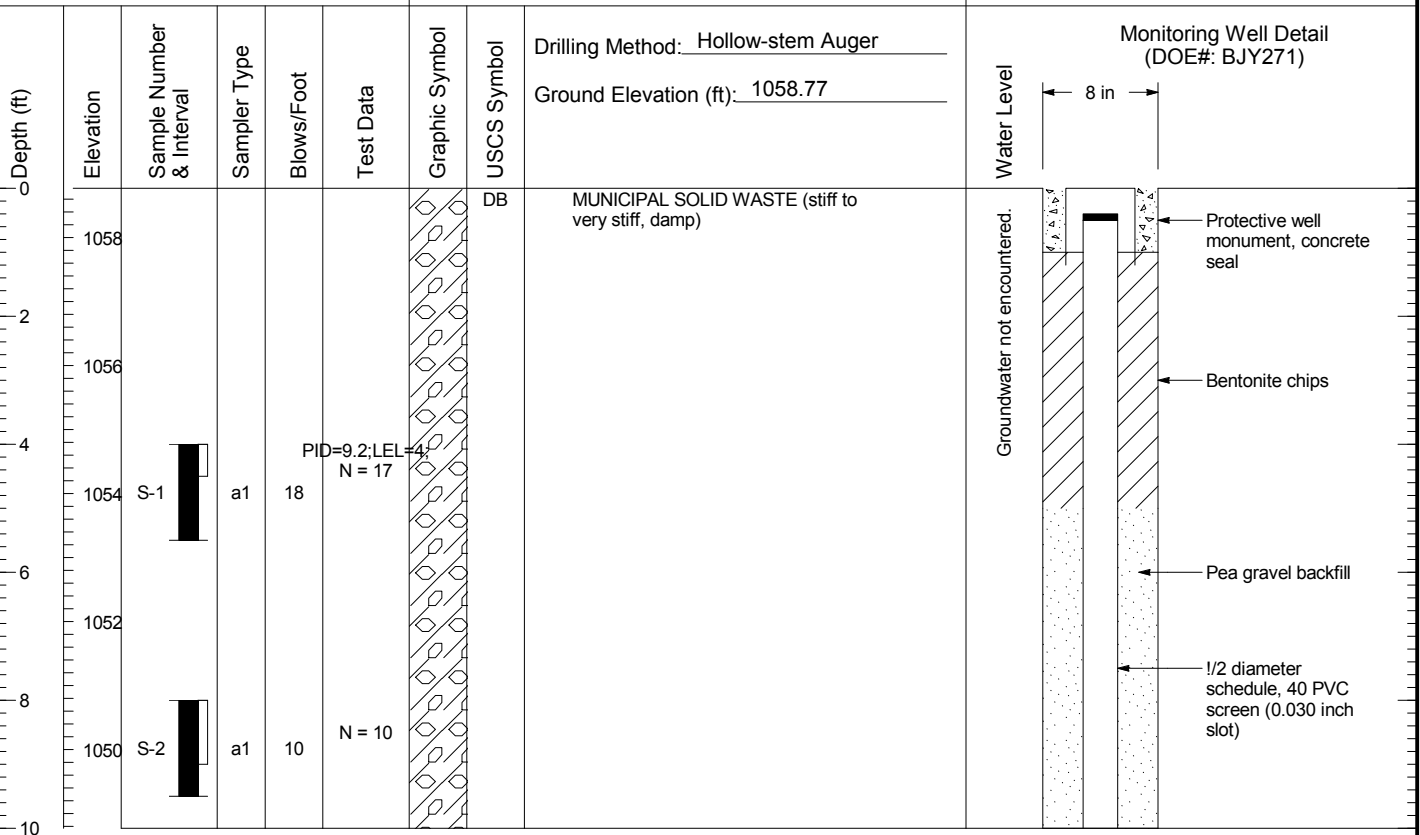
Figure  
**B-12**

# GP-43

## SAMPLE DATA

## SOIL PROFILE

## GROUNDWATER



Boring Completed 10/10/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/10/16  
Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG W/ ELEVATION



Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-43

Figure  
**B-13**

# GP-44

SAMPLE DATA						SOIL PROFILE		GROUNDWATER	
Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Drilling Method: <u>Hollow-stem Auger</u>	Monitoring Well Detail (DOE#: BJY283)
	Ground Elevation (ft): <u>1059.03</u>							Ground Elevation (ft): _____	
0	1058					SP-SM		Light brown, medium SAND with silt and trace gravel (unable to collect SS samples)	Water Level
2	1056								8 in
4	1054								Groundwater not encountered.
6	1052								Protective well monument, concrete seal
8	1050								Bentonite chips
10									Pea gravel backfill
									1/2 diameter schedule, 40 PVC screen (0.030 inch slot)

Boring Completed 10/12/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/12/16  
Total Depth of Monitoring Well = 10.0 ft.

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG W/ ELEVATION

- Notes:
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  3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.



Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-44

Figure  
**B-14**

# Analytical Laboratory Reports





October 10, 2016

Mr. Piper Roelen  
Landau Associates, Inc.  
130 - 2nd Ave. S.  
Edmonds, WA 98020

Dear Mr. Roelen,

On October 3rd, 2 samples were received by our laboratory and assigned our laboratory project number EV16100003. The project was identified as your Transportation Corridor - 1148009.010.013. The sample identification and requested analyses are outlined on the attached chain of custody record.

No abnormalities or nonconformances were observed during the analyses of the project samples.

Please do not hesitate to call me if you have any questions or if I can be of further assistance.

Sincerely,

ALS Laboratory Group

Rick Bagan  
Laboratory Director



CERTIFICATE OF ANALYSIS

CLIENT: Landau Associates, Inc. DATE: 10/10/2016
130 - 2nd Ave. S. ALS JOB#: EV16100003
Edmonds, WA 98020 ALS SAMPLE#: EV16100003-01
CLIENT CONTACT: Piper Roelen DATE RECEIVED: 10/03/2016
CLIENT PROJECT: Transportation Corridor - COLLECTION DATE: 9/27/2016 10:45:00 AM
1148009.010.013
CLIENT SAMPLE ID TP-15-16(1.5-2)09272016 WDOE ACCREDITATION: C601

SAMPLE DATA RESULTS

Table with 8 columns: ANALYTE, METHOD, RESULTS, REPORTING LIMITS, DILUTION FACTOR, UNITS, ANALYSIS DATE, ANALYSIS BY. Rows include TPH-Diesel Range (C12-C24) and TPH-Oil Range (C24-C40).

Table with 5 columns: SURROGATE, METHOD, %REC, ANALYSIS DATE, ANALYSIS BY. Row includes C25 25X Dilution.

U - Analyte analyzed for but not detected at level above reporting limit.
DS2 - Due to high dilution factor surrogate results should be considered uncontrolled.
Chromatogram indicates that it is likely that sample contains light oil.



CERTIFICATE OF ANALYSIS

CLIENT: Landau Associates, Inc. DATE: 10/10/2016
130 - 2nd Ave. S. ALS JOB#: EV16100003
Edmonds, WA 98020 ALS SAMPLE#: EV16100003-02
CLIENT CONTACT: Piper Roelen DATE RECEIVED: 10/03/2016
CLIENT PROJECT: Transportation Corridor - COLLECTION DATE: 9/28/2016 9:55:00 AM
1148009.010.013
CLIENT SAMPLE ID TP-16B-16(0-2)09282016 WDOE ACCREDITATION: C601

SAMPLE DATA RESULTS

Table with 8 columns: ANALYTE, METHOD, RESULTS, REPORTING LIMITS, DILUTION FACTOR, UNITS, ANALYSIS DATE, ANALYSIS BY. Rows include TPH-Diesel Range (C12-C24) and TPH-Oil Range (C24-C40).

Table with 5 columns: SURROGATE, METHOD, %REC, ANALYSIS DATE, ANALYSIS BY. Row includes C25.

U - Analyte analyzed for but not detected at level above reporting limit. Chromatogram indicates that it is likely that sample contains lube oil.



CERTIFICATE OF ANALYSIS

CLIENT: Landau Associates, Inc. DATE: 10/10/2016  
130 - 2nd Ave. S. ALS SDG#: EV16100003  
Edmonds, WA 98020 WDOE ACCREDITATION: C601  
CLIENT CONTACT: Piper Roelen  
CLIENT PROJECT: Transportation Corridor -  
1148009.010.013

LABORATORY BLANK RESULTS

MB-092716S - Batch 108429 - Soil by NWTPH-DX

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
TPH-Diesel Range (C12-C24)	NWTPH-DX	U	MG/KG	25	09/27/2016	EBS
TPH-Oil Range (C24-C40)	NWTPH-DX	U	MG/KG	50	09/27/2016	EBS

U - Analyte analyzed for but not detected at level above reporting limit.

**CERTIFICATE OF ANALYSIS**

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	10/10/2016
CLIENT CONTACT:	Piper Roelen	ALS SDG#:	EV16100003
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	WDOE ACCREDITATION:	C601

**LABORATORY CONTROL SAMPLE RESULTS**

**ALS Test Batch ID: 108429 - Soil by NWTPH-DX**

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS		ANALYSIS DATE	ANALYSIS BY
					MIN	MAX		
TPH-Diesel Range (C12-C24) - BS	NWTPH-DX	94.5			75.5	122.1	09/27/2016	EBS
TPH-Diesel Range (C12-C24) - BSD	NWTPH-DX	99.7	5		75.5	122.1	09/27/2016	EBS

APPROVED BY



Laboratory Director

# ALS ENVIRONMENTAL

## Sample Receiving Checklist

Client: Landan Associates

ALS Job #: EV16100003

Project: Yakima, WA Transportation Corridor - 1148009.010.013

Received Date: 10/3/16 Received Time: 12:00 By: RB

Type of shipping container: Cooler  Box  Other

Shipped via: FedEx Ground  UPS  Mail  Courier ALS Hand Delivered   
FedEx Express

Were custody seals on outside of shipping container? 

	<u>Yes</u>	<u>No</u>	<u>N/A</u>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If yes, how many? 2 Where? Top / Side  
Custody seal date: 10/2 Seal name: Landan Assoc.

Was Chain of Custody properly filled out (ink, signed, dated, etc.)? 

	<u>Yes</u>	<u>No</u>	<u>N/A</u>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Did all bottles have labels? 

	<u>Yes</u>	<u>No</u>	<u>N/A</u>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Did all bottle labels and tags agree with Chain of Custody? 

	<u>Yes</u>	<u>No</u>	<u>N/A</u>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Were samples received within hold time? 

	<u>Yes</u>	<u>No</u>	<u>N/A</u>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Did all bottles arrive in good condition (unbroken, etc.)? 

	<u>Yes</u>	<u>No</u>	<u>N/A</u>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Was sufficient amount of sample sent for the tests indicated? 

	<u>Yes</u>	<u>No</u>	<u>N/A</u>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Was correct preservation added to samples? 

	<u>Yes</u>	<u>No</u>	<u>N/A</u>
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

If no, Sample Control added preservative to the following:

<u>Sample Number</u>	<u>Reagent</u>	<u>Analyte</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

Were VOA vials checked for absence of air bubbles? 

	<u>Yes</u>	<u>No</u>	<u>N/A</u>
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Bubbles present in sample #: \_\_\_\_\_

Temperature of cooler upon receipt: 6.8°C Cold Cool Ambient N/A  
on Ice

Explain any discrepancies: \_\_\_\_\_  
\_\_\_\_\_

Was client contacted? \_\_\_\_\_ Who was called? \_\_\_\_\_ By whom? \_\_\_\_\_ Date: \_\_\_\_\_

Outcome of call: \_\_\_\_\_  
\_\_\_\_\_





November 4, 2016

Mr. Piper Roelen  
Landau Associates, Inc.  
130 - 2nd Ave. S.  
Edmonds, WA 98020

Dear Mr. Roelen,

On October 14th, 20 samples were received by our laboratory and assigned our laboratory project number EV16100095. The project was identified as your Transportation Corridor - 1148009.010.013. The sample identification and requested analyses are outlined on the attached chain of custody record.

No abnormalities or nonconformances were observed during the analyses of the project samples.

Please do not hesitate to call me if you have any questions or if I can be of further assistance.

Sincerely,

ALS Laboratory Group

Rick Bagan  
Laboratory Director





**CERTIFICATE OF ANALYSIS**

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	11/4/2016
CLIENT CONTACT:	Piper Roelen	ALS JOB#:	EV16100095
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	ALS SAMPLE#:	EV16100095-01
CLIENT SAMPLE ID	TP-1-16 S-1 (1-2)	DATE RECEIVED:	10/14/2016
		COLLECTION DATE:	9/26/2016
		WDOE ACCREDITATION:	C601

**SAMPLE DATA RESULTS**

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>3.0</b>	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	<b>0.042</b>	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	<b>7200</b>	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

**CERTIFICATE OF ANALYSIS**

<b>CLIENT:</b>	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	<b>DATE:</b>	11/4/2016
<b>CLIENT CONTACT:</b>	Piper Roelen	<b>ALS JOB#:</b>	EV16100095
<b>CLIENT PROJECT:</b>	Transportation Corridor - 1148009.010.013	<b>ALS SAMPLE#:</b>	EV16100095-02
<b>CLIENT SAMPLE ID</b>	TP-6-16 S-2 (15-2)	<b>DATE RECEIVED:</b>	10/14/2016
		<b>COLLECTION DATE:</b>	9/26/2016
		<b>WDOE ACCREDITATION:</b>	C601

**SAMPLE DATA RESULTS**

<b>ANALYTE</b>	<b>METHOD</b>	<b>RESULTS</b>	<b>REPORTING LIMITS</b>	<b>DILUTION FACTOR</b>	<b>UNITS</b>	<b>ANALYSIS DATE</b>	<b>ANALYSIS BY</b>
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.25</b>	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	<b>4600</b>	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.



**CERTIFICATE OF ANALYSIS**

<b>CLIENT:</b>	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	<b>DATE:</b>	11/4/2016
<b>CLIENT CONTACT:</b>	Piper Roelen	<b>ALS JOB#:</b>	EV16100095
<b>CLIENT PROJECT:</b>	Transportation Corridor - 1148009.010.013	<b>ALS SAMPLE#:</b>	EV16100095-03
<b>CLIENT SAMPLE ID</b>	TP-9-16 S-1 (0-1.5)	<b>DATE RECEIVED:</b>	10/14/2016
		<b>COLLECTION DATE:</b>	9/26/2016
		<b>WDOE ACCREDITATION:</b>	C601

**SAMPLE DATA RESULTS**

<b>ANALYTE</b>	<b>METHOD</b>	<b>RESULTS</b>	<b>REPORTING LIMITS</b>	<b>DILUTION FACTOR</b>	<b>UNITS</b>	<b>ANALYSIS DATE</b>	<b>ANALYSIS BY</b>
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.29</b>	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	<b>6600</b>	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.



**CERTIFICATE OF ANALYSIS**

<b>CLIENT:</b>	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	<b>DATE:</b>	11/4/2016
<b>CLIENT CONTACT:</b>	Piper Roelen	<b>ALS JOB#:</b>	EV16100095
<b>CLIENT PROJECT:</b>	Transportation Corridor - 1148009.010.013	<b>ALS SAMPLE#:</b>	EV16100095-04
<b>CLIENT SAMPLE ID</b>	TP-9B-16 S-4 (8-9)	<b>DATE RECEIVED:</b>	10/14/2016
		<b>COLLECTION DATE:</b>	9/29/2016
		<b>WDOE ACCREDITATION:</b>	C601

**SAMPLE DATA RESULTS**

<b>ANALYTE</b>	<b>METHOD</b>	<b>RESULTS</b>	<b>REPORTING LIMITS</b>	<b>DILUTION FACTOR</b>	<b>UNITS</b>	<b>ANALYSIS DATE</b>	<b>ANALYSIS BY</b>
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.24</b>	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	<b>3500</b>	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

**CERTIFICATE OF ANALYSIS**

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	11/4/2016
CLIENT CONTACT:	Piper Roelen	ALS JOB#:	EV16100095
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	ALS SAMPLE#:	EV16100095-05
CLIENT SAMPLE ID	TP-9C-16 S-3 (5-6)	DATE RECEIVED:	10/14/2016
		COLLECTION DATE:	9/30/2016
		WDOE ACCREDITATION:	C601

**SAMPLE DATA RESULTS**

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.23</b>	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	<b>7300</b>	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.



**CERTIFICATE OF ANALYSIS**

<b>CLIENT:</b>	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	<b>DATE:</b>	11/4/2016
<b>CLIENT CONTACT:</b>	Piper Roelen	<b>ALS JOB#:</b>	EV16100095
<b>CLIENT PROJECT:</b>	Transportation Corridor - 1148009.010.013	<b>ALS SAMPLE#:</b>	EV16100095-06
<b>CLIENT SAMPLE ID</b>	TP-10-16 S-2 (1-2)	<b>DATE RECEIVED:</b>	10/14/2016
		<b>COLLECTION DATE:</b>	9/26/2016
		<b>WDOE ACCREDITATION:</b>	C601

**SAMPLE DATA RESULTS**

<b>ANALYTE</b>	<b>METHOD</b>	<b>RESULTS</b>	<b>REPORTING LIMITS</b>	<b>DILUTION FACTOR</b>	<b>UNITS</b>	<b>ANALYSIS DATE</b>	<b>ANALYSIS BY</b>
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.31</b>	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	<b>3100</b>	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.



**CERTIFICATE OF ANALYSIS**

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	11/4/2016
CLIENT CONTACT:	Piper Roelen	ALS JOB#:	EV16100095
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	ALS SAMPLE#:	EV16100095-07
CLIENT SAMPLE ID	TP-10-16 S-5 (10-12)	DATE RECEIVED:	10/14/2016
		COLLECTION DATE:	9/26/2016
		WDOE ACCREDITATION:	C601

**SAMPLE DATA RESULTS**

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.28</b>	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	<b>6000</b>	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.

**CERTIFICATE OF ANALYSIS**

<b>CLIENT:</b>	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	<b>DATE:</b>	11/4/2016
<b>CLIENT CONTACT:</b>	Piper Roelen	<b>ALS JOB#:</b>	EV16100095
<b>CLIENT PROJECT:</b>	Transportation Corridor - 1148009.010.013	<b>ALS SAMPLE#:</b>	EV16100095-08
<b>CLIENT SAMPLE ID</b>	TP-10A-16 S-4 (6-7)	<b>DATE RECEIVED:</b>	10/14/2016
		<b>COLLECTION DATE:</b>	9/29/2016
		<b>WDOE ACCREDITATION:</b>	C601

**SAMPLE DATA RESULTS**

<b>ANALYTE</b>	<b>METHOD</b>	<b>RESULTS</b>	<b>REPORTING LIMITS</b>	<b>DILUTION FACTOR</b>	<b>UNITS</b>	<b>ANALYSIS DATE</b>	<b>ANALYSIS BY</b>
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.18</b>	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	<b>8600</b>	0	1	BTU/lb	10/18/2016	ALTU
Chlorine	EPA-5050/9056	<b>56</b>	0	1	MG/KG	11/03/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.





**CERTIFICATE OF ANALYSIS**

<b>CLIENT:</b>	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	<b>DATE:</b>	11/4/2016
<b>CLIENT CONTACT:</b>	Piper Roelen	<b>ALS JOB#:</b>	EV16100095
<b>CLIENT PROJECT:</b>	Transportation Corridor - 1148009.010.013	<b>ALS SAMPLE#:</b>	EV16100095-09
<b>CLIENT SAMPLE ID</b>	TP-10B-16 S-4 (5-5.5)	<b>DATE RECEIVED:</b>	10/14/2016
		<b>COLLECTION DATE:</b>	9/29/2016
		<b>WDOE ACCREDITATION:</b>	C601

**SAMPLE DATA RESULTS**

<b>ANALYTE</b>	<b>METHOD</b>	<b>RESULTS</b>	<b>REPORTING LIMITS</b>	<b>DILUTION FACTOR</b>	<b>UNITS</b>	<b>ANALYSIS DATE</b>	<b>ANALYSIS BY</b>
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.17</b>	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	<b>5300</b>	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.



**CERTIFICATE OF ANALYSIS**

<b>CLIENT:</b>	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	<b>DATE:</b>	11/4/2016
<b>CLIENT CONTACT:</b>	Piper Roelen	<b>ALS JOB#:</b>	EV16100095
<b>CLIENT PROJECT:</b>	Transportation Corridor - 1148009.010.013	<b>ALS SAMPLE#:</b>	EV16100095-10
<b>CLIENT SAMPLE ID</b>	TP-11-16 S-3 (3-3.5)	<b>DATE RECEIVED:</b>	10/14/2016
		<b>COLLECTION DATE:</b>	9/26/2016
		<b>WDOE ACCREDITATION:</b>	C601

**SAMPLE DATA RESULTS**

<b>ANALYTE</b>	<b>METHOD</b>	<b>RESULTS</b>	<b>REPORTING LIMITS</b>	<b>DILUTION FACTOR</b>	<b>UNITS</b>	<b>ANALYSIS DATE</b>	<b>ANALYSIS BY</b>
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.18</b>	0.025	5	MG/L	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/26/2016	RAL
Heating Value (Gross)	D5865	<b>9200</b>	0	1	BTU/lb	10/18/2016	ALTU
Chlorine	EPA-5050/9056	<b>41</b>	0	1	MG/KG	11/03/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.



**CERTIFICATE OF ANALYSIS**

<b>CLIENT:</b>	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	<b>DATE:</b>	11/4/2016
<b>CLIENT CONTACT:</b>	Piper Roelen	<b>ALS JOB#:</b>	EV16100095
<b>CLIENT PROJECT:</b>	Transportation Corridor - 1148009.010.013	<b>ALS SAMPLE#:</b>	EV16100095-11
<b>CLIENT SAMPLE ID</b>	TP-11A-16 S-3 (5-6)	<b>DATE RECEIVED:</b>	10/14/2016
		<b>COLLECTION DATE:</b>	9/29/2016
		<b>WDOE ACCREDITATION:</b>	C601

**SAMPLE DATA RESULTS**

<b>ANALYTE</b>	<b>METHOD</b>	<b>RESULTS</b>	<b>REPORTING LIMITS</b>	<b>DILUTION FACTOR</b>	<b>UNITS</b>	<b>ANALYSIS DATE</b>	<b>ANALYSIS BY</b>
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.27</b>	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	<b>5500</b>	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.



**CERTIFICATE OF ANALYSIS**

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	11/4/2016
CLIENT CONTACT:	Piper Roelen	ALS JOB#:	EV16100095
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	ALS SAMPLE#:	EV16100095-12
CLIENT SAMPLE ID	TP-11B-16 S-5 (8-9)	DATE RECEIVED:	10/14/2016
		COLLECTION DATE:	9/29/2016
		WDOE ACCREDITATION:	C601

**SAMPLE DATA RESULTS**

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.23</b>	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	<b>4600</b>	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.



**CERTIFICATE OF ANALYSIS**

<b>CLIENT:</b>	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	<b>DATE:</b>	11/4/2016
<b>CLIENT CONTACT:</b>	Piper Roelen	<b>ALS JOB#:</b>	EV16100095
<b>CLIENT PROJECT:</b>	Transportation Corridor - 1148009.010.013	<b>ALS SAMPLE#:</b>	EV16100095-13
<b>CLIENT SAMPLE ID</b>	TP-25-16 S-5 (8-10)	<b>DATE RECEIVED:</b>	10/14/2016
		<b>COLLECTION DATE:</b>	9/28/2016
		<b>WDOE ACCREDITATION:</b>	C601

**SAMPLE DATA RESULTS**

<b>ANALYTE</b>	<b>METHOD</b>	<b>RESULTS</b>	<b>REPORTING LIMITS</b>	<b>DILUTION FACTOR</b>	<b>UNITS</b>	<b>ANALYSIS DATE</b>	<b>ANALYSIS BY</b>
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.19</b>	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	<b>7300</b>	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.



**CERTIFICATE OF ANALYSIS**

<b>CLIENT:</b>	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	<b>DATE:</b>	11/4/2016
<b>CLIENT CONTACT:</b>	Piper Roelen	<b>ALS JOB#:</b>	EV16100095
<b>CLIENT PROJECT:</b>	Transportation Corridor - 1148009.010.013	<b>ALS SAMPLE#:</b>	EV16100095-14
<b>CLIENT SAMPLE ID</b>	TP-26-16 S-3 (4-4.5)	<b>DATE RECEIVED:</b>	10/14/2016
		<b>COLLECTION DATE:</b>	9/28/2016
		<b>WDOE ACCREDITATION:</b>	C601

**SAMPLE DATA RESULTS**

<b>ANALYTE</b>	<b>METHOD</b>	<b>RESULTS</b>	<b>REPORTING LIMITS</b>	<b>DILUTION FACTOR</b>	<b>UNITS</b>	<b>ANALYSIS DATE</b>	<b>ANALYSIS BY</b>
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.21</b>	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	<b>9000</b>	0	1	BTU/lb	10/18/2016	ALTU
Chlorine	EPA-5050/9056	<b>56</b>	0	1	MG/KG	11/03/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.



**CERTIFICATE OF ANALYSIS**

<b>CLIENT:</b>	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	<b>DATE:</b>	11/4/2016
<b>CLIENT CONTACT:</b>	Piper Roelen	<b>ALS JOB#:</b>	EV16100095
<b>CLIENT PROJECT:</b>	Transportation Corridor - 1148009.010.013	<b>ALS SAMPLE#:</b>	EV16100095-15
<b>CLIENT SAMPLE ID</b>	TP-26A-16 S-3 (6-7)	<b>DATE RECEIVED:</b>	10/14/2016
		<b>COLLECTION DATE:</b>	9/30/2016
		<b>WDOE ACCREDITATION:</b>	C601

**SAMPLE DATA RESULTS**

<b>ANALYTE</b>	<b>METHOD</b>	<b>RESULTS</b>	<b>REPORTING LIMITS</b>	<b>DILUTION FACTOR</b>	<b>UNITS</b>	<b>ANALYSIS DATE</b>	<b>ANALYSIS BY</b>
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.27</b>	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	<b>7100</b>	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.



**CERTIFICATE OF ANALYSIS**

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	11/4/2016
CLIENT CONTACT:	Piper Roelen	ALS JOB#:	EV16100095
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	ALS SAMPLE#:	EV16100095-16
CLIENT SAMPLE ID	TP-26B-16 S-3 (4-5)	DATE RECEIVED:	10/14/2016
		COLLECTION DATE:	9/30/2016
		WDOE ACCREDITATION:	C601

**SAMPLE DATA RESULTS**

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.33</b>	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	<b>8500</b>	0	1	BTU/lb	10/18/2016	ALTU
Chlorine	EPA-5050/9056	<b>130</b>	0	1	MG/KG	11/03/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.



**CERTIFICATE OF ANALYSIS**

<b>CLIENT:</b>	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	<b>DATE:</b>	11/4/2016
<b>CLIENT CONTACT:</b>	Piper Roelen	<b>ALS JOB#:</b>	EV16100095
<b>CLIENT PROJECT:</b>	Transportation Corridor - 1148009.010.013	<b>ALS SAMPLE#:</b>	EV16100095-17
<b>CLIENT SAMPLE ID</b>	TP-28-16 S-1 (1-2)	<b>DATE RECEIVED:</b>	10/14/2016
		<b>COLLECTION DATE:</b>	9/28/2016
		<b>WDOE ACCREDITATION:</b>	C601

**SAMPLE DATA RESULTS**

<b>ANALYTE</b>	<b>METHOD</b>	<b>RESULTS</b>	<b>REPORTING LIMITS</b>	<b>DILUTION FACTOR</b>	<b>UNITS</b>	<b>ANALYSIS DATE</b>	<b>ANALYSIS BY</b>
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.20</b>	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	<b>4400</b>	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.



**CERTIFICATE OF ANALYSIS**

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	11/4/2016
CLIENT CONTACT:	Piper Roelen	ALS JOB#:	EV16100095
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	ALS SAMPLE#:	EV16100095-18
CLIENT SAMPLE ID	TP-34-16 S-4 (6-7)	DATE RECEIVED:	10/14/2016
		COLLECTION DATE:	9/30/2016
		WDOE ACCREDITATION:	C601

**SAMPLE DATA RESULTS**

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.28</b>	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	<b>7000</b>	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.



**CERTIFICATE OF ANALYSIS**

<b>CLIENT:</b>	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	<b>DATE:</b>	11/4/2016
<b>CLIENT CONTACT:</b>	Piper Roelen	<b>ALS JOB#:</b>	EV16100095
<b>CLIENT PROJECT:</b>	Transportation Corridor - 1148009.010.013	<b>ALS SAMPLE#:</b>	EV16100095-19
<b>CLIENT SAMPLE ID</b>	TP-34-16 S-5 (10-11)	<b>DATE RECEIVED:</b>	10/14/2016
		<b>COLLECTION DATE:</b>	9/30/2016
		<b>WDOE ACCREDITATION:</b>	C601

**SAMPLE DATA RESULTS**

<b>ANALYTE</b>	<b>METHOD</b>	<b>RESULTS</b>	<b>REPORTING LIMITS</b>	<b>DILUTION FACTOR</b>	<b>UNITS</b>	<b>ANALYSIS DATE</b>	<b>ANALYSIS BY</b>
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.20</b>	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	<b>9600</b>	0	1	BTU/lb	10/18/2016	ALTU
Chlorine	EPA-5050/9056	<b>53</b>	0	1	MG/KG	11/03/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.



**CERTIFICATE OF ANALYSIS**

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	11/4/2016
CLIENT CONTACT:	Piper Roelen	ALS JOB#:	EV16100095
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	ALS SAMPLE#:	EV16100095-20
CLIENT SAMPLE ID	TP-34A-16 S-1 (0-3)	DATE RECEIVED:	10/14/2016
		COLLECTION DATE:	9/30/2016
		WDOE ACCREDITATION:	C601

**SAMPLE DATA RESULTS**

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	0.00020	1	MG/L	10/26/2016	RAL
Arsenic (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	<b>0.25</b>	0.025	5	MG/L	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	<b>0.025</b>	0.025	5	MG/L	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	0.025	5	MG/L	10/28/2016	RAL
Heating Value (Gross)	D5865	<b>6600</b>	0	1	BTU/lb	10/18/2016	ALTU

U - Analyte analyzed for but not detected at level above reporting limit.



**CERTIFICATE OF ANALYSIS**

<b>CLIENT:</b>	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	<b>DATE:</b>	11/4/2016
<b>CLIENT CONTACT:</b>	Piper Roelen	<b>ALS SDG#:</b>	EV16100095
<b>CLIENT PROJECT:</b>	Transportation Corridor - 1148009.010.013	<b>WDOE ACCREDITATION:</b>	C601

**LABORATORY BLANK RESULTS**

**MBLK-283820 - Batch R283820 - TCLP Extract by EPA-7470**

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Mercury (TCLP)	EPA-7470/1311	U	MG/L	0.00020	10/26/2016	RAL

U - Analyte analyzed for but not detected at level above reporting limit.

**MBLK-283821 - Batch R283821 - TCLP Extract by EPA-6020**

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Arsenic (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/26/2016	RAL
Barium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/26/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/26/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/26/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/26/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/26/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/26/2016	RAL

U - Analyte analyzed for but not detected at level above reporting limit.

**MBLK-283823 - Batch R283823 - TCLP Extract by EPA-6020**

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Arsenic (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/28/2016	RAL
Barium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/28/2016	RAL
Cadmium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/28/2016	RAL
Chromium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/28/2016	RAL
Lead (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/28/2016	RAL
Selenium (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/28/2016	RAL
Silver (TCLP)	EPA-6020/1311	U	MG/L	0.0050	10/28/2016	RAL

U - Analyte analyzed for but not detected at level above reporting limit.



**CERTIFICATE OF ANALYSIS**

<b>CLIENT:</b>	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	<b>DATE:</b>	11/4/2016
<b>CLIENT CONTACT:</b>	Piper Roelen	<b>ALS SDG#:</b>	EV16100095
<b>CLIENT PROJECT:</b>	Transportation Corridor - 1148009.010.013	<b>WDOE ACCREDITATION:</b>	C601

**LABORATORY CONTROL SAMPLE RESULTS**

**ALS Test Batch ID: R283820 - TCLP Extract by EPA-7470**

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS		ANALYSIS DATE	ANALYSIS BY
					MIN	MAX		
Mercury (TCLP) - BS	EPA-7470/1311	94.0			85	115	10/26/2016	RAL
Mercury (TCLP) - BSD	EPA-7470/1311	91.0	3		85	115	10/26/2016	RAL

**ALS Test Batch ID: R283821 - TCLP Extract by EPA-6020**

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS		ANALYSIS DATE	ANALYSIS BY
					MIN	MAX		
Arsenic (TCLP) - BS	EPA-6020/1311	99.0			89.1	110	10/26/2016	RAL
Arsenic (TCLP) - BSD	EPA-6020/1311	99.4	0		89.1	110	10/26/2016	RAL
Barium (TCLP) - BS	EPA-6020/1311	101			88.5	108	10/26/2016	RAL
Barium (TCLP) - BSD	EPA-6020/1311	100	0		88.5	108	10/26/2016	RAL
Cadmium (TCLP) - BS	EPA-6020/1311	101			89.4	109	10/26/2016	RAL
Cadmium (TCLP) - BSD	EPA-6020/1311	102	1		89.4	109	10/26/2016	RAL
Chromium (TCLP) - BS	EPA-6020/1311	102			86.2	107	10/26/2016	RAL
Chromium (TCLP) - BSD	EPA-6020/1311	102	0		86.2	107	10/26/2016	RAL
Lead (TCLP) - BS	EPA-6020/1311	99.5			87.5	107	10/26/2016	RAL
Lead (TCLP) - BSD	EPA-6020/1311	101	2		87.5	107	10/26/2016	RAL
Selenium (TCLP) - BS	EPA-6020/1311	102			90.2	113	10/26/2016	RAL
Selenium (TCLP) - BSD	EPA-6020/1311	102	0		90.2	113	10/26/2016	RAL
Silver (TCLP) - BS	EPA-6020/1311	101			80	120	10/26/2016	RAL
Silver (TCLP) - BSD	EPA-6020/1311	98.2	3		80	120	10/26/2016	RAL

**ALS Test Batch ID: R283823 - TCLP Extract by EPA-6020**

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS		ANALYSIS DATE	ANALYSIS BY
					MIN	MAX		
Arsenic (TCLP) - BS	EPA-6020/1311	96.9			89.1	110	10/28/2016	RAL
Arsenic (TCLP) - BSD	EPA-6020/1311	97.6	1		89.1	110	10/28/2016	RAL
Barium (TCLP) - BS	EPA-6020/1311	99.6			88.5	108	10/28/2016	RAL
Barium (TCLP) - BSD	EPA-6020/1311	99.6	0		88.5	108	10/28/2016	RAL
Cadmium (TCLP) - BS	EPA-6020/1311	98.1			89.4	109	10/28/2016	RAL
Cadmium (TCLP) - BSD	EPA-6020/1311	99.5	1		89.4	109	10/28/2016	RAL
Chromium (TCLP) - BS	EPA-6020/1311	96.8			86.2	107	10/28/2016	RAL
Chromium (TCLP) - BSD	EPA-6020/1311	97.2	0		86.2	107	10/28/2016	RAL
Lead (TCLP) - BS	EPA-6020/1311	96.6			87.5	107	10/28/2016	RAL
Lead (TCLP) - BSD	EPA-6020/1311	97.5	1		87.5	107	10/28/2016	RAL
Selenium (TCLP) - BS	EPA-6020/1311	98.1			90.2	113	10/28/2016	RAL
Selenium (TCLP) - BSD	EPA-6020/1311	99.7	2		90.2	113	10/28/2016	RAL
Silver (TCLP) - BS	EPA-6020/1311	93.7			80	120	10/28/2016	RAL
Silver (TCLP) - BSD	EPA-6020/1311	92.2	2		80	120	10/28/2016	RAL

**CERTIFICATE OF ANALYSIS**

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	11/4/2016
CLIENT CONTACT:	Piper Roelen	ALS SDG#:	EV16100095
CLIENT PROJECT:	Transportation Corridor - 1148009.010.013	WDOE ACCREDITATION:	C601

**LABORATORY CONTROL SAMPLE RESULTS**

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS		ANALYSIS DATE	ANALYSIS BY
					MIN	MAX		

APPROVED BY



Laboratory Director

EV16100095

Date 10/13/2016  
Page 2 of 2



- Seattle (Edmonds) (206) 778-0907
- Tacoma (253) 926-2493
- Spokane (509) 327-9737
- Portland (503) 542-1080

# Chain-of-Custody Record

CLP (CPL) & Metals  
BTX (BTM Dests)  
Chlorine (EPA) (905) \*

Project Name Transportation Corridor Project No. 1146009.010.013

Project Location/Event Yakima, WA

Sampler's Name Brian Christianson

Project Contact Piper Hoeler

Send Results To Piper Hoeler

Sample I.D.	Date	Time	Matrix	No. of Containers	Testing Parameters	Observations/Comments
1 TP-1-16 S-1 (1-2)	9/26/16		Solid	1		
2 TP-6-16 S-2 (1-2)	9/26/16			2		
3 TP-9-16 S-1 (0-1.5)	9/26/16			3		
4 TP-9B-16 S-4 (8-9)	9/29/16			4		
5 TP-9C-16 S-3 (5-6)	9/30/16			5		
6 TP-10-16 S-2 (1-2)	9/26/16			6		
7 TP-10-16 S-5 (10-12)	9/26/16			7		
8 TP-10A-16 S-4 (6-7)	9/29/16			8		
9 TP-10B-16 S-4 (5-5.5)	9/29/16			9		
10 TP-11-16 S-3 (3-3.5)	9/26/16			10		
11 TP-11A-16 S-3 (5-6)	9/29/16					
12 TP-11B-16 S-5 (8-9)	9/29/16					
13 TP-25-16 S-5 (8-10)	9/28/16					
14 TP-26-16 S-3 (44.5)	9/28/16					
15 TP-26A-16 S-3 (6-7)	9/30/16					
16 TP-26B-16 S-3 (4-5)	9/30/16					
17 TP-28-16 S-1 (1-2)	9/28/16					
18 TP-34-16 S-4 (6-7)	9/30/16					

Turnaround Time  
 Standard  
 Accelerated

Observations/Comments  
 X Allow water samples to settle, collect aliquot from clear portion  
 NWTPH-DX - run acid wash silica gel cleanup

Analyze for EPH if no specific product identified  
 VOC/BTEX/NPH (soil):  
 non-preserved  
 preserved w/methanol  
 preserved w/sodium bisulfate  
 Freeze upon receipt  
 Dissolved metal water samples field filtered

Other  
 X Chlorine Analysis  
 5 samples w/TA  
 the highest BTX  
 values

Special Shipment/Handling or Storage Requirements: Carrier

Method of Shipment: Carrier

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Relinquished by: Signature [Signature] Printed Name Brian Christianson Company Landau Assoc. Date 10/13/16 Time 3:30 AM

Received by: Signature [Signature] Printed Name Shawn Robinson Company ALS Date 10/14/16 Time 12:35 pm





# ALS ENVIRONMENTAL

## Sample Receiving Checklist

Client: Landau Associates ALS Job #: EV16100095

Project: Transportation Corridor - 1148009.010.013

Received Date: 10/14/16 Received Time: 12:35 pm By: Su

Type of shipping container: Cooler  Box  Other

Shipped via: FedEx Ground  UPS  Mail  Courier  Hand Delivered   
FedEx Express  ALS

	Yes	No	N/A
Were custody seals on outside of shipping container?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If yes, how many? <u>2</u> Where? <u>Top of each cooler</u>			
Custody seal date: <u>10/13/16</u> Seal name: <u>Landau</u>			

Was Chain of Custody properly filled out (ink, signed, dated, etc.)?

Did all bottles have labels?

Did all bottle labels and tags agree with Chain of Custody?

Were samples received within hold time?

Did all bottles arrive in good condition (unbroken, etc.)?

Was sufficient amount of sample sent for the tests indicated?

Was correct preservation added to samples?

If no, Sample Control added preservative to the following:

<u>Sample Number</u>	<u>Reagent</u>	<u>Analyte</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

Were VOA vials checked for absence of air bubbles?

Bubbles present in sample #: \_\_\_\_\_

Temperature of cooler upon receipt: 19.6° each cooler Cold Cool Ambient N/A

Explain any discrepancies: \_\_\_\_\_

Was client contacted?  Who was called? \_\_\_\_\_ By whom? \_\_\_\_\_ Date: \_\_\_\_\_

Outcome of call: \_\_\_\_\_



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[www.alsglobal.com](http://www.alsglobal.com)

## LABORATORY REPORT

December 7, 2016

Cody Johnson  
Landau Associates, Inc.  
130 2nd Ave. South  
Edmonds, WA 98020

**RE: Transportation Corridor Investigation / 1148009.010.014**

Dear Cody:

Enclosed are the results of the samples submitted to our laboratory on November 21, 2016. For your reference, these analyses have been assigned our service request number P1605444.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at [www.alsglobal.com](http://www.alsglobal.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**ALS | Environmental**

By Kate Kaneko at 11:24 am, 12/07/16

Kate Kaneko  
Project Manager



---

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Client: Landau Associates, Inc. Service Request No: P1605444  
Project: Transportation Corridor Investigation / 1148009.010.014

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## CASE NARRATIVE

The samples were received intact under chain of custody on November 21, 2016 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

### Fixed Gases Analysis

The samples were analyzed for fixed gases (oxygen, nitrogen, carbon monoxide, methane and carbon dioxide) according to ASTM D1946 (single injection) using a gas chromatograph equipped with a thermal conductivity detector (TCD). This procedure is described in laboratory SOP VOA-EPA3C. This method is included on the laboratory's DoD-ELAP scope of accreditation, however it is not part of the NELAP accreditation.

### Sulfur Analysis

The samples were also analyzed for twenty sulfur compounds per ASTM D 5504-12 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan. This method is included on the laboratory's NELAP scope of accreditation, however it is not part of the DoD-ELAP accreditation.

### Total Gaseous Non-Methane Organics as Methane Analysis

The samples were also analyzed for total gaseous non-methane organics as methane according to modified EPA Method 25C. The analyses included a single sample injection (method modification) analyzed by gas chromatography using flame ionization detection/total combustion analysis. This method is not included on the laboratory's NELAP or DoD-ELAP scope of accreditation.

### Volatile Organic Compound Analysis

The samples were also analyzed for volatile organic compounds in accordance with EPA Method TO-15 from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition (EPA/625/R-96/010b), January, 1999. This procedure is described in laboratory SOP VOA-TO15. The analytical system was comprised of a gas chromatograph / mass spectrometer (GC/MS) interfaced to a whole-air preconcentrator. The method was



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Client: Landau Associates, Inc. Service Request No: P1605444  
Project: Transportation Corridor Investigation / 1148009.010.014

---

## CASE NARRATIVE

modified to include the use of helium as a diluent gas in place of zero-grade air for container pressurization. When necessary, analytical sample volumes were adjusted by a correction factor for containers pressurized with helium. A summary sheet has been included listing the affected samples. This method is included on the laboratory's NELAP and DoD-ELAP scope of accreditation. Any analytes flagged with an X are not included on the NELAP or DoD-ELAP accreditation.

The containers were cleaned, prior to sampling, down to the method reporting limit (MRL) reported for this project. Please note, projects which require reporting below the MRL could have results between the MRL and method detection limit (MDL) that are biased high.

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*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.*

*Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.*



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ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
Arizona DHS	<a href="http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home">http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home</a>	AZ0694
Florida DOH (NELAP)	<a href="http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm">http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm</a>	E871020
Louisiana DEQ (NELAP)	<a href="http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx">http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx</a>	05071
Maine DHHS	<a href="http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm">http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm</a>	2016036
Minnesota DOH (NELAP)	<a href="http://www.health.state.mn.us/accreditation">http://www.health.state.mn.us/accreditation</a>	977273
New Jersey DEP (NELAP)	<a href="http://www.nj.gov/dep/oqa/">http://www.nj.gov/dep/oqa/</a>	CA009
New York DOH (NELAP)	<a href="http://www.wadsworth.org/labcert/elap/elap.html">http://www.wadsworth.org/labcert/elap/elap.html</a>	11221
Oregon PHD (NELAP)	<a href="http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx">http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx</a>	4068-003
Pennsylvania DEP	<a href="http://www.depweb.state.pa.us/labs">http://www.depweb.state.pa.us/labs</a>	68-03307 (Registration)
PJLA (DoD ELAP)	<a href="http://www.pjlabs.com/search-accredited-labs">http://www.pjlabs.com/search-accredited-labs</a>	65818 (Testing)
Texas CEQ (NELAP)	<a href="http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html">http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html</a>	T104704413-16-7
Utah DOH (NELAP)	<a href="http://health.utah.gov/lab/environmental-lab-certification/">http://health.utah.gov/lab/environmental-lab-certification/</a>	CA01627201 6-6
Washington DOE	<a href="http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html">http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html</a>	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at [www.alsglobal.com](http://www.alsglobal.com), or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

# ALS ENVIRONMENTAL

## DETAIL SUMMARY REPORT

Client: Landau Associates, Inc.  
 Project ID: Transportation Corridor Investigation / 1148009.010.014

Service Request: P1605444

Date Received: 11/21/2016  
 Time Received: 10:15

ASTM D1946-90(2006) - Fxd Gases Can	ASTM D5504-08 - Sulfur Can	25C Modified - TGNMO+ 1X Can	TO-15 - VOC Cans
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Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)	ASTM D1946-90(2006) - Fxd Gases Can	ASTM D5504-08 - Sulfur Can	25C Modified - TGNMO+ 1X Can	TO-15 - VOC Cans
GP-43-11162016	P1605444-001	Air	11/16/2016	16:24	SSC00302	-1.61	3.31	X	X	X	X
GP-41-11162016	P1605444-002	Air	11/16/2016	16:32	SSC00106	-2.49	3.27	X	X	X	X
Ambient-11162016	P1605444-003	Air	11/16/2016	17:00	SSC00078	0.54	3.47	X	X	X	X
GP-39-11162016	P1605444-004	Air	11/16/2016	16:48	SSC00347	-1.25	3.36	X	X	X	X
GP-38-11162016	P1605444-005	Air	11/16/2016	17:33	SSC00127	-2.22	3.48	X	X	X	X



**ALS ENVIRONMENTAL**  
**Sample Volume Correction for Helium Pressurization**  
**for SCAN Analysis**

<u>Sample ID</u>	<u>Pi</u>	<u>Pf</u>	<u>Sample Volume (L)</u>	<u>Adjusted Volume (L)</u>
P1605444-003	0.54	3.47	0.930	1.00
P1605444-005	-2.22	3.48	0.018	0.0200







# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-43-11162016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P1605444-001

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Adam McAfee  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00302

Date Collected: 11/16/16  
 Date Received: 11/21/16  
 Date Analyzed: 11/29/16  
 Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -1.61      Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	<b>Oxygen*</b>	<b>7.30</b>	0.14	
7727-37-9	<b>Nitrogen</b>	<b>26.2</b>	0.14	
630-08-0	Carbon Monoxide	ND	0.14	
74-82-8	<b>Methane</b>	<b>42.6</b>	0.14	
124-38-9	<b>Carbon Dioxide</b>	<b>23.9</b>	0.14	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-41-11162016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P1605444-002

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Adam McAfee  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00106

Date Collected: 11/16/16  
 Date Received: 11/21/16  
 Date Analyzed: 11/29/16  
 Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -2.49      Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	<b>Oxygen*</b>	<b>0.254</b>	0.15	
7727-37-9	<b>Nitrogen</b>	<b>10.2</b>	0.15	
630-08-0	Carbon Monoxide	ND	0.15	
74-82-8	<b>Methane</b>	<b>57.5</b>	0.15	
124-38-9	<b>Carbon Dioxide</b>	<b>32.0</b>	0.15	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Landau Associates, Inc.

**Client Sample ID:** Ambient-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-003

Test Code: ASTM D1946

Instrument ID: HP5890 II/GC1/TCD

Analyst: Adam McAfee

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00078

Date Collected: 11/16/16

Date Received: 11/21/16

Date Analyzed: 11/29/16

Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): 0.54

Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	22.0	0.12	
7727-37-9	Nitrogen	77.9	0.12	
630-08-0	Carbon Monoxide	ND	0.12	
74-82-8	Methane	ND	0.12	
124-38-9	Carbon Dioxide	ND	0.12	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-39-11162016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P1605444-004

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Adam McAfee  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00347

Date Collected: 11/16/16  
 Date Received: 11/21/16  
 Date Analyzed: 11/29/16  
 Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -1.25      Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.13	
7727-37-9	<b>Nitrogen</b>	<b>0.668</b>	0.13	
630-08-0	Carbon Monoxide	ND	0.13	
74-82-8	<b>Methane</b>	<b>64.0</b>	0.13	
124-38-9	<b>Carbon Dioxide</b>	<b>35.2</b>	0.13	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-38-11162016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P1605444-005

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Adam McAfee  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00127

Date Collected: 11/16/16  
 Date Received: 11/21/16  
 Date Analyzed: 11/29/16  
 Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -2.22      Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	<b>Oxygen*</b>	<b>1.72</b>	0.15	
7727-37-9	<b>Nitrogen</b>	<b>8.71</b>	0.15	
630-08-0	Carbon Monoxide	ND	0.15	
74-82-8	<b>Methane</b>	<b>55.1</b>	0.15	
124-38-9	<b>Carbon Dioxide</b>	<b>34.4</b>	0.15	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P161129-MB

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Adam McAfee  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 11/29/16  
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.



# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

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**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P161129-LCS

Test Code: ASTM D1946

Instrument ID: HP5890 II/GC1/TCD

Analyst: Adam McAfee

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 11/29/16

Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppmV	Result ppmV	% Recovery	ALS Acceptance Limits	Data Qualifier
7782-44-7	Oxygen*	50,000	52,000	104	97-108	
7727-37-9	Nitrogen	50,000	51,700	103	89-113	
630-08-0	Carbon Monoxide	50,000	51,400	103	98-108	
74-82-8	Methane	50,000	49,600	99	94-111	
124-38-9	Carbon Dioxide	50,000	49,600	99	94-104	

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-43-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-001

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00302

Date Collected: 11/16/16  
 Time Collected: 16:24  
 Date Received: 11/21/16  
 Date Analyzed: 11/23/16  
 Time Analyzed: 07:45  
 Volume(s) Analyzed: 1.0 ml(s)

Initial Pressure (psig): -1.61      Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	10,000	9.6	7,200	6.9	
463-58-1	Carbonyl Sulfide	ND	17	ND	6.9	
74-93-1	Methyl Mercaptan	59	14	30	6.9	
75-08-1	Ethyl Mercaptan	45	18	18	6.9	
75-18-3	Dimethyl Sulfide	47	18	19	6.9	
75-15-0	Carbon Disulfide	ND	11	ND	3.5	
75-33-2	Isopropyl Mercaptan	ND	21	ND	6.9	
75-66-1	tert-Butyl Mercaptan	ND	25	ND	6.9	
107-03-9	n-Propyl Mercaptan	ND	21	ND	6.9	
624-89-5	Ethyl Methyl Sulfide	ND	21	ND	6.9	
110-02-1	Thiophene	ND	24	ND	6.9	
513-44-0	Isobutyl Mercaptan	ND	25	ND	6.9	
352-93-2	Diethyl Sulfide	ND	25	ND	6.9	
109-79-5	n-Butyl Mercaptan	ND	25	ND	6.9	
624-92-0	Dimethyl Disulfide	ND	13	ND	3.5	
616-44-4	3-Methylthiophene	ND	28	ND	6.9	
110-01-0	Tetrahydrothiophene	ND	25	ND	6.9	
638-02-8	2,5-Dimethylthiophene	ND	32	ND	6.9	
872-55-9	2-Ethylthiophene	ND	32	ND	6.9	
110-81-6	Diethyl Disulfide	ND	17	ND	3.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-41-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-002

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00106

Date Collected: 11/16/16  
 Time Collected: 16:32  
 Date Received: 11/21/16  
 Date Analyzed: 11/23/16  
 Time Analyzed: 07:58  
 Volume(s) Analyzed: 1.0 ml(s)

Initial Pressure (psig): -2.49      Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	10	ND	7.4	
463-58-1	Carbonyl Sulfide	ND	18	ND	7.4	
74-93-1	Methyl Mercaptan	ND	14	ND	7.4	
75-08-1	Ethyl Mercaptan	ND	19	ND	7.4	
75-18-3	Dimethyl Sulfide	ND	19	ND	7.4	
75-15-0	Carbon Disulfide	ND	11	ND	3.7	
75-33-2	Isopropyl Mercaptan	ND	23	ND	7.4	
75-66-1	tert-Butyl Mercaptan	ND	27	ND	7.4	
107-03-9	n-Propyl Mercaptan	ND	23	ND	7.4	
624-89-5	Ethyl Methyl Sulfide	ND	23	ND	7.4	
110-02-1	Thiophene	ND	25	ND	7.4	
513-44-0	Isobutyl Mercaptan	ND	27	ND	7.4	
352-93-2	Diethyl Sulfide	ND	27	ND	7.4	
109-79-5	n-Butyl Mercaptan	ND	27	ND	7.4	
624-92-0	Dimethyl Disulfide	ND	14	ND	3.7	
616-44-4	3-Methylthiophene	ND	29	ND	7.4	
110-01-0	Tetrahydrothiophene	ND	26	ND	7.4	
638-02-8	2,5-Dimethylthiophene	ND	34	ND	7.4	
872-55-9	2-Ethylthiophene	ND	34	ND	7.4	
110-81-6	Diethyl Disulfide	ND	18	ND	3.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** Ambient-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-003

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00078

Date Collected: 11/16/16  
 Time Collected: 17:00  
 Date Received: 11/21/16  
 Date Analyzed: 11/23/16  
 Time Analyzed: 08:10  
 Volume(s) Analyzed: 1.0 ml(s)

Initial Pressure (psig): 0.54      Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	8.3	ND	6.0	
463-58-1	Carbonyl Sulfide	ND	15	ND	6.0	
74-93-1	Methyl Mercaptan	ND	12	ND	6.0	
75-08-1	Ethyl Mercaptan	ND	15	ND	6.0	
75-18-3	Dimethyl Sulfide	ND	15	ND	6.0	
75-15-0	Carbon Disulfide	ND	9.3	ND	3.0	
75-33-2	Isopropyl Mercaptan	ND	19	ND	6.0	
75-66-1	tert-Butyl Mercaptan	ND	22	ND	6.0	
107-03-9	n-Propyl Mercaptan	ND	19	ND	6.0	
624-89-5	Ethyl Methyl Sulfide	ND	19	ND	6.0	
110-02-1	Thiophene	ND	20	ND	6.0	
513-44-0	Isobutyl Mercaptan	ND	22	ND	6.0	
352-93-2	Diethyl Sulfide	ND	22	ND	6.0	
109-79-5	n-Butyl Mercaptan	ND	22	ND	6.0	
624-92-0	Dimethyl Disulfide	ND	11	ND	3.0	
616-44-4	3-Methylthiophene	ND	24	ND	6.0	
110-01-0	Tetrahydrothiophene	ND	21	ND	6.0	
638-02-8	2,5-Dimethylthiophene	ND	27	ND	6.0	
872-55-9	2-Ethylthiophene	ND	27	ND	6.0	
110-81-6	Diethyl Disulfide	ND	15	ND	3.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-39-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-004

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00347

Date Collected: 11/16/16  
 Time Collected: 16:48  
 Date Received: 11/21/16  
 Date Analyzed: 11/23/16  
 Time Analyzed: 08:24  
 Volume(s) Analyzed: 1.0 ml(s)

Initial Pressure (psig): -1.25      Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	14,000	9.3	10,000	6.7	
463-58-1	Carbonyl Sulfide	ND	16	ND	6.7	
74-93-1	Methyl Mercaptan	37	13	19	6.7	
75-08-1	Ethyl Mercaptan	39	17	15	6.7	
75-18-3	Dimethyl Sulfide	ND	17	ND	6.7	
75-15-0	Carbon Disulfide	ND	10	ND	3.4	
75-33-2	Isopropyl Mercaptan	ND	21	ND	6.7	
75-66-1	tert-Butyl Mercaptan	ND	25	ND	6.7	
107-03-9	n-Propyl Mercaptan	ND	21	ND	6.7	
624-89-5	Ethyl Methyl Sulfide	ND	21	ND	6.7	
110-02-1	Thiophene	ND	23	ND	6.7	
513-44-0	Isobutyl Mercaptan	ND	25	ND	6.7	
352-93-2	Diethyl Sulfide	ND	25	ND	6.7	
109-79-5	n-Butyl Mercaptan	ND	25	ND	6.7	
624-92-0	Dimethyl Disulfide	ND	13	ND	3.4	
616-44-4	3-Methylthiophene	ND	27	ND	6.7	
110-01-0	Tetrahydrothiophene	ND	24	ND	6.7	
638-02-8	2,5-Dimethylthiophene	ND	31	ND	6.7	
872-55-9	2-Ethylthiophene	ND	31	ND	6.7	
110-81-6	Diethyl Disulfide	ND	17	ND	3.4	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-38-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-005

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00127

Date Collected: 11/16/16  
 Time Collected: 17:33  
 Date Received: 11/21/16  
 Date Analyzed: 11/23/16  
 Time Analyzed: 08:37  
 Volume(s) Analyzed: 1.0 ml(s)

Initial Pressure (psig): -2.22      Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	10	ND	7.3	
463-58-1	Carbonyl Sulfide	<b>63</b>	18	<b>26</b>	7.3	
74-93-1	Methyl Mercaptan	ND	14	ND	7.3	
75-08-1	Ethyl Mercaptan	ND	19	ND	7.3	
75-18-3	Dimethyl Sulfide	ND	19	ND	7.3	
75-15-0	Carbon Disulfide	ND	11	ND	3.7	
75-33-2	Isopropyl Mercaptan	ND	23	ND	7.3	
75-66-1	tert-Butyl Mercaptan	ND	27	ND	7.3	
107-03-9	n-Propyl Mercaptan	ND	23	ND	7.3	
624-89-5	Ethyl Methyl Sulfide	ND	23	ND	7.3	
110-02-1	Thiophene	ND	25	ND	7.3	
513-44-0	Isobutyl Mercaptan	ND	27	ND	7.3	
352-93-2	Diethyl Sulfide	ND	27	ND	7.3	
109-79-5	n-Butyl Mercaptan	ND	27	ND	7.3	
624-92-0	Dimethyl Disulfide	ND	14	ND	3.7	
616-44-4	3-Methylthiophene	ND	29	ND	7.3	
110-01-0	Tetrahydrothiophene	ND	26	ND	7.3	
638-02-8	2,5-Dimethylthiophene	ND	33	ND	7.3	
872-55-9	2-Ethylthiophene	ND	33	ND	7.3	
110-81-6	Diethyl Disulfide	ND	18	ND	3.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P161123-MB

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Time Collected: NA  
 Date Received: NA  
 Date Analyzed: 11/23/16  
 Time Analyzed: 07:26  
 Volume(s) Analyzed: 1.0 ml(s)

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	
463-58-1	Carbonyl Sulfide	ND	12	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-08-1	Ethyl Mercaptan	ND	13	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
75-15-0	Carbon Disulfide	ND	7.8	ND	2.5	
75-33-2	Isopropyl Mercaptan	ND	16	ND	5.0	
75-66-1	tert-Butyl Mercaptan	ND	18	ND	5.0	
107-03-9	n-Propyl Mercaptan	ND	16	ND	5.0	
624-89-5	Ethyl Methyl Sulfide	ND	16	ND	5.0	
110-02-1	Thiophene	ND	17	ND	5.0	
513-44-0	Isobutyl Mercaptan	ND	18	ND	5.0	
352-93-2	Diethyl Sulfide	ND	18	ND	5.0	
109-79-5	n-Butyl Mercaptan	ND	18	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	
616-44-4	3-Methylthiophene	ND	20	ND	5.0	
110-01-0	Tetrahydrothiophene	ND	18	ND	5.0	
638-02-8	2,5-Dimethylthiophene	ND	23	ND	5.0	
872-55-9	2-Ethylthiophene	ND	23	ND	5.0	
110-81-6	Diethyl Disulfide	ND	12	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Lab Control Sample  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P161123-LCS

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 11/23/16  
 Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppbV	Result ppbV	% Recovery	ALS	
					Acceptance Limits	Data Qualifier
7783-06-4	Hydrogen Sulfide	1,000	<b>1,080</b>	<b>108</b>	75-148	
463-58-1	Carbonyl Sulfide	1,000	<b>1,050</b>	<b>105</b>	70-137	
74-93-1	Methyl Mercaptan	1,000	<b>1,040</b>	<b>104</b>	72-139	



**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

**Total Gaseous Nonmethane Organics (TGNMO) as Methane**

Test Code: EPA Method 25C Modified  
 Instrument ID: HP5890 II/GC1/FID/TCA  
 Analyst: Adam McAfee  
 Sampling Media: 6.0 L Silonite Canister(s)  
 Test Notes:

Date(s) Collected: 11/16/16  
 Date Received: 11/21/16  
 Date Analyzed: #N/A

Client Sample ID	ALS Sample ID	Canister Dilution Factor	Injection Volume ml(s)	Result ppmV	MRL ppmV	Data Qualifier
GP-43-11162016	P1605444-001	1.38	0.50	<b>350</b>	1.4	
GP-41-11162016	P1605444-002	1.47	0.50	<b>640</b>	1.5	
Ambient-11162016	P1605444-003	1.19	0.50	ND	1.2	
GP-39-11162016	P1605444-004	1.34	0.50	<b>630</b>	1.3	
GP-38-11162016	P1605444-005	1.46	0.50	<b>220</b>	1.5	
Method Blank	P161129-MB	1.00	0.50	ND	1.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** Lab Control Sample  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
ALS Sample ID: P161129-LCS

Test Code: EPA Method 25C Modified  
Instrument ID: HP5890 II/GC1/FID/TCA  
Analyst: Adam McAfee  
Sampling Media: 6.0 L Silonite Canister  
Test Notes:

Date Collected: NA  
Date Received: NA  
Date Analyzed: 11/29/16  
Volume(s) Analyzed: NA ml(s)

<b>Compound</b>	<b>Spike Amount</b> ppmV	<b>Result</b> ppmV	<b>% Recovery</b>	<b>ALS</b> Acceptance Limits
Total Gaseous Nonmethane Organics (TGNMO) as Methane	300	266	89	85-121

Data  
Qualifier

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# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-43-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-001

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.010 Liter(s)

Test Notes:

Container ID: SSC00302

Initial Pressure (psig): -1.61      Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	800	69	470	40	
75-71-8	Dichlorodifluoromethane (CFC 12)	1,600	69	330	14	
74-87-3	Chloromethane	ND	69	ND	33	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	980	69	140	9.9	
75-01-4	Vinyl Chloride	3,900	69	1,500	27	
106-99-0	1,3-Butadiene	ND	69	ND	31	
74-83-9	Bromomethane	ND	69	ND	18	
75-00-3	Chloroethane	ND	69	ND	26	
64-17-5	Ethanol	ND	690	ND	370	
75-05-8	Acetonitrile	ND	69	ND	41	
107-02-8	Acrolein	ND	280	ND	120	
67-64-1	Acetone	4,200	690	1,800	290	
75-69-4	Trichlorofluoromethane	510	69	91	12	
67-63-0	2-Propanol (Isopropyl Alcohol)	1,700	690	690	280	
107-13-1	Acrylonitrile	ND	69	ND	32	
75-35-4	1,1-Dichloroethene	99	69	25	17	
75-09-2	Methylene Chloride	110	69	32	20	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	69	ND	22	
76-13-1	Trichlorotrifluoroethane	ND	69	ND	9.0	
75-15-0	Carbon Disulfide	ND	690	ND	220	
156-60-5	trans-1,2-Dichloroethene	150	69	38	17	
75-34-3	1,1-Dichloroethane	ND	69	ND	17	
1634-04-4	Methyl tert-Butyl Ether	ND	69	ND	19	
108-05-4	Vinyl Acetate	ND	690	ND	200	
78-93-3	2-Butanone (MEK)	5,500	690	1,900	230	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-43-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-001

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.010 Liter(s)

Test Notes:

Container ID: SSC00302

Initial Pressure (psig): -1.61      Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	5,100	69	1,300	17	
141-78-6	Ethyl Acetate	ND	140	ND	38	
110-54-3	n-Hexane	660	69	190	20	
67-66-3	Chloroform	ND	69	ND	14	
109-99-9	Tetrahydrofuran (THF)	1,100	69	360	23	
107-06-2	1,2-Dichloroethane	ND	69	ND	17	
71-55-6	1,1,1-Trichloroethane	ND	69	ND	13	
71-43-2	Benzene	370	69	120	22	
56-23-5	Carbon Tetrachloride	ND	69	ND	11	
110-82-7	Cyclohexane	580	140	170	40	
78-87-5	1,2-Dichloropropane	ND	69	ND	15	
75-27-4	Bromodichloromethane	ND	69	ND	10	
79-01-6	Trichloroethene	460	69	86	13	
123-91-1	1,4-Dioxane	ND	69	ND	19	
80-62-6	Methyl Methacrylate	ND	140	ND	34	
142-82-5	n-Heptane	2,000	69	500	17	
10061-01-5	cis-1,3-Dichloropropene	ND	69	ND	15	
108-10-1	4-Methyl-2-pentanone	1,000	69	240	17	
10061-02-6	trans-1,3-Dichloropropene	ND	69	ND	15	
79-00-5	1,1,2-Trichloroethane	ND	69	ND	13	
108-88-3	Toluene	8,400	69	2,200	18	
591-78-6	2-Hexanone	ND	69	ND	17	
124-48-1	Dibromochloromethane	ND	69	ND	8.1	
106-93-4	1,2-Dibromoethane	ND	69	ND	9.0	
123-86-4	n-Butyl Acetate	ND	69	ND	15	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 3 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-43-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-001

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.010 Liter(s)

Test Notes:

Container ID: SSC00302

Initial Pressure (psig): -1.61      Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	1,800	69	380	15	
127-18-4	Tetrachloroethene	810	69	120	10	
108-90-7	Chlorobenzene	96	69	21	15	
100-41-4	Ethylbenzene	4,500	69	1,000	16	
179601-23-1	m,p-Xylenes	8,600	140	2,000	32	
75-25-2	Bromoform	ND	69	ND	6.7	
100-42-5	Styrene	160	69	38	16	
95-47-6	o-Xylene	2,200	69	510	16	
111-84-2	n-Nonane	3,200	69	610	13	
79-34-5	1,1,2,2-Tetrachloroethane	ND	69	ND	10	
98-82-8	Cumene	750	69	150	14	
80-56-8	alpha-Pinene	4,100	69	730	12	
103-65-1	n-Propylbenzene	690	69	140	14	
622-96-8	4-Ethyltoluene	290	69	59	14	
108-67-8	1,3,5-Trimethylbenzene	550	69	110	14	
95-63-6	1,2,4-Trimethylbenzene	1,500	69	310	14	
100-44-7	Benzyl Chloride	ND	69	ND	13	
541-73-1	1,3-Dichlorobenzene	ND	69	ND	11	
106-46-7	1,4-Dichlorobenzene	ND	69	ND	11	
95-50-1	1,2-Dichlorobenzene	ND	69	ND	11	
5989-27-5	d-Limonene	8,000	69	1,400	12	
96-12-8	1,2-Dibromo-3-chloropropane	ND	69	ND	7.1	
120-82-1	1,2,4-Trichlorobenzene	ND	69	ND	9.3	
91-20-3	Naphthalene	ND	69	ND	13	
87-68-3	Hexachlorobutadiene	ND	69	ND	6.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-41-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-002

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.0050 Liter(s)

Test Notes:

Container ID: SSC00106

Initial Pressure (psig): -2.49      Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	500	150	290	85	
75-71-8	Dichlorodifluoromethane (CFC 12)	1,100	150	210	30	
74-87-3	Chloromethane	ND	150	ND	71	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	980	150	140	21	
75-01-4	Vinyl Chloride	3,700	150	1,500	58	
106-99-0	1,3-Butadiene	ND	150	ND	66	
74-83-9	Bromomethane	ND	150	ND	38	
75-00-3	Chloroethane	ND	150	ND	56	
64-17-5	Ethanol	ND	1,500	ND	780	
75-05-8	Acetonitrile	ND	150	ND	88	
107-02-8	Acrolein	ND	590	ND	260	
67-64-1	Acetone	ND	1,500	ND	620	
75-69-4	Trichlorofluoromethane	ND	150	ND	26	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	1,500	ND	600	
107-13-1	Acrylonitrile	ND	150	ND	68	
75-35-4	1,1-Dichloroethene	ND	150	ND	37	
75-09-2	Methylene Chloride	ND	150	ND	42	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	150	ND	47	
76-13-1	Trichlorotrifluoroethane	ND	150	ND	19	
75-15-0	Carbon Disulfide	ND	1,500	ND	470	
156-60-5	trans-1,2-Dichloroethene	ND	150	ND	37	
75-34-3	1,1-Dichloroethane	ND	150	ND	36	
1634-04-4	Methyl tert-Butyl Ether	ND	150	ND	41	
108-05-4	Vinyl Acetate	ND	1,500	ND	420	
78-93-3	2-Butanone (MEK)	ND	1,500	ND	500	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-41-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-002

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.0050 Liter(s)

Test Notes:

Container ID: SSC00106

Initial Pressure (psig): -2.49      Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	970	150	250	37	
141-78-6	Ethyl Acetate	ND	290	ND	82	
110-54-3	n-Hexane	400	150	110	42	
67-66-3	Chloroform	ND	150	ND	30	
109-99-9	Tetrahydrofuran (THF)	ND	150	ND	50	
107-06-2	1,2-Dichloroethane	ND	150	ND	36	
71-55-6	1,1,1-Trichloroethane	ND	150	ND	27	
71-43-2	Benzene	220	150	69	46	
56-23-5	Carbon Tetrachloride	ND	150	ND	23	
110-82-7	Cyclohexane	320	290	93	85	
78-87-5	1,2-Dichloropropane	ND	150	ND	32	
75-27-4	Bromodichloromethane	ND	150	ND	22	
79-01-6	Trichloroethene	ND	150	ND	27	
123-91-1	1,4-Dioxane	ND	150	ND	41	
80-62-6	Methyl Methacrylate	ND	290	ND	72	
142-82-5	n-Heptane	490	150	120	36	
10061-01-5	cis-1,3-Dichloropropene	ND	150	ND	32	
108-10-1	4-Methyl-2-pentanone	ND	150	ND	36	
10061-02-6	trans-1,3-Dichloropropene	ND	150	ND	32	
79-00-5	1,1,2-Trichloroethane	ND	150	ND	27	
108-88-3	Toluene	260	150	70	39	
591-78-6	2-Hexanone	ND	150	ND	36	
124-48-1	Dibromochloromethane	ND	150	ND	17	
106-93-4	1,2-Dibromoethane	ND	150	ND	19	
123-86-4	n-Butyl Acetate	ND	150	ND	31	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-41-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-002

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.0050 Liter(s)

Test Notes:

Container ID: SSC00106

Initial Pressure (psig): -2.49      Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	320	150	69	31	
127-18-4	Tetrachloroethene	230	150	34	22	
108-90-7	Chlorobenzene	ND	150	ND	32	
100-41-4	Ethylbenzene	ND	150	ND	34	
179601-23-1	m,p-Xylenes	ND	290	ND	68	
75-25-2	Bromoform	ND	150	ND	14	
100-42-5	Styrene	ND	150	ND	35	
95-47-6	o-Xylene	ND	150	ND	34	
111-84-2	n-Nonane	480	150	91	28	
79-34-5	1,1,2,2-Tetrachloroethane	ND	150	ND	21	
98-82-8	Cumene	ND	150	ND	30	
80-56-8	alpha-Pinene	ND	150	ND	26	
103-65-1	n-Propylbenzene	ND	150	ND	30	
622-96-8	4-Ethyltoluene	ND	150	ND	30	
108-67-8	1,3,5-Trimethylbenzene	ND	150	ND	30	
95-63-6	1,2,4-Trimethylbenzene	ND	150	ND	30	
100-44-7	Benzyl Chloride	ND	150	ND	28	
541-73-1	1,3-Dichlorobenzene	ND	150	ND	24	
106-46-7	1,4-Dichlorobenzene	ND	150	ND	24	
95-50-1	1,2-Dichlorobenzene	ND	150	ND	24	
5989-27-5	d-Limonene	ND	150	ND	26	
96-12-8	1,2-Dibromo-3-chloropropane	ND	150	ND	15	
120-82-1	1,2,4-Trichlorobenzene	ND	150	ND	20	
91-20-3	Naphthalene	ND	150	ND	28	
87-68-3	Hexachlorobutadiene	ND	150	ND	14	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** Ambient-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-003

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 12/5/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 1.00 Liter(s)

Test Notes:

Container ID: SSC00078

Initial Pressure (psig): 0.54      Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	1.3	0.60	0.78	0.35	
75-71-8	Dichlorodifluoromethane (CFC 12)	2.2	0.60	0.45	0.12	
74-87-3	Chloromethane	ND	0.60	ND	0.29	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.60	ND	0.085	
75-01-4	Vinyl Chloride	ND	0.60	ND	0.23	
106-99-0	1,3-Butadiene	ND	0.60	ND	0.27	
74-83-9	Bromomethane	ND	0.60	ND	0.15	
75-00-3	Chloroethane	ND	0.60	ND	0.23	
64-17-5	Ethanol	ND	6.0	ND	3.2	
75-05-8	Acetonitrile	ND	0.60	ND	0.35	
107-02-8	Acrolein	ND	2.4	ND	1.0	
67-64-1	Acetone	ND	6.0	ND	2.5	
75-69-4	Trichlorofluoromethane	1.1	0.60	0.20	0.11	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	6.0	ND	2.4	
107-13-1	Acrylonitrile	ND	0.60	ND	0.27	
75-35-4	1,1-Dichloroethene	ND	0.60	ND	0.15	
75-09-2	Methylene Chloride	ND	0.60	ND	0.17	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.60	ND	0.19	
76-13-1	Trichlorotrifluoroethane	ND	0.60	ND	0.078	
75-15-0	Carbon Disulfide	ND	6.0	ND	1.9	
156-60-5	trans-1,2-Dichloroethene	ND	0.60	ND	0.15	
75-34-3	1,1-Dichloroethane	ND	0.60	ND	0.15	
1634-04-4	Methyl tert-Butyl Ether	ND	0.60	ND	0.17	
108-05-4	Vinyl Acetate	ND	6.0	ND	1.7	
78-93-3	2-Butanone (MEK)	ND	6.0	ND	2.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** Ambient-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-003

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 12/5/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 1.00 Liter(s)

Test Notes:

Container ID: SSC00078

Initial Pressure (psig): 0.54      Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	0.60	ND	0.15	
141-78-6	Ethyl Acetate	ND	1.2	ND	0.33	
110-54-3	n-Hexane	ND	0.60	ND	0.17	
67-66-3	Chloroform	ND	0.60	ND	0.12	
109-99-9	Tetrahydrofuran (THF)	ND	0.60	ND	0.20	
107-06-2	1,2-Dichloroethane	ND	0.60	ND	0.15	
71-55-6	1,1,1-Trichloroethane	ND	0.60	ND	0.11	
71-43-2	Benzene	<b>0.60</b>	0.60	<b>0.19</b>	0.19	
56-23-5	Carbon Tetrachloride	ND	0.60	ND	0.095	
110-82-7	Cyclohexane	ND	1.2	ND	0.35	
78-87-5	1,2-Dichloropropane	ND	0.60	ND	0.13	
75-27-4	Bromodichloromethane	ND	0.60	ND	0.089	
79-01-6	Trichloroethene	ND	0.60	ND	0.11	
123-91-1	1,4-Dioxane	ND	0.60	ND	0.17	
80-62-6	Methyl Methacrylate	ND	1.2	ND	0.29	
142-82-5	n-Heptane	ND	0.60	ND	0.15	
10061-01-5	cis-1,3-Dichloropropene	ND	0.60	ND	0.13	
108-10-1	4-Methyl-2-pentanone	ND	0.60	ND	0.15	
10061-02-6	trans-1,3-Dichloropropene	ND	0.60	ND	0.13	
79-00-5	1,1,2-Trichloroethane	ND	0.60	ND	0.11	
108-88-3	Toluene	<b>2.2</b>	0.60	<b>0.59</b>	0.16	
591-78-6	2-Hexanone	ND	0.60	ND	0.15	
124-48-1	Dibromochloromethane	ND	0.60	ND	0.070	
106-93-4	1,2-Dibromoethane	ND	0.60	ND	0.077	
123-86-4	n-Butyl Acetate	ND	0.60	ND	0.13	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** Ambient-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-003

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 12/5/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 1.00 Liter(s)

Test Notes:

Container ID: SSC00078

Initial Pressure (psig): 0.54      Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.60	ND	0.13	
127-18-4	Tetrachloroethene	ND	0.60	ND	0.088	
108-90-7	Chlorobenzene	ND	0.60	ND	0.13	
100-41-4	Ethylbenzene	ND	0.60	ND	0.14	
179601-23-1	m,p-Xylenes	ND	1.2	ND	0.27	
75-25-2	Bromoform	ND	0.60	ND	0.058	
100-42-5	Styrene	ND	0.60	ND	0.14	
95-47-6	o-Xylene	ND	0.60	ND	0.14	
111-84-2	n-Nonane	ND	0.60	ND	0.11	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.60	ND	0.087	
98-82-8	Cumene	ND	0.60	ND	0.12	
80-56-8	alpha-Pinene	ND	0.60	ND	0.11	
103-65-1	n-Propylbenzene	ND	0.60	ND	0.12	
622-96-8	4-Ethyltoluene	ND	0.60	ND	0.12	
108-67-8	1,3,5-Trimethylbenzene	ND	0.60	ND	0.12	
95-63-6	1,2,4-Trimethylbenzene	ND	0.60	ND	0.12	
100-44-7	Benzyl Chloride	ND	0.60	ND	0.11	
541-73-1	1,3-Dichlorobenzene	ND	0.60	ND	0.099	
106-46-7	1,4-Dichlorobenzene	ND	0.60	ND	0.099	
95-50-1	1,2-Dichlorobenzene	ND	0.60	ND	0.099	
5989-27-5	d-Limonene	ND	0.60	ND	0.11	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.60	ND	0.062	
120-82-1	1,2,4-Trichlorobenzene	ND	0.60	ND	0.080	
91-20-3	Naphthalene	ND	0.60	ND	0.11	
87-68-3	Hexachlorobutadiene	ND	0.60	ND	0.056	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-39-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-004

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.0040 Liter(s)

Test Notes:

Container ID: SSC00347

Initial Pressure (psig): -1.25      Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	800	170	460	97	
75-71-8	Dichlorodifluoromethane (CFC 12)	970	170	200	34	
74-87-3	Chloromethane	ND	170	ND	81	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	1,100	170	150	24	
75-01-4	Vinyl Chloride	6,600	170	2,600	66	
106-99-0	1,3-Butadiene	ND	170	ND	76	
74-83-9	Bromomethane	ND	170	ND	43	
75-00-3	Chloroethane	ND	170	ND	64	
64-17-5	Ethanol	ND	1,700	ND	890	
75-05-8	Acetonitrile	ND	170	ND	100	
107-02-8	Acrolein	ND	670	ND	290	
67-64-1	Acetone	ND	1,700	ND	710	
75-69-4	Trichlorofluoromethane	ND	170	ND	30	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	1,700	ND	680	
107-13-1	Acrylonitrile	ND	170	ND	77	
75-35-4	1,1-Dichloroethene	ND	170	ND	42	
75-09-2	Methylene Chloride	ND	170	ND	48	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	170	ND	54	
76-13-1	Trichlorotrifluoroethane	ND	170	ND	22	
75-15-0	Carbon Disulfide	ND	1,700	ND	540	
156-60-5	trans-1,2-Dichloroethene	ND	170	ND	42	
75-34-3	1,1-Dichloroethane	ND	170	ND	41	
1634-04-4	Methyl tert-Butyl Ether	ND	170	ND	46	
108-05-4	Vinyl Acetate	ND	1,700	ND	480	
78-93-3	2-Butanone (MEK)	ND	1,700	ND	570	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-39-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-004

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.0040 Liter(s)

Test Notes:

Container ID: SSC00347

Initial Pressure (psig): -1.25      Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	1,500	170	380	42	
141-78-6	Ethyl Acetate	ND	340	ND	93	
110-54-3	n-Hexane	820	170	230	48	
67-66-3	Chloroform	ND	170	ND	34	
109-99-9	Tetrahydrofuran (THF)	ND	170	ND	57	
107-06-2	1,2-Dichloroethane	ND	170	ND	41	
71-55-6	1,1,1-Trichloroethane	ND	170	ND	31	
71-43-2	Benzene	410	170	130	52	
56-23-5	Carbon Tetrachloride	ND	170	ND	27	
110-82-7	Cyclohexane	2,800	340	820	97	
78-87-5	1,2-Dichloropropane	ND	170	ND	36	
75-27-4	Bromodichloromethane	ND	170	ND	25	
79-01-6	Trichloroethene	ND	170	ND	31	
123-91-1	1,4-Dioxane	ND	170	ND	46	
80-62-6	Methyl Methacrylate	ND	340	ND	82	
142-82-5	n-Heptane	2,000	170	490	41	
10061-01-5	cis-1,3-Dichloropropene	ND	170	ND	37	
108-10-1	4-Methyl-2-pentanone	ND	170	ND	41	
10061-02-6	trans-1,3-Dichloropropene	ND	170	ND	37	
79-00-5	1,1,2-Trichloroethane	ND	170	ND	31	
108-88-3	Toluene	1,900	170	500	44	
591-78-6	2-Hexanone	ND	170	ND	41	
124-48-1	Dibromochloromethane	ND	170	ND	20	
106-93-4	1,2-Dibromoethane	ND	170	ND	22	
123-86-4	n-Butyl Acetate	ND	170	ND	35	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 3 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-39-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-004

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.0040 Liter(s)

Test Notes:

Container ID: SSC00347

Initial Pressure (psig): -1.25      Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	1,700	170	360	36	
127-18-4	Tetrachloroethene	ND	170	ND	25	
108-90-7	Chlorobenzene	ND	170	ND	36	
100-41-4	Ethylbenzene	3,800	170	870	39	
179601-23-1	m,p-Xylenes	7,600	340	1,700	77	
75-25-2	Bromoform	ND	170	ND	16	
100-42-5	Styrene	ND	170	ND	39	
95-47-6	o-Xylene	2,800	170	640	39	
111-84-2	n-Nonane	13,000	170	2,500	32	
79-34-5	1,1,2,2-Tetrachloroethane	ND	170	ND	24	
98-82-8	Cumene	690	170	140	34	
80-56-8	alpha-Pinene	1,200	170	220	30	
103-65-1	n-Propylbenzene	1,000	170	210	34	
622-96-8	4-Ethyltoluene	470	170	95	34	
108-67-8	1,3,5-Trimethylbenzene	1,500	170	310	34	
95-63-6	1,2,4-Trimethylbenzene	3,400	170	700	34	
100-44-7	Benzyl Chloride	ND	170	ND	32	
541-73-1	1,3-Dichlorobenzene	ND	170	ND	28	
106-46-7	1,4-Dichlorobenzene	ND	170	ND	28	
95-50-1	1,2-Dichlorobenzene	ND	170	ND	28	
5989-27-5	d-Limonene	620	170	110	30	
96-12-8	1,2-Dibromo-3-chloropropane	ND	170	ND	17	
120-82-1	1,2,4-Trichlorobenzene	ND	170	ND	23	
91-20-3	Naphthalene	ND	170	ND	32	
87-68-3	Hexachlorobutadiene	ND	170	ND	16	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-38-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-005

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.020 Liter(s)

Test Notes:

Container ID: SSC00127

Initial Pressure (psig): -2.22      Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	800	37	460	21	
75-71-8	Dichlorodifluoromethane (CFC 12)	110	37	23	7.4	
74-87-3	Chloromethane	ND	37	ND	18	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	1,400	37	190	5.2	
75-01-4	Vinyl Chloride	90	37	35	14	
106-99-0	1,3-Butadiene	ND	37	ND	17	
74-83-9	Bromomethane	ND	37	ND	9.4	
75-00-3	Chloroethane	ND	37	ND	14	
64-17-5	Ethanol	ND	370	ND	190	
75-05-8	Acetonitrile	ND	37	ND	22	
107-02-8	Acrolein	ND	150	ND	64	
67-64-1	Acetone	ND	370	ND	150	
75-69-4	Trichlorofluoromethane	ND	37	ND	6.5	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	370	ND	150	
107-13-1	Acrylonitrile	ND	37	ND	17	
75-35-4	1,1-Dichloroethene	ND	37	ND	9.2	
75-09-2	Methylene Chloride	ND	37	ND	11	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	37	ND	12	
76-13-1	Trichlorotrifluoroethane	ND	37	ND	4.8	
75-15-0	Carbon Disulfide	ND	370	ND	120	
156-60-5	trans-1,2-Dichloroethene	ND	37	ND	9.2	
75-34-3	1,1-Dichloroethane	ND	37	ND	9.0	
1634-04-4	Methyl tert-Butyl Ether	ND	37	ND	10	
108-05-4	Vinyl Acetate	ND	370	ND	100	
78-93-3	2-Butanone (MEK)	ND	370	ND	120	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-38-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-005

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.020 Liter(s)

Test Notes:

Container ID: SSC00127

Initial Pressure (psig): -2.22      Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	37	ND	9.2	
141-78-6	Ethyl Acetate	ND	73	ND	20	
110-54-3	n-Hexane	<b>830</b>	37	<b>240</b>	10	
67-66-3	Chloroform	ND	37	ND	7.5	
109-99-9	Tetrahydrofuran (THF)	ND	37	ND	12	
107-06-2	1,2-Dichloroethane	ND	37	ND	9.0	
71-55-6	1,1,1-Trichloroethane	ND	37	ND	6.7	
71-43-2	Benzene	<b>78</b>	37	<b>25</b>	11	
56-23-5	Carbon Tetrachloride	ND	37	ND	5.8	
110-82-7	Cyclohexane	<b>1,800</b>	73	<b>530</b>	21	
78-87-5	1,2-Dichloropropane	ND	37	ND	7.9	
75-27-4	Bromodichloromethane	ND	37	ND	5.5	
79-01-6	Trichloroethene	ND	37	ND	6.8	
123-91-1	1,4-Dioxane	ND	37	ND	10	
80-62-6	Methyl Methacrylate	ND	73	ND	18	
142-82-5	n-Heptane	<b>2,200</b>	37	<b>540</b>	8.9	
10061-01-5	cis-1,3-Dichloropropene	ND	37	ND	8.0	
108-10-1	4-Methyl-2-pentanone	ND	37	ND	8.9	
10061-02-6	trans-1,3-Dichloropropene	ND	37	ND	8.0	
79-00-5	1,1,2-Trichloroethane	ND	37	ND	6.7	
108-88-3	Toluene	<b>110</b>	37	<b>30</b>	9.7	
591-78-6	2-Hexanone	ND	37	ND	8.9	
124-48-1	Dibromochloromethane	ND	37	ND	4.3	
106-93-4	1,2-Dibromoethane	ND	37	ND	4.8	
123-86-4	n-Butyl Acetate	ND	37	ND	7.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 3 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-38-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-005

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.020 Liter(s)

Test Notes:

Container ID: SSC00127

Initial Pressure (psig): -2.22      Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	490	37	100	7.8	
127-18-4	Tetrachloroethene	ND	37	ND	5.4	
108-90-7	Chlorobenzene	ND	37	ND	7.9	
100-41-4	Ethylbenzene	38	37	8.8	8.4	
179601-23-1	m,p-Xylenes	1,200	73	280	17	
75-25-2	Bromoform	ND	37	ND	3.5	
100-42-5	Styrene	ND	37	ND	8.6	
95-47-6	o-Xylene	430	37	98	8.4	
111-84-2	n-Nonane	140	37	26	7.0	
79-34-5	1,1,2,2-Tetrachloroethane	ND	37	ND	5.3	
98-82-8	Cumene	ND	37	ND	7.4	
80-56-8	alpha-Pinene	110	37	21	6.6	
103-65-1	n-Propylbenzene	ND	37	ND	7.4	
622-96-8	4-Ethyltoluene	51	37	10	7.4	
108-67-8	1,3,5-Trimethylbenzene	220	37	46	7.4	
95-63-6	1,2,4-Trimethylbenzene	260	37	53	7.4	
100-44-7	Benzyl Chloride	ND	37	ND	7.1	
541-73-1	1,3-Dichlorobenzene	ND	37	ND	6.1	
106-46-7	1,4-Dichlorobenzene	61	37	10	6.1	
95-50-1	1,2-Dichlorobenzene	ND	37	ND	6.1	
5989-27-5	d-Limonene	ND	37	ND	6.6	
96-12-8	1,2-Dibromo-3-chloropropane	ND	37	ND	3.8	
120-82-1	1,2,4-Trichlorobenzene	ND	37	ND	4.9	
91-20-3	Naphthalene	ND	37	ND	7.0	
87-68-3	Hexachlorobutadiene	ND	37	ND	3.4	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Method Blank

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P161130-MB

Test Code: EPA TO-15 Modified

Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: NA

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 1.00 Liter(s)

Test Notes:

Canister Dilution Factor: 1.00

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	ND	0.50	ND	0.29	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.50	ND	0.10	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.50	ND	0.072	
75-01-4	Vinyl Chloride	ND	0.50	ND	0.20	
106-99-0	1,3-Butadiene	ND	0.50	ND	0.23	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.50	ND	0.19	
64-17-5	Ethanol	ND	5.0	ND	2.7	
75-05-8	Acetonitrile	ND	0.50	ND	0.30	
107-02-8	Acrolein	ND	2.0	ND	0.87	
67-64-1	Acetone	ND	5.0	ND	2.1	
75-69-4	Trichlorofluoromethane	ND	0.50	ND	0.089	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	5.0	ND	2.0	
107-13-1	Acrylonitrile	ND	0.50	ND	0.23	
75-35-4	1,1-Dichloroethene	ND	0.50	ND	0.13	
75-09-2	Methylene Chloride	ND	0.50	ND	0.14	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.50	ND	0.16	
76-13-1	Trichlorotrifluoroethane	ND	0.50	ND	0.065	
75-15-0	Carbon Disulfide	ND	5.0	ND	1.6	
156-60-5	trans-1,2-Dichloroethene	ND	0.50	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.50	ND	0.12	
1634-04-4	Methyl tert-Butyl Ether	ND	0.50	ND	0.14	
108-05-4	Vinyl Acetate	ND	5.0	ND	1.4	
78-93-3	2-Butanone (MEK)	ND	5.0	ND	1.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Method Blank

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P161130-MB

Test Code: EPA TO-15 Modified

Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: NA

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 1.00 Liter(s)

Test Notes:

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	0.50	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.0	ND	0.28	
110-54-3	n-Hexane	ND	0.50	ND	0.14	
67-66-3	Chloroform	ND	0.50	ND	0.10	
109-99-9	Tetrahydrofuran (THF)	ND	0.50	ND	0.17	
107-06-2	1,2-Dichloroethane	ND	0.50	ND	0.12	
71-55-6	1,1,1-Trichloroethane	ND	0.50	ND	0.092	
71-43-2	Benzene	ND	0.50	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.50	ND	0.080	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.50	ND	0.11	
75-27-4	Bromodichloromethane	ND	0.50	ND	0.075	
79-01-6	Trichloroethene	ND	0.50	ND	0.093	
123-91-1	1,4-Dioxane	ND	0.50	ND	0.14	
80-62-6	Methyl Methacrylate	ND	1.0	ND	0.24	
142-82-5	n-Heptane	ND	0.50	ND	0.12	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ND	0.11	
108-10-1	4-Methyl-2-pentanone	ND	0.50	ND	0.12	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ND	0.11	
79-00-5	1,1,2-Trichloroethane	ND	0.50	ND	0.092	
108-88-3	Toluene	ND	0.50	ND	0.13	
591-78-6	2-Hexanone	ND	0.50	ND	0.12	
124-48-1	Dibromochloromethane	ND	0.50	ND	0.059	
106-93-4	1,2-Dibromoethane	ND	0.50	ND	0.065	
123-86-4	n-Butyl Acetate	ND	0.50	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P161130-MB

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 11/30/16  
 Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.50	ND	0.11	
127-18-4	Tetrachloroethene	ND	0.50	ND	0.074	
108-90-7	Chlorobenzene	ND	0.50	ND	0.11	
100-41-4	Ethylbenzene	ND	0.50	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.0	ND	0.23	
75-25-2	Bromoform	ND	0.50	ND	0.048	
100-42-5	Styrene	ND	0.50	ND	0.12	
95-47-6	o-Xylene	ND	0.50	ND	0.12	
111-84-2	n-Nonane	ND	0.50	ND	0.095	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	ND	0.073	
98-82-8	Cumene	ND	0.50	ND	0.10	
80-56-8	alpha-Pinene	ND	0.50	ND	0.090	
103-65-1	n-Propylbenzene	ND	0.50	ND	0.10	
622-96-8	4-Ethyltoluene	ND	0.50	ND	0.10	
108-67-8	1,3,5-Trimethylbenzene	ND	0.50	ND	0.10	
95-63-6	1,2,4-Trimethylbenzene	ND	0.50	ND	0.10	
100-44-7	Benzyl Chloride	ND	0.50	ND	0.097	
541-73-1	1,3-Dichlorobenzene	ND	0.50	ND	0.083	
106-46-7	1,4-Dichlorobenzene	ND	0.50	ND	0.083	
95-50-1	1,2-Dichlorobenzene	ND	0.50	ND	0.083	
5989-27-5	d-Limonene	ND	0.50	ND	0.090	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.50	ND	0.052	
120-82-1	1,2,4-Trichlorobenzene	ND	0.50	ND	0.067	
91-20-3	Naphthalene	ND	0.50	ND	0.095	
87-68-3	Hexachlorobutadiene	ND	0.50	ND	0.047	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Method Blank

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P161205-MB

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Lusine Hakobyan

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 12/5/16

Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	ND	0.50	ND	0.29	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.50	ND	0.10	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.50	ND	0.072	
75-01-4	Vinyl Chloride	ND	0.50	ND	0.20	
106-99-0	1,3-Butadiene	ND	0.50	ND	0.23	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.50	ND	0.19	
64-17-5	Ethanol	ND	5.0	ND	2.7	
75-05-8	Acetonitrile	ND	0.50	ND	0.30	
107-02-8	Acrolein	ND	2.0	ND	0.87	
67-64-1	Acetone	ND	5.0	ND	2.1	
75-69-4	Trichlorofluoromethane	ND	0.50	ND	0.089	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	5.0	ND	2.0	
107-13-1	Acrylonitrile	ND	0.50	ND	0.23	
75-35-4	1,1-Dichloroethene	ND	0.50	ND	0.13	
75-09-2	Methylene Chloride	ND	0.50	ND	0.14	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.50	ND	0.16	
76-13-1	Trichlorotrifluoroethane	ND	0.50	ND	0.065	
75-15-0	Carbon Disulfide	ND	5.0	ND	1.6	
156-60-5	trans-1,2-Dichloroethene	ND	0.50	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.50	ND	0.12	
1634-04-4	Methyl tert-Butyl Ether	ND	0.50	ND	0.14	
108-05-4	Vinyl Acetate	ND	5.0	ND	1.4	
78-93-3	2-Butanone (MEK)	ND	5.0	ND	1.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Method Blank

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P161205-MB

Test Code: EPA TO-15 Modified

Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: NA

Analyst: Lusine Hakobyan

Date Analyzed: 12/5/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 1.00 Liter(s)

Test Notes:

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	0.50	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.0	ND	0.28	
110-54-3	n-Hexane	ND	0.50	ND	0.14	
67-66-3	Chloroform	ND	0.50	ND	0.10	
109-99-9	Tetrahydrofuran (THF)	ND	0.50	ND	0.17	
107-06-2	1,2-Dichloroethane	ND	0.50	ND	0.12	
71-55-6	1,1,1-Trichloroethane	ND	0.50	ND	0.092	
71-43-2	Benzene	ND	0.50	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.50	ND	0.080	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.50	ND	0.11	
75-27-4	Bromodichloromethane	ND	0.50	ND	0.075	
79-01-6	Trichloroethene	ND	0.50	ND	0.093	
123-91-1	1,4-Dioxane	ND	0.50	ND	0.14	
80-62-6	Methyl Methacrylate	ND	1.0	ND	0.24	
142-82-5	n-Heptane	ND	0.50	ND	0.12	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ND	0.11	
108-10-1	4-Methyl-2-pentanone	ND	0.50	ND	0.12	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ND	0.11	
79-00-5	1,1,2-Trichloroethane	ND	0.50	ND	0.092	
108-88-3	Toluene	ND	0.50	ND	0.13	
591-78-6	2-Hexanone	ND	0.50	ND	0.12	
124-48-1	Dibromochloromethane	ND	0.50	ND	0.059	
106-93-4	1,2-Dibromoethane	ND	0.50	ND	0.065	
123-86-4	n-Butyl Acetate	ND	0.50	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 3 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P161205-MB

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 12/5/16  
 Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.50	ND	0.11	
127-18-4	Tetrachloroethene	ND	0.50	ND	0.074	
108-90-7	Chlorobenzene	ND	0.50	ND	0.11	
100-41-4	Ethylbenzene	ND	0.50	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.0	ND	0.23	
75-25-2	Bromoform	ND	0.50	ND	0.048	
100-42-5	Styrene	ND	0.50	ND	0.12	
95-47-6	o-Xylene	ND	0.50	ND	0.12	
111-84-2	n-Nonane	ND	0.50	ND	0.095	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	ND	0.073	
98-82-8	Cumene	ND	0.50	ND	0.10	
80-56-8	alpha-Pinene	ND	0.50	ND	0.090	
103-65-1	n-Propylbenzene	ND	0.50	ND	0.10	
622-96-8	4-Ethyltoluene	ND	0.50	ND	0.10	
108-67-8	1,3,5-Trimethylbenzene	ND	0.50	ND	0.10	
95-63-6	1,2,4-Trimethylbenzene	ND	0.50	ND	0.10	
100-44-7	Benzyl Chloride	ND	0.50	ND	0.097	
541-73-1	1,3-Dichlorobenzene	ND	0.50	ND	0.083	
106-46-7	1,4-Dichlorobenzene	ND	0.50	ND	0.083	
95-50-1	1,2-Dichlorobenzene	ND	0.50	ND	0.083	
5989-27-5	d-Limonene	ND	0.50	ND	0.090	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.50	ND	0.052	
120-82-1	1,2,4-Trichlorobenzene	ND	0.50	ND	0.067	
91-20-3	Naphthalene	ND	0.50	ND	0.095	
87-68-3	Hexachlorobutadiene	ND	0.50	ND	0.047	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



**ALS ENVIRONMENTAL**

SURROGATE SPIKE RECOVERY RESULTS

Page 1 of 1

**Client:** Landau Associates, Inc.  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister(s)  
 Test Notes:

Date(s) Collected: 11/16/16  
 Date(s) Received: 11/21/16  
 Date(s) Analyzed: 11/30 - 12/5/16

Client Sample ID	ALS Sample ID	1,2-Dichloroethane-d4	Toluene-d8	Bromofluorobenzene	Acceptance Limits	Data Qualifier
		Percent Recovered	Percent Recovered	Percent Recovered		
Method Blank	P161130-MB	97	103	102	70-130	
Method Blank	P161205-MB	91	104	108	70-130	
Lab Control Sample	P161130-LCS	93	100	107	70-130	
Lab Control Sample	P161205-LCS	89	102	112	70-130	
GP-43-11162016	P1605444-001	94	98	108	70-130	
GP-41-11162016	P1605444-002	94	97	106	70-130	
Ambient-11162016	P1605444-003	92	102	111	70-130	
GP-39-11162016	P1605444-004	94	98	107	70-130	
GP-38-11162016	P1605444-005	93	96	104	70-130	

Surrogate percent recovery is verified and accepted based on the on-column result.

Reported results are shown in concentration units and as a result of the calculation, may vary slightly from the on-column percent recovery.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Lab Control Sample  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P161130-LCS

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 11/30/16  
 Volume(s) Analyzed: 0.125 Liter(s)

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
115-07-1	Propene	210	191	91	52-127	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	197	94	68-109	
74-87-3	Chloromethane	210	195	93	51-130	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	188	89	66-114	
75-01-4	Vinyl Chloride	210	200	95	61-125	
106-99-0	1,3-Butadiene	210	223	106	62-144	
74-83-9	Bromomethane	210	204	97	73-123	
75-00-3	Chloroethane	210	210	100	69-122	
64-17-5	Ethanol	1,060	996	94	62-124	
75-05-8	Acetonitrile	213	206	97	57-114	
107-02-8	Acrolein	212	172	81	62-116	
67-64-1	Acetone	1,060	967	91	57-117	
75-69-4	Trichlorofluoromethane	210	191	91	63-98	
67-63-0	2-Propanol (Isopropyl Alcohol)	424	406	96	66-121	
107-13-1	Acrylonitrile	213	210	99	68-123	
75-35-4	1,1-Dichloroethene	213	217	102	76-118	
75-09-2	Methylene Chloride	212	193	91	60-118	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	212	203	96	65-126	
76-13-1	Trichlorotrifluoroethane	212	204	96	73-114	
75-15-0	Carbon Disulfide	213	212	100	57-102	
156-60-5	trans-1,2-Dichloroethene	213	207	97	74-123	
75-34-3	1,1-Dichloroethane	212	199	94	69-111	
1634-04-4	Methyl tert-Butyl Ether	213	195	92	69-113	
108-05-4	Vinyl Acetate	1,060	1060	100	76-128	
78-93-3	2-Butanone (MEK)	212	198	93	63-127	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 2 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Lab Control Sample  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P161130-LCS

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 11/30/16  
 Volume(s) Analyzed: 0.125 Liter(s)

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
156-59-2	cis-1,2-Dichloroethene	212	200	94	72-117	
141-78-6	Ethyl Acetate	426	417	98	68-127	
110-54-3	n-Hexane	213	190	89	55-116	
67-66-3	Chloroform	212	193	91	70-109	
109-99-9	Tetrahydrofuran (THF)	213	192	90	72-113	
107-06-2	1,2-Dichloroethane	212	188	89	69-113	
71-55-6	1,1,1-Trichloroethane	212	200	94	72-115	
71-43-2	Benzene	212	180	85	65-107	
56-23-5	Carbon Tetrachloride	213	208	98	71-113	
110-82-7	Cyclohexane	425	400	94	71-115	
78-87-5	1,2-Dichloropropane	212	198	93	71-115	
75-27-4	Bromodichloromethane	214	214	100	75-118	
79-01-6	Trichloroethene	212	205	97	68-114	
123-91-1	1,4-Dioxane	213	200	94	81-131	
80-62-6	Methyl Methacrylate	424	425	100	72-130	
142-82-5	n-Heptane	213	194	91	68-116	
10061-01-5	cis-1,3-Dichloropropene	210	216	103	77-126	
108-10-1	4-Methyl-2-pentanone	213	212	100	69-126	
10061-02-6	trans-1,3-Dichloropropene	213	224	105	79-125	
79-00-5	1,1,2-Trichloroethane	212	207	98	75-119	
108-88-3	Toluene	212	203	96	59-118	
591-78-6	2-Hexanone	213	201	94	69-129	
124-48-1	Dibromochloromethane	213	227	107	74-136	
106-93-4	1,2-Dibromoethane	212	212	100	73-131	
123-86-4	n-Butyl Acetate	216	198	92	69-130	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 3 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P161130-LCS

Test Code: EPA TO-15 Modified

Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: NA

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.125 Liter(s)

Test Notes:

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
111-65-9	n-Octane	212	<b>198</b>	<b>93</b>	66-120	
127-18-4	Tetrachloroethene	213	<b>208</b>	<b>98</b>	65-130	
108-90-7	Chlorobenzene	212	<b>201</b>	<b>95</b>	68-120	
100-41-4	Ethylbenzene	212	<b>197</b>	<b>93</b>	68-122	
179601-23-1	m,p-Xylenes	424	<b>393</b>	<b>93</b>	68-123	
75-25-2	Bromoform	212	<b>250</b>	<b>118</b>	69-130	
100-42-5	Styrene	212	<b>207</b>	<b>98</b>	71-133	
95-47-6	o-Xylene	212	<b>199</b>	<b>94</b>	68-122	
111-84-2	n-Nonane	212	<b>192</b>	<b>91</b>	65-120	
79-34-5	1,1,2,2-Tetrachloroethane	212	<b>218</b>	<b>103</b>	69-130	
98-82-8	Cumene	212	<b>211</b>	<b>100</b>	70-123	
80-56-8	alpha-Pinene	213	<b>204</b>	<b>96</b>	70-128	
103-65-1	n-Propylbenzene	214	<b>206</b>	<b>96</b>	69-125	
622-96-8	4-Ethyltoluene	212	<b>206</b>	<b>97</b>	67-130	
108-67-8	1,3,5-Trimethylbenzene	212	<b>196</b>	<b>92</b>	67-124	
95-63-6	1,2,4-Trimethylbenzene	212	<b>201</b>	<b>95</b>	67-129	
100-44-7	Benzyl Chloride	212	<b>244</b>	<b>115</b>	79-138	
541-73-1	1,3-Dichlorobenzene	212	<b>227</b>	<b>107</b>	65-136	
106-46-7	1,4-Dichlorobenzene	213	<b>200</b>	<b>94</b>	66-141	
95-50-1	1,2-Dichlorobenzene	212	<b>214</b>	<b>101</b>	67-136	
5989-27-5	d-Limonene	212	<b>208</b>	<b>98</b>	71-134	
96-12-8	1,2-Dibromo-3-chloropropane	212	<b>259</b>	<b>122</b>	73-136	
120-82-1	1,2,4-Trichlorobenzene	212	<b>258</b>	<b>122</b>	64-134	
91-20-3	Naphthalene	214	<b>266</b>	<b>124</b>	62-136	
87-68-3	Hexachlorobutadiene	213	<b>247</b>	<b>116</b>	60-133	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Lab Control Sample  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P161205-LCS

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 12/5/16  
 Volume(s) Analyzed: 0.125 Liter(s)

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
115-07-1	Propene	210	179	85	52-127	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	185	88	68-109	
74-87-3	Chloromethane	210	173	82	51-130	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	184	87	66-114	
75-01-4	Vinyl Chloride	210	184	88	61-125	
106-99-0	1,3-Butadiene	210	221	105	62-144	
74-83-9	Bromomethane	210	203	97	73-123	
75-00-3	Chloroethane	210	203	97	69-122	
64-17-5	Ethanol	1,060	930	88	62-124	
75-05-8	Acetonitrile	213	193	91	57-114	
107-02-8	Acrolein	212	164	77	62-116	
67-64-1	Acetone	1,060	908	86	57-117	
75-69-4	Trichlorofluoromethane	210	181	86	63-98	
67-63-0	2-Propanol (Isopropyl Alcohol)	424	369	87	66-121	
107-13-1	Acrylonitrile	213	199	93	68-123	
75-35-4	1,1-Dichloroethene	213	210	99	76-118	
75-09-2	Methylene Chloride	212	186	88	60-118	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	212	188	89	65-126	
76-13-1	Trichlorotrifluoroethane	212	199	94	73-114	
75-15-0	Carbon Disulfide	213	205	96	57-102	
156-60-5	trans-1,2-Dichloroethene	213	196	92	74-123	
75-34-3	1,1-Dichloroethane	212	189	89	69-111	
1634-04-4	Methyl tert-Butyl Ether	213	187	88	69-113	
108-05-4	Vinyl Acetate	1,060	1000	94	76-128	
78-93-3	2-Butanone (MEK)	212	190	90	63-127	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P161205-LCS

Test Code: EPA TO-15 Modified

Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: NA

Analyst: Lusine Hakobyan

Date Analyzed: 12/5/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.125 Liter(s)

Test Notes:

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
156-59-2	cis-1,2-Dichloroethene	212	189	89	72-117	
141-78-6	Ethyl Acetate	426	389	91	68-127	
110-54-3	n-Hexane	213	176	83	55-116	
67-66-3	Chloroform	212	184	87	70-109	
109-99-9	Tetrahydrofuran (THF)	213	184	86	72-113	
107-06-2	1,2-Dichloroethane	212	175	83	69-113	
71-55-6	1,1,1-Trichloroethane	212	189	89	72-115	
71-43-2	Benzene	212	172	81	65-107	
56-23-5	Carbon Tetrachloride	213	198	93	71-113	
110-82-7	Cyclohexane	425	385	91	71-115	
78-87-5	1,2-Dichloropropane	212	189	89	71-115	
75-27-4	Bromodichloromethane	214	200	93	75-118	
79-01-6	Trichloroethene	212	201	95	68-114	
123-91-1	1,4-Dioxane	213	192	90	81-131	
80-62-6	Methyl Methacrylate	424	408	96	72-130	
142-82-5	n-Heptane	213	187	88	68-116	
10061-01-5	cis-1,3-Dichloropropene	210	204	97	77-126	
108-10-1	4-Methyl-2-pentanone	213	199	93	69-126	
10061-02-6	trans-1,3-Dichloropropene	213	211	99	79-125	
79-00-5	1,1,2-Trichloroethane	212	199	94	75-119	
108-88-3	Toluene	212	198	93	59-118	
591-78-6	2-Hexanone	213	186	87	69-129	
124-48-1	Dibromochloromethane	213	224	105	74-136	
106-93-4	1,2-Dibromoethane	212	208	98	73-131	
123-86-4	n-Butyl Acetate	216	185	86	69-130	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 3 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P161205-LCS

Test Code: EPA TO-15 Modified

Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: NA

Analyst: Lusine Hakobyan

Date Analyzed: 12/5/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.125 Liter(s)

Test Notes:

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
111-65-9	n-Octane	212	190	90	66-120	
127-18-4	Tetrachloroethene	213	207	97	65-130	
108-90-7	Chlorobenzene	212	198	93	68-120	
100-41-4	Ethylbenzene	212	192	91	68-122	
179601-23-1	m,p-Xylenes	424	378	89	68-123	
75-25-2	Bromoform	212	248	117	69-130	
100-42-5	Styrene	212	203	96	71-133	
95-47-6	o-Xylene	212	193	91	68-122	
111-84-2	n-Nonane	212	179	84	65-120	
79-34-5	1,1,2,2-Tetrachloroethane	212	210	99	69-130	
98-82-8	Cumene	212	206	97	70-123	
80-56-8	alpha-Pinene	213	197	92	70-128	
103-65-1	n-Propylbenzene	214	198	93	69-125	
622-96-8	4-Ethyltoluene	212	194	92	67-130	
108-67-8	1,3,5-Trimethylbenzene	212	187	88	67-124	
95-63-6	1,2,4-Trimethylbenzene	212	186	88	67-129	
100-44-7	Benzyl Chloride	212	225	106	79-138	
541-73-1	1,3-Dichlorobenzene	212	219	103	65-136	
106-46-7	1,4-Dichlorobenzene	213	195	92	66-141	
95-50-1	1,2-Dichlorobenzene	212	206	97	67-136	
5989-27-5	d-Limonene	212	181	85	71-134	
96-12-8	1,2-Dibromo-3-chloropropane	212	257	121	73-136	
120-82-1	1,2,4-Trichlorobenzene	212	256	121	64-134	
91-20-3	Naphthalene	214	258	121	62-136	
87-68-3	Hexachlorobutadiene	213	248	116	60-133	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.



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[www.alsglobal.com](http://www.alsglobal.com)

## LABORATORY REPORT

January 17, 2017

Piper Roelen  
Landau Associates, Inc.  
130 2nd Ave. South  
Edmonds, WA 98020

**RE: Transportation Corridor Investigation / 1148009.010.014**

Dear Piper:

Enclosed are the results of the samples submitted to our laboratory on January 3, 2017. For your reference, these analyses have been assigned our service request number P1700001.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at [www.alsglobal.com](http://www.alsglobal.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**ALS | Environmental**

By Kate Kaneko at 7:43 am, 01/17/17

Kate Kaneko  
Project Manager





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[www.alsglobal.com](http://www.alsglobal.com)

Client: Landau Associates, Inc. Service Request No: P1700001  
Project: Transportation Corridor Investigation / 1148009.010.014

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## CASE NARRATIVE

The samples were received intact under chain of custody on January 3, 2017 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

### Fixed Gases Analysis

The samples were analyzed for fixed gases (oxygen, nitrogen, carbon monoxide, methane and carbon dioxide) according to modified EPA Method 3C (single injection) using a gas chromatograph equipped with a thermal conductivity detector (TCD). This procedure is described in laboratory SOP VOA-EPA3C. This method is included on the laboratory's DoD-ELAP scope of accreditation, however it is not part of the NELAP accreditation.

### Sulfur Analysis

The samples were also analyzed for twenty sulfur compounds per ASTM D 5504-12 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan. This method is included on the laboratory's NELAP scope of accreditation, however it is not part of the DoD-ELAP accreditation.

### Total Gaseous Non-Methane Organics as Methane Analysis

The samples were also analyzed for total gaseous non-methane organics as methane according to modified EPA Method 25C. The analyses included a single sample injection (method modification) analyzed by gas chromatography using flame ionization detection/total combustion analysis. This method is not included on the laboratory's NELAP or DoD-ELAP scope of accreditation.

### Volatile Organic Compound Analysis

The samples were also analyzed for volatile organic compounds in accordance with EPA Method TO-15 from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition (EPA/625/R-96/010b), January, 1999. This procedure is described in laboratory SOP VOA-TO15. The analytical system was comprised of a gas chromatograph / mass spectrometer (GC/MS) interfaced to a whole-air preconcentrator. The method was modified to include the use of helium as a diluent gas in place of zero-grade air for container pressurization. When necessary, analytical sample volumes were adjusted by a correction factor



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Client: Landau Associates, Inc. Service Request No: P1700001  
Project: Transportation Corridor Investigation / 1148009.010.014

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### CASE NARRATIVE

for containers pressurized with helium. A summary sheet has been included listing the affected samples. This method is included on the laboratory's NELAP and DoD-ELAP scope of accreditation. Any analytes flagged with an X are not included on the NELAP or DoD-ELAP accreditation.

The containers were cleaned, prior to sampling, down to the method reporting limit (MRL) reported for this project. Please note, projects which require reporting below the MRL could have results between the MRL and method detection limit (MDL) that are biased high.

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*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.*

*Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.*



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ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
Arizona DHS	<a href="http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home">http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home</a>	AZ0694
Florida DOH (NELAP)	<a href="http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm">http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm</a>	E871020
Louisiana DEQ (NELAP)	<a href="http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx">http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx</a>	05071
Maine DHHS	<a href="http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm">http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm</a>	2016036
Minnesota DOH (NELAP)	<a href="http://www.health.state.mn.us/accreditation">http://www.health.state.mn.us/accreditation</a>	1177034
New Jersey DEP (NELAP)	<a href="http://www.nj.gov/dep/oqa/">http://www.nj.gov/dep/oqa/</a>	CA009
New York DOH (NELAP)	<a href="http://www.wadsworth.org/labcert/elap/elap.html">http://www.wadsworth.org/labcert/elap/elap.html</a>	11221
Oregon PHD (NELAP)	<a href="http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx">http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx</a>	4068-003
Pennsylvania DEP	<a href="http://www.depweb.state.pa.us/labs">http://www.depweb.state.pa.us/labs</a>	68-03307 (Registration)
PJLA (DoD ELAP)	<a href="http://www.pjlabs.com/search-accredited-labs">http://www.pjlabs.com/search-accredited-labs</a>	65818 (Testing)
Texas CEQ (NELAP)	<a href="http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html">http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html</a>	T104704413-16-7
Utah DOH (NELAP)	<a href="http://health.utah.gov/lab/environmental-lab-certification/">http://health.utah.gov/lab/environmental-lab-certification/</a>	CA01627201 6-6
Washington DOE	<a href="http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html">http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html</a>	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at [www.alsglobal.com](http://www.alsglobal.com), or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

# ALS ENVIRONMENTAL

## DETAIL SUMMARY REPORT

Client: Landau Associates, Inc.  
 Project ID: Transportation Corridor Investigation / 1148009.010.014

Service Request: P1700001

Date Received: 1/3/2017  
 Time Received: 09:15

ASTM D1946-90(2006) - Fxd Gases Can	ASTM D 5504-12 - Sulfur Can	25C Modified - TGNMO+ 1X Can	TO-15 Modified - VOC Cans
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Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)	ASTM D1946-90(2006) - Fxd Gases Can	ASTM D 5504-12 - Sulfur Can	25C Modified - TGNMO+ 1X Can	TO-15 Modified - VOC Cans
Ambient-12292016	P1700001-001	Air	12/29/2016	13:07	SSC00151	0.05	3.91	X	X	X	X
GP-38-12292016	P1700001-002	Air	12/29/2016	13:30	SSC00258	0.22	3.92	X	X	X	X
GP-39-12292016	P1700001-003	Air	12/29/2016	14:15	SSC00120	0.04	3.81	X	X	X	X
GP-43-12292016	P1700001-004	Air	12/29/2016	14:30	SSC00277	0.11	4.07	X	X	X	X
GP-41-12292016	P1700001-005	Air	12/29/2016	14:45	SSC00402	-0.33	3.74	X	X	X	X



# Air - Chain of Custody Record & Analytical Service Request

2655 Park Center Drive, Suite A  
 Simi Valley, California 93065  
 Phone (805) 526-7161  
 Fax (805) 526-7270

**Requested Turnaround Time in Business Days (Surcharges) please circle**  
 1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10-Day-Standard

ALS Project No. A60070000

Company Name & Address (Reporting Information) <i>Landaw Associates 130 2nd Ave. South Edmonds, WA 98026</i>				Project Name <i>Transportation Corridor Investigation</i>				ALS Contact:				Comments e.g. Actual Preservative or specific instructions
								Analysis Method				
Project Manager <i>Piper Roelen</i>				Project Number <i>1148009.010.014</i>				<i>Total Reduced Sulfur ASTM D-5504</i> <i>Fixed Gases &amp; ASTM D-1945</i> <i>NMOC's (EPA 25C)</i> <i>VOC's (TO-15)</i>				
Phone <i>(425) 778-0907</i>		Fax <i>—</i>		P.O. # / Billing Information <i>1148009.010.014</i>								
Email Address for Result Reporting <i>proelen@landawinc.com, johnson@landawinc.com, jdawis@landawinc.com</i>				Sampler (Print & Sign) <i>Stephanie Renando</i>				<i>closed City of Yakima Landfill Site Project</i>  <i>Invoice through LAI</i>				
Client Sample ID				Canister ID (Bar code # - AC, SC, etc.)								Flow Controller ID (Bar code # - FC #)
Laboratory ID Number		Date Collected		Time Collected		Canister Start Pressure "Hg		Canister End Pressure "Hg/psig		Sample Volume		
<i>①</i>		<i>12/28/16</i>		<i>1307</i>		<i>SSC00151</i>		<i>SFCM105</i>		<i>-17.49</i>		
<i>②</i>		<i>12/29/16</i>		<i>1330</i>		<i>SSC00258</i>		<i>SFCM095</i>		<i>-17.58</i>		
<i>③</i>		<i>12/29/16</i>		<i>1415</i>		<i>SSC00120</i>		<i>SFC00144</i>		<i>-17.64</i>		
<i>④</i>		<i>12/29/16</i>		<i>1430</i>		<i>SSC00277</i>		<i>SFC00113</i>		<i>-0.70</i>		
<i>⑤</i>		<i>12/29/16</i>		<i>1445</i>		<i>SSC00402</i>		<i>SFC00161</i>		<i>-17.67</i>		

**Report Tier Levels - please select**

Tier I - Results (Default in not specified) \_\_\_\_\_ Tier III (Results + QC & Calibration Summaries) \_\_\_\_\_  
 Tier II (Results + QC Summaries) \_\_\_\_\_ Tier IV (Date Validation Package) 10% Surcharge \_\_\_\_\_

EDD required YES / No  
 Type: \_\_\_\_\_ Units: \_\_\_\_\_

Chain of Custody Seal: (Circle) INTACT  BROKEN \_\_\_\_\_ ABSENT \_\_\_\_\_

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature) <i>[Signature]</i>	Date: <i>12/29/16</i>	Time: <i>1600</i>	Received by: (Signature) _____	Date: _____	Time: _____
Relinquished by: (Signature) <i>[Signature]</i>	Date: _____	Time: _____	Received by: (Signature) <i>[Signature]</i>	Date: <i>1/3/17</i>	Time: <i>0915</i>

Cooler / Blank Temperature \_\_\_\_\_ °C

**ALS Environmental  
Sample Acceptance Check Form**

Client: Landau Associates, Inc. Work order: P1700001  
 Project: Transportation Corridor Investigation / 1148009.010.014  
 Sample(s) received on: 1/3/17 Date opened: 1/3/17 by: ADAVID

**Note:** This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

- |   | <b>Yes</b>                          | <b>No</b>                           | <b>N/A</b>                          |
|---|-------------------------------------|-------------------------------------|-------------------------------------|
| 1 Were <b>sample containers</b> properly marked with client sample ID?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 2 Did <b>sample containers</b> arrive in good condition?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 3 Were <b>chain-of-custody</b> papers used and filled out?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 4 Did <b>sample container labels</b> and/or tags agree with custody papers?                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 5 Was <b>sample volume</b> received adequate for analysis?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 6 Are samples within specified holding times?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 7 Was proper <b>temperature</b> (thermal preservation) of cooler at receipt adhered to?                         | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 8 Were <b>custody seals</b> on outside of cooler/Box/Container?   | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Location of seal(s)? _____ Sealing Lid?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were signature and date included?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were seals intact?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 9 Do containers have appropriate <b>preservation</b> , according to method/SOP or Client specified information? | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Is there a client indication that the submitted samples are <b>pH</b> preserved?                                | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were <b>VOA vials</b> checked for presence/absence of air bubbles?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?       | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 10 <b>Tubes:</b> Are the tubes capped and intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 11 <b>Badges:</b> Are the badges properly capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Are dual bed badges separated and individually capped and intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1700001-001.01	6.0 L Silonite Can					
P1700001-002.01	6.0 L Silonite Can					
P1700001-003.01	6.0 L Silonite Can					
P1700001-004.01	6.0 L Silonite Can					
P1700001-005.01	6.0 L Silonite Can					

Explain any discrepancies: (include lab sample ID numbers): \_\_\_\_\_

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** Ambient-12292016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P1700001-001

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00151

Date Collected: 12/29/16  
 Date Received: 1/3/17  
 Date Analyzed: 1/3/17  
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 2.20

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	22.2	0.22	
7727-37-9	Nitrogen	77.8	0.22	
630-08-0	Carbon Monoxide	ND	0.22	
74-82-8	Methane	ND	0.22	
124-38-9	Carbon Dioxide	ND	0.22	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-38-12292016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P1700001-002

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00258

Date Collected: 12/29/16  
 Date Received: 1/3/17  
 Date Analyzed: 1/3/17  
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 2.16

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	<b>Oxygen*</b>	<b>0.286</b>	0.22	
7727-37-9	<b>Nitrogen</b>	<b>5.76</b>	0.22	
630-08-0	Carbon Monoxide	ND	0.22	
74-82-8	<b>Methane</b>	<b>57.9</b>	0.22	
124-38-9	<b>Carbon Dioxide</b>	<b>36.0</b>	0.22	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.



**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-39-12292016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P1700001-003

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00120

Date Collected: 12/29/16  
 Date Received: 1/3/17  
 Date Analyzed: 1/3/17  
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 2.19

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.22	
7727-37-9	<b>Nitrogen</b>	<b>1.18</b>	0.22	
630-08-0	Carbon Monoxide	ND	0.22	
74-82-8	<b>Methane</b>	<b>66.0</b>	0.22	
124-38-9	<b>Carbon Dioxide</b>	<b>32.6</b>	0.22	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-43-12292016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P1700001-004

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00277

Date Collected: 12/29/16  
 Date Received: 1/3/17  
 Date Analyzed: 1/4/17  
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 2.21

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	<b>Oxygen*</b>	<b>0.380</b>	0.22	
7727-37-9	<b>Nitrogen</b>	<b>2.82</b>	0.22	
630-08-0	Carbon Monoxide	ND	0.22	
74-82-8	<b>Methane</b>	<b>65.9</b>	0.22	
124-38-9	<b>Carbon Dioxide</b>	<b>30.8</b>	0.22	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

**ALS ENVIRONMENTAL**

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-41-12292016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P1700001-005

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00402

Date Collected: 12/29/16  
 Date Received: 1/3/17  
 Date Analyzed: 1/4/17  
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 2.29

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	<b>Oxygen*</b>	<b>0.376</b>	0.23	
7727-37-9	<b>Nitrogen</b>	<b>4.02</b>	0.23	
630-08-0	Carbon Monoxide	ND	0.23	
74-82-8	<b>Methane</b>	<b>70.5</b>	0.23	
124-38-9	<b>Carbon Dioxide</b>	<b>25.1</b>	0.23	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P170103-MB

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 1/03/17  
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P170104-MB

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 1/04/17  
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

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**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170103-LCS

Test Code: ASTM D1946

Instrument ID: HP5890 II/GC1/TCD

Analyst: Mike Conejo

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 1/03/17

Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppmV	Result ppmV	% Recovery	ALS Acceptance Limits	Data Qualifier
7782-44-7	Oxygen*	50,000	53,000	106	97-108	
7727-37-9	Nitrogen	50,000	52,900	106	89-113	
630-08-0	Carbon Monoxide	50,000	52,200	104	98-108	
74-82-8	Methane	50,000	50,300	101	94-111	
124-38-9	Carbon Dioxide	50,000	50,200	100	94-104	

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170104-LCS

Test Code: ASTM D1946

Instrument ID: HP5890 II/GC1/TCD

Analyst: Mike Conejo

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 1/04/17

Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppmV	Result ppmV	% Recovery	ALS Acceptance Limits	Data Qualifier
7782-44-7	Oxygen*	50,000	53,000	106	97-108	
7727-37-9	Nitrogen	50,000	53,800	108	89-113	
630-08-0	Carbon Monoxide	50,000	51,800	104	98-108	
74-82-8	Methane	50,000	50,000	100	94-111	
124-38-9	Carbon Dioxide	50,000	49,800	100	94-104	

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** Ambient-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-001

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00151

Date Collected: 12/29/16  
 Time Collected: 13:07  
 Date Received: 1/3/17  
 Date Analyzed: 1/3/17  
 Time Analyzed: 15:18  
 Volume(s) Analyzed: 1.0 ml(s)

Canister Dilution Factor: 2.20

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	15	ND	11	
463-58-1	Carbonyl Sulfide	ND	27	ND	11	
74-93-1	Methyl Mercaptan	ND	22	ND	11	
75-08-1	Ethyl Mercaptan	ND	28	ND	11	
75-18-3	Dimethyl Sulfide	ND	28	ND	11	
75-15-0	Carbon Disulfide	ND	17	ND	5.5	
75-33-2	Isopropyl Mercaptan	ND	34	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	41	ND	11	
107-03-9	n-Propyl Mercaptan	ND	34	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	34	ND	11	
110-02-1	Thiophene	ND	38	ND	11	
513-44-0	Isobutyl Mercaptan	ND	41	ND	11	
352-93-2	Diethyl Sulfide	ND	41	ND	11	
109-79-5	n-Butyl Mercaptan	ND	41	ND	11	
624-92-0	Dimethyl Disulfide	ND	21	ND	5.5	
616-44-4	3-Methylthiophene	ND	44	ND	11	
110-01-0	Tetrahydrothiophene	ND	40	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	50	ND	11	
872-55-9	2-Ethylthiophene	ND	50	ND	11	
110-81-6	Diethyl Disulfide	ND	27	ND	5.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-38-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-002

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00258

Date Collected: 12/29/16  
 Time Collected: 13:30  
 Date Received: 1/3/17  
 Date Analyzed: 1/3/17  
 Time Analyzed: 15:42  
 Volume(s) Analyzed: 1.0 ml(s)

Canister Dilution Factor: 2.16

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	<b>3,400</b>	15	<b>2,400</b>	11	
463-58-1	Carbonyl Sulfide	ND	27	ND	11	
74-93-1	Methyl Mercaptan	<b>38</b>	21	<b>19</b>	11	
75-08-1	Ethyl Mercaptan	ND	27	ND	11	
75-18-3	Dimethyl Sulfide	ND	27	ND	11	
75-15-0	Carbon Disulfide	ND	17	ND	5.4	
75-33-2	Isopropyl Mercaptan	ND	34	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	40	ND	11	
107-03-9	n-Propyl Mercaptan	ND	34	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	34	ND	11	
110-02-1	Thiophene	ND	37	ND	11	
513-44-0	Isobutyl Mercaptan	ND	40	ND	11	
352-93-2	Diethyl Sulfide	ND	40	ND	11	
109-79-5	n-Butyl Mercaptan	ND	40	ND	11	
624-92-0	Dimethyl Disulfide	ND	21	ND	5.4	
616-44-4	3-Methylthiophene	ND	43	ND	11	
110-01-0	Tetrahydrothiophene	ND	39	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	50	ND	11	
872-55-9	2-Ethylthiophene	ND	50	ND	11	
110-81-6	Diethyl Disulfide	ND	27	ND	5.4	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-39-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-003

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00120

Date Collected: 12/29/16  
 Time Collected: 14:15  
 Date Received: 1/3/17  
 Date Analyzed: 1/3/17  
 Time Analyzed: 16:00  
 Volume(s) Analyzed: 1.0 ml(s)

Canister Dilution Factor: 2.19

CAS #	Compound	Result μg/m <sup>3</sup>	MRL μg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	12,000	15	8,800	11	
463-58-1	Carbonyl Sulfide	ND	27	ND	11	
74-93-1	Methyl Mercaptan	ND	22	ND	11	
75-08-1	Ethyl Mercaptan	28	28	11	11	
75-18-3	Dimethyl Sulfide	ND	28	ND	11	
75-15-0	Carbon Disulfide	ND	17	ND	5.5	
75-33-2	Isopropyl Mercaptan	ND	34	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	40	ND	11	
107-03-9	n-Propyl Mercaptan	ND	34	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	34	ND	11	
110-02-1	Thiophene	ND	38	ND	11	
513-44-0	Isobutyl Mercaptan	ND	40	ND	11	
352-93-2	Diethyl Sulfide	ND	40	ND	11	
109-79-5	n-Butyl Mercaptan	ND	40	ND	11	
624-92-0	Dimethyl Disulfide	ND	21	ND	5.5	
616-44-4	3-Methylthiophene	ND	44	ND	11	
110-01-0	Tetrahydrothiophene	ND	39	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	50	ND	11	
872-55-9	2-Ethylthiophene	ND	50	ND	11	
110-81-6	Diethyl Disulfide	ND	27	ND	5.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-43-12292016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P1700001-004

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00277

Date Collected: 12/29/16  
 Time Collected: 14:30  
 Date Received: 1/3/17  
 Date Analyzed: 1/3/17  
 Time Analyzed: 16:18  
 Volume(s) Analyzed: 1.0 ml(s)

Canister Dilution Factor: 2.21

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	<b>5,100</b>	15	<b>3,600</b>	11	
463-58-1	Carbonyl Sulfide	ND	27	ND	11	
74-93-1	Methyl Mercaptan	<b>30</b>	22	<b>15</b>	11	
75-08-1	Ethyl Mercaptan	ND	28	ND	11	
75-18-3	Dimethyl Sulfide	<b>110</b>	28	<b>42</b>	11	
75-15-0	Carbon Disulfide	ND	17	ND	5.5	
75-33-2	Isopropyl Mercaptan	ND	34	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	41	ND	11	
107-03-9	n-Propyl Mercaptan	ND	34	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	34	ND	11	
110-02-1	Thiophene	ND	38	ND	11	
513-44-0	Isobutyl Mercaptan	ND	41	ND	11	
352-93-2	Diethyl Sulfide	ND	41	ND	11	
109-79-5	n-Butyl Mercaptan	ND	41	ND	11	
624-92-0	Dimethyl Disulfide	ND	21	ND	5.5	
616-44-4	3-Methylthiophene	ND	44	ND	11	
110-01-0	Tetrahydrothiophene	ND	40	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	51	ND	11	
872-55-9	2-Ethylthiophene	ND	51	ND	11	
110-81-6	Diethyl Disulfide	ND	28	ND	5.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-41-12292016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P1700001-005

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00402

Date Collected: 12/29/16  
 Time Collected: 14:45  
 Date Received: 1/3/17  
 Date Analyzed: 1/3/17  
 Time Analyzed: 16:36  
 Volume(s) Analyzed: 1.0 ml(s)

Canister Dilution Factor: 2.29

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	<b>640</b>	16	<b>460</b>	11	
463-58-1	Carbonyl Sulfide	ND	28	ND	11	
74-93-1	Methyl Mercaptan	ND	23	ND	11	
75-08-1	Ethyl Mercaptan	ND	29	ND	11	
75-18-3	Dimethyl Sulfide	ND	29	ND	11	
75-15-0	Carbon Disulfide	<b>110</b>	18	<b>34</b>	5.7	
75-33-2	Isopropyl Mercaptan	ND	36	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	42	ND	11	
107-03-9	n-Propyl Mercaptan	ND	36	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	36	ND	11	
110-02-1	Thiophene	ND	39	ND	11	
513-44-0	Isobutyl Mercaptan	ND	42	ND	11	
352-93-2	Diethyl Sulfide	ND	42	ND	11	
109-79-5	n-Butyl Mercaptan	ND	42	ND	11	
624-92-0	Dimethyl Disulfide	ND	22	ND	5.7	
616-44-4	3-Methylthiophene	ND	46	ND	11	
110-01-0	Tetrahydrothiophene	ND	41	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	53	ND	11	
872-55-9	2-Ethylthiophene	ND	53	ND	11	
110-81-6	Diethyl Disulfide	ND	29	ND	5.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P170103-MB

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Time Collected: NA  
 Date Received: NA  
 Date Analyzed: 1/03/17  
 Time Analyzed: 08:21  
 Volume(s) Analyzed: 1.0 ml(s)

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	
463-58-1	Carbonyl Sulfide	ND	12	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-08-1	Ethyl Mercaptan	ND	13	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
75-15-0	Carbon Disulfide	ND	7.8	ND	2.5	
75-33-2	Isopropyl Mercaptan	ND	16	ND	5.0	
75-66-1	tert-Butyl Mercaptan	ND	18	ND	5.0	
107-03-9	n-Propyl Mercaptan	ND	16	ND	5.0	
624-89-5	Ethyl Methyl Sulfide	ND	16	ND	5.0	
110-02-1	Thiophene	ND	17	ND	5.0	
513-44-0	Isobutyl Mercaptan	ND	18	ND	5.0	
352-93-2	Diethyl Sulfide	ND	18	ND	5.0	
109-79-5	n-Butyl Mercaptan	ND	18	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	
616-44-4	3-Methylthiophene	ND	20	ND	5.0	
110-01-0	Tetrahydrothiophene	ND	18	ND	5.0	
638-02-8	2,5-Dimethylthiophene	ND	23	ND	5.0	
872-55-9	2-Ethylthiophene	ND	23	ND	5.0	
110-81-6	Diethyl Disulfide	ND	12	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Lab Control Sample  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P170103-LCS

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 1/03/17  
 Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppbV	Result ppbV	% Recovery	ALS	
					Acceptance Limits	Data Qualifier
7783-06-4	Hydrogen Sulfide	1,000	<b>1,040</b>	<b>104</b>	75-148	
463-58-1	Carbonyl Sulfide	1,000	<b>1,060</b>	<b>106</b>	70-137	
74-93-1	Methyl Mercaptan	1,000	<b>1,050</b>	<b>105</b>	72-139	

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Landau Associates, Inc.

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

**Total Gaseous Nonmethane Organics (TGNMO) as Methane**

Test Code: EPA Method 25C Modified  
 Instrument ID: HP5890 II/GC1/FID/TCA  
 Analyst: Mike Conejo  
 Sampling Media: 6.0 L Silonite Canister(s)  
 Test Notes:

Date(s) Collected: 12/29/16  
 Date Received: 1/3/17  
 Date Analyzed: 1/5/17

Client Sample ID	ALS Sample ID	Canister Dilution Factor	Injection Volume ml(s)	Result ppmV	MRL ppmV	Data Qualifier
Ambient-12292016	P1700001-001	2.20	0.50	ND	2.2	
GP-38-12292016	P1700001-002	2.16	0.50	<b>250</b>	2.2	
GP-39-12292016	P1700001-003	2.19	0.50	<b>600</b>	2.2	
GP-43-12292016	P1700001-004	2.21	0.50	<b>230</b>	2.2	
GP-41-12292016	P1700001-005	2.29	0.50	<b>310</b>	2.3	
Method Blank	P170105-MB	1.00	0.50	ND	1.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170105-LCS

Test Code: EPA Method 25C Modified

Instrument ID: HP5890 II/GC1/FID/TCA

Analyst: Mike Conejo

Sampling Media: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 1/05/17

Volume(s) Analyzed: NA ml(s)

Compound	Spike Amount ppmV	Result ppmV	% Recovery	ALS	Data Qualifier
				Acceptance Limits	
Total Gaseous Nonmethane Organics (TGNMO) as Methane	1,000	902	90	85-121	



# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Ambient-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-001

Test Code: EPA TO-15 Modified

Date Collected: 12/29/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 1/3/17

Analyst: Lusine Hakobyan

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 1.00 Liter(s)

Test Notes:

Container ID: SSC00151

Canister Dilution Factor: 2.20

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	3.4	1.1	2.0	0.64	
75-71-8	Dichlorodifluoromethane (CFC 12)	2.1	1.1	0.42	0.22	
74-87-3	Chloromethane	ND	1.1	ND	0.53	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	1.1	ND	0.16	
75-01-4	Vinyl Chloride	ND	1.1	ND	0.43	
106-99-0	1,3-Butadiene	ND	1.1	ND	0.50	
74-83-9	Bromomethane	ND	1.1	ND	0.28	
75-00-3	Chloroethane	ND	1.1	ND	0.42	
64-17-5	Ethanol	ND	11	ND	5.8	
75-05-8	Acetonitrile	ND	1.1	ND	0.66	
107-02-8	Acrolein	ND	4.4	ND	1.9	
67-64-1	Acetone	ND	11	ND	4.6	
75-69-4	Trichlorofluoromethane	ND	1.1	ND	0.20	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	11	ND	4.5	
107-13-1	Acrylonitrile	ND	1.1	ND	0.51	
75-35-4	1,1-Dichloroethene	ND	1.1	ND	0.28	
75-09-2	Methylene Chloride	ND	1.1	ND	0.32	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	1.1	ND	0.35	
76-13-1	Trichlorotrifluoroethane	ND	1.1	ND	0.14	
75-15-0	Carbon Disulfide	ND	11	ND	3.5	
156-60-5	trans-1,2-Dichloroethene	ND	1.1	ND	0.28	
75-34-3	1,1-Dichloroethane	ND	1.1	ND	0.27	
1634-04-4	Methyl tert-Butyl Ether	ND	1.1	ND	0.31	
108-05-4	Vinyl Acetate	ND	11	ND	3.1	
78-93-3	2-Butanone (MEK)	ND	11	ND	3.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Ambient-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-001

Test Code: EPA TO-15 Modified

Date Collected: 12/29/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 1/3/17

Analyst: Lusine Hakobyan

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 1.00 Liter(s)

Test Notes:

Container ID: SSC00151

Canister Dilution Factor: 2.20

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	1.1	ND	0.28	
141-78-6	Ethyl Acetate	<b>3.3</b>	2.2	<b>0.92</b>	0.61	
110-54-3	n-Hexane	ND	1.1	ND	0.31	
67-66-3	Chloroform	ND	1.1	ND	0.23	
109-99-9	Tetrahydrofuran (THF)	ND	1.1	ND	0.37	
107-06-2	1,2-Dichloroethane	ND	1.1	ND	0.27	
71-55-6	1,1,1-Trichloroethane	ND	1.1	ND	0.20	
71-43-2	Benzene	ND	1.1	ND	0.34	
56-23-5	Carbon Tetrachloride	ND	1.1	ND	0.17	
110-82-7	Cyclohexane	ND	2.2	ND	0.64	
78-87-5	1,2-Dichloropropane	ND	1.1	ND	0.24	
75-27-4	Bromodichloromethane	ND	1.1	ND	0.16	
79-01-6	Trichloroethene	ND	1.1	ND	0.20	
123-91-1	1,4-Dioxane	ND	1.1	ND	0.31	
80-62-6	Methyl Methacrylate	ND	2.2	ND	0.54	
142-82-5	n-Heptane	ND	1.1	ND	0.27	
10061-01-5	cis-1,3-Dichloropropene	ND	1.1	ND	0.24	
108-10-1	4-Methyl-2-pentanone	ND	1.1	ND	0.27	
10061-02-6	trans-1,3-Dichloropropene	ND	1.1	ND	0.24	
79-00-5	1,1,2-Trichloroethane	ND	1.1	ND	0.20	
108-88-3	Toluene	ND	1.1	ND	0.29	
591-78-6	2-Hexanone	ND	1.1	ND	0.27	
124-48-1	Dibromochloromethane	ND	1.1	ND	0.13	
106-93-4	1,2-Dibromoethane	ND	1.1	ND	0.14	
123-86-4	n-Butyl Acetate	ND	1.1	ND	0.23	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 3 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Ambient-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-001

Test Code: EPA TO-15 Modified

Date Collected: 12/29/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 1/3/17

Analyst: Lusine Hakobyan

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 1.00 Liter(s)

Test Notes:

Container ID: SSC00151

Canister Dilution Factor: 2.20

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	1.1	ND	0.24	
127-18-4	Tetrachloroethene	ND	1.1	ND	0.16	
108-90-7	Chlorobenzene	ND	1.1	ND	0.24	
100-41-4	Ethylbenzene	ND	1.1	ND	0.25	
179601-23-1	m,p-Xylenes	ND	2.2	ND	0.51	
75-25-2	Bromoform	ND	1.1	ND	0.11	
100-42-5	Styrene	ND	1.1	ND	0.26	
95-47-6	o-Xylene	ND	1.1	ND	0.25	
111-84-2	n-Nonane	ND	1.1	ND	0.21	
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.1	ND	0.16	
98-82-8	Cumene	ND	1.1	ND	0.22	
80-56-8	alpha-Pinene	ND	1.1	ND	0.20	
103-65-1	n-Propylbenzene	ND	1.1	ND	0.22	
622-96-8	4-Ethyltoluene	ND	1.1	ND	0.22	
108-67-8	1,3,5-Trimethylbenzene	ND	1.1	ND	0.22	
95-63-6	1,2,4-Trimethylbenzene	ND	1.1	ND	0.22	
100-44-7	Benzyl Chloride	ND	1.1	ND	0.21	
541-73-1	1,3-Dichlorobenzene	ND	1.1	ND	0.18	
106-46-7	1,4-Dichlorobenzene	ND	1.1	ND	0.18	
95-50-1	1,2-Dichlorobenzene	ND	1.1	ND	0.18	
5989-27-5	d-Limonene	ND	1.1	ND	0.20	
96-12-8	1,2-Dibromo-3-chloropropane	ND	1.1	ND	0.11	
120-82-1	1,2,4-Trichlorobenzene	ND	1.1	ND	0.15	
91-20-3	Naphthalene	ND	1.1	ND	0.21	
87-68-3	Hexachlorobutadiene	ND	1.1	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-38-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-002

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Lusine Hakobyan

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00258

Date Collected: 12/29/16

Date Received: 1/3/17

Date Analyzed: 1/4 - 1/5/17

Volume(s) Analyzed: 0.10 Liter(s)

0.020 Liter(s)

Canister Dilution Factor: 2.16

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	870	11	500	6.3	
75-71-8	Dichlorodifluoromethane (CFC 12)	53	11	11	2.2	
74-87-3	Chloromethane	ND	11	ND	5.2	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	1,100	11	150	1.5	
75-01-4	Vinyl Chloride	78	11	30	4.2	
106-99-0	1,3-Butadiene	ND	11	ND	4.9	
74-83-9	Bromomethane	ND	11	ND	2.8	
75-00-3	Chloroethane	26	11	9.9	4.1	
64-17-5	Ethanol	ND	110	ND	57	
75-05-8	Acetonitrile	ND	11	ND	6.4	
107-02-8	Acrolein	ND	43	ND	19	
67-64-1	Acetone	ND	110	ND	45	
75-69-4	Trichlorofluoromethane	ND	11	ND	1.9	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	110	ND	44	
107-13-1	Acrylonitrile	ND	11	ND	5.0	
75-35-4	1,1-Dichloroethene	11	11	2.9	2.7	
75-09-2	Methylene Chloride	ND	11	ND	3.1	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	11	ND	3.5	
76-13-1	Trichlorotrifluoroethane	ND	11	ND	1.4	
75-15-0	Carbon Disulfide	ND	110	ND	35	
156-60-5	trans-1,2-Dichloroethene	ND	11	ND	2.7	
75-34-3	1,1-Dichloroethane	ND	11	ND	2.7	
1634-04-4	Methyl tert-Butyl Ether	ND	11	ND	3.0	
108-05-4	Vinyl Acetate	ND	110	ND	31	
78-93-3	2-Butanone (MEK)	ND	110	ND	37	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-38-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-002

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Lusine Hakobyan

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00258

Date Collected: 12/29/16

Date Received: 1/3/17

Date Analyzed: 1/4 - 1/5/17

Volume(s) Analyzed: 0.10 Liter(s)

0.020 Liter(s)

Canister Dilution Factor: 2.16

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	21	11	5.4	2.7	
141-78-6	Ethyl Acetate	ND	22	ND	6.0	
110-54-3	n-Hexane	920	11	260	3.1	
67-66-3	Chloroform	ND	11	ND	2.2	
109-99-9	Tetrahydrofuran (THF)	ND	11	ND	3.7	
107-06-2	1,2-Dichloroethane	ND	11	ND	2.7	
71-55-6	1,1,1-Trichloroethane	ND	11	ND	2.0	
71-43-2	Benzene	70	11	22	3.4	
56-23-5	Carbon Tetrachloride	ND	11	ND	1.7	
110-82-7	Cyclohexane	2,200	22	640	6.3	
78-87-5	1,2-Dichloropropane	ND	11	ND	2.3	
75-27-4	Bromodichloromethane	ND	11	ND	1.6	
79-01-6	Trichloroethene	19	11	3.4	2.0	
123-91-1	1,4-Dioxane	ND	11	ND	3.0	
80-62-6	Methyl Methacrylate	ND	22	ND	5.3	
142-82-5	n-Heptane	3,100	54	760	13	D
10061-01-5	cis-1,3-Dichloropropene	ND	11	ND	2.4	
108-10-1	4-Methyl-2-pentanone	ND	11	ND	2.6	
10061-02-6	trans-1,3-Dichloropropene	ND	11	ND	2.4	
79-00-5	1,1,2-Trichloroethane	ND	11	ND	2.0	
108-88-3	Toluene	54	11	14	2.9	
591-78-6	2-Hexanone	ND	11	ND	2.6	
124-48-1	Dibromochloromethane	ND	11	ND	1.3	
106-93-4	1,2-Dibromoethane	ND	11	ND	1.4	
123-86-4	n-Butyl Acetate	ND	11	ND	2.3	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

D = The reported result is from a dilution.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-38-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-002

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Lusine Hakobyan

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00258

Date Collected: 12/29/16

Date Received: 1/3/17

Date Analyzed: 1/4 - 1/5/17

Volume(s) Analyzed: 0.10 Liter(s)

0.020 Liter(s)

Canister Dilution Factor: 2.16

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	260	11	56	2.3	
127-18-4	Tetrachloroethene	ND	11	ND	1.6	
108-90-7	Chlorobenzene	190	11	42	2.3	
100-41-4	Ethylbenzene	62	11	14	2.5	
179601-23-1	m,p-Xylenes	440	22	100	5.0	
75-25-2	Bromoform	ND	11	ND	1.0	
100-42-5	Styrene	ND	11	ND	2.5	
95-47-6	o-Xylene	130	11	29	2.5	
111-84-2	n-Nonane	200	11	38	2.1	
79-34-5	1,1,2,2-Tetrachloroethane	ND	11	ND	1.6	
98-82-8	Cumene	300	11	62	2.2	
80-56-8	alpha-Pinene	65	11	12	1.9	
103-65-1	n-Propylbenzene	170	11	35	2.2	
622-96-8	4-Ethyltoluene	28	11	5.7	2.2	
108-67-8	1,3,5-Trimethylbenzene	110	11	23	2.2	
95-63-6	1,2,4-Trimethylbenzene	270	11	56	2.2	
100-44-7	Benzyl Chloride	ND	11	ND	2.1	
541-73-1	1,3-Dichlorobenzene	ND	11	ND	1.8	
106-46-7	1,4-Dichlorobenzene	100	11	17	1.8	
95-50-1	1,2-Dichlorobenzene	22	11	3.6	1.8	
5989-27-5	d-Limonene	ND	11	ND	1.9	
96-12-8	1,2-Dibromo-3-chloropropane	ND	11	ND	1.1	
120-82-1	1,2,4-Trichlorobenzene	ND	11	ND	1.5	
91-20-3	Naphthalene	ND	11	ND	2.1	
87-68-3	Hexachlorobutadiene	ND	11	ND	1.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-39-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-003

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Lusine Hakobyan

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00120

Date Collected: 12/29/16

Date Received: 1/3/17

Date Analyzed: 1/5/17

Volume(s) Analyzed: 0.020 Liter(s)

0.010 Liter(s)

Canister Dilution Factor: 2.19

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	1,200	55	700	32	
75-71-8	Dichlorodifluoromethane (CFC 12)	1,100	55	210	11	
74-87-3	Chloromethane	ND	55	ND	27	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	1,300	55	190	7.8	
75-01-4	Vinyl Chloride	11,000	55	4,200	21	
106-99-0	1,3-Butadiene	ND	55	ND	25	
74-83-9	Bromomethane	ND	55	ND	14	
75-00-3	Chloroethane	83	55	32	21	
64-17-5	Ethanol	ND	550	ND	290	
75-05-8	Acetonitrile	ND	55	ND	33	
107-02-8	Acrolein	ND	220	ND	96	
67-64-1	Acetone	ND	550	ND	230	
75-69-4	Trichlorofluoromethane	ND	55	ND	9.7	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	550	ND	220	
107-13-1	Acrylonitrile	ND	55	ND	25	
75-35-4	1,1-Dichloroethene	ND	55	ND	14	
75-09-2	Methylene Chloride	ND	55	ND	16	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	55	ND	17	
76-13-1	Trichlorotrifluoroethane	ND	55	ND	7.1	
75-15-0	Carbon Disulfide	ND	550	ND	180	
156-60-5	trans-1,2-Dichloroethene	ND	55	ND	14	
75-34-3	1,1-Dichloroethane	ND	55	ND	14	
1634-04-4	Methyl tert-Butyl Ether	ND	55	ND	15	
108-05-4	Vinyl Acetate	ND	550	ND	160	
78-93-3	2-Butanone (MEK)	ND	550	ND	190	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-39-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-003

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Lusine Hakobyan

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00120

Date Collected: 12/29/16

Date Received: 1/3/17

Date Analyzed: 1/5/17

Volume(s) Analyzed: 0.020 Liter(s)

0.010 Liter(s)

Canister Dilution Factor: 2.19

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	380	55	95	14	
141-78-6	Ethyl Acetate	ND	110	ND	30	
110-54-3	n-Hexane	840	55	240	16	
67-66-3	Chloroform	ND	55	ND	11	
109-99-9	Tetrahydrofuran (THF)	ND	55	ND	19	
107-06-2	1,2-Dichloroethane	ND	55	ND	14	
71-55-6	1,1,1-Trichloroethane	ND	55	ND	10	
71-43-2	Benzene	450	55	140	17	
56-23-5	Carbon Tetrachloride	ND	55	ND	8.7	
110-82-7	Cyclohexane	3,000	110	880	32	
78-87-5	1,2-Dichloropropane	ND	55	ND	12	
75-27-4	Bromodichloromethane	ND	55	ND	8.2	
79-01-6	Trichloroethene	77	55	14	10	
123-91-1	1,4-Dioxane	ND	55	ND	15	
80-62-6	Methyl Methacrylate	ND	110	ND	27	
142-82-5	n-Heptane	2,400	55	580	13	
10061-01-5	cis-1,3-Dichloropropene	ND	55	ND	12	
108-10-1	4-Methyl-2-pentanone	78	55	19	13	
10061-02-6	trans-1,3-Dichloropropene	ND	55	ND	12	
79-00-5	1,1,2-Trichloroethane	ND	55	ND	10	
108-88-3	Toluene	1,400	55	380	15	
591-78-6	2-Hexanone	ND	55	ND	13	
124-48-1	Dibromochloromethane	ND	55	ND	6.4	
106-93-4	1,2-Dibromoethane	ND	55	ND	7.1	
123-86-4	n-Butyl Acetate	ND	55	ND	12	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-39-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-003

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Lusine Hakobyan

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00120

Date Collected: 12/29/16

Date Received: 1/3/17

Date Analyzed: 1/5/17

Volume(s) Analyzed: 0.020 Liter(s)

0.010 Liter(s)

Canister Dilution Factor: 2.19

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	1,900	55	400	12	
127-18-4	Tetrachloroethene	67	55	9.9	8.1	
108-90-7	Chlorobenzene	ND	55	ND	12	
100-41-4	Ethylbenzene	4,200	55	960	13	
179601-23-1	m,p-Xylenes	8,600	110	2,000	25	
75-25-2	Bromoform	ND	55	ND	5.3	
100-42-5	Styrene	ND	55	ND	13	
95-47-6	o-Xylene	3,200	55	730	13	
111-84-2	n-Nonane	15,000	110	2,900	21	<b>D</b>
79-34-5	1,1,2,2-Tetrachloroethane	ND	55	ND	8.0	
98-82-8	Cumene	780	55	160	11	
80-56-8	alpha-Pinene	1,300	55	230	9.8	
103-65-1	n-Propylbenzene	1,300	55	260	11	
622-96-8	4-Ethyltoluene	570	55	120	11	
108-67-8	1,3,5-Trimethylbenzene	1,800	55	360	11	
95-63-6	1,2,4-Trimethylbenzene	3,800	55	780	11	
100-44-7	Benzyl Chloride	ND	55	ND	11	
541-73-1	1,3-Dichlorobenzene	ND	55	ND	9.1	
106-46-7	1,4-Dichlorobenzene	69	55	11	9.1	
95-50-1	1,2-Dichlorobenzene	79	55	13	9.1	
5989-27-5	d-Limonene	620	55	110	9.8	
96-12-8	1,2-Dibromo-3-chloropropane	ND	55	ND	5.7	
120-82-1	1,2,4-Trichlorobenzene	ND	55	ND	7.4	
91-20-3	Naphthalene	ND	55	ND	10	
87-68-3	Hexachlorobutadiene	ND	55	ND	5.1	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

D = The reported result is from a dilution.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-43-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-004

Test Code: EPA TO-15 Modified

Date Collected: 12/29/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 1/3/17

Analyst: Lusine Hakobyan

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.030 Liter(s)

Test Notes:

Container ID: SSC00277

Canister Dilution Factor: 2.21

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	1,200	37	670	21	
75-71-8	Dichlorodifluoromethane (CFC 12)	1,500	37	290	7.5	
74-87-3	Chloromethane	ND	37	ND	18	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	1,200	37	170	5.3	
75-01-4	Vinyl Chloride	5,400	37	2,100	14	
106-99-0	1,3-Butadiene	ND	37	ND	17	
74-83-9	Bromomethane	ND	37	ND	9.5	
75-00-3	Chloroethane	ND	37	ND	14	
64-17-5	Ethanol	ND	370	ND	200	
75-05-8	Acetonitrile	ND	37	ND	22	
107-02-8	Acrolein	ND	150	ND	64	
67-64-1	Acetone	970	370	410	160	
75-69-4	Trichlorofluoromethane	430	37	77	6.6	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	370	ND	150	
107-13-1	Acrylonitrile	ND	37	ND	17	
75-35-4	1,1-Dichloroethene	81	37	21	9.3	
75-09-2	Methylene Chloride	85	37	24	11	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	37	ND	12	
76-13-1	Trichlorotrifluoroethane	ND	37	ND	4.8	
75-15-0	Carbon Disulfide	ND	370	ND	120	
156-60-5	trans-1,2-Dichloroethene	120	37	31	9.3	
75-34-3	1,1-Dichloroethane	ND	37	ND	9.1	
1634-04-4	Methyl tert-Butyl Ether	ND	37	ND	10	
108-05-4	Vinyl Acetate	ND	370	ND	100	
78-93-3	2-Butanone (MEK)	1,500	370	510	120	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-43-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-004

Test Code: EPA TO-15 Modified

Date Collected: 12/29/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 1/3/17

Analyst: Lusine Hakobyan

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.030 Liter(s)

Test Notes:

Container ID: SSC00277

Canister Dilution Factor: 2.21

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	2,800	37	710	9.3	
141-78-6	Ethyl Acetate	ND	74	ND	20	
110-54-3	n-Hexane	580	37	170	10	
67-66-3	Chloroform	ND	37	ND	7.5	
109-99-9	Tetrahydrofuran (THF)	910	37	310	12	
107-06-2	1,2-Dichloroethane	ND	37	ND	9.1	
71-55-6	1,1,1-Trichloroethane	ND	37	ND	6.8	
71-43-2	Benzene	340	37	110	12	
56-23-5	Carbon Tetrachloride	ND	37	ND	5.9	
110-82-7	Cyclohexane	500	74	140	21	
78-87-5	1,2-Dichloropropane	ND	37	ND	8.0	
75-27-4	Bromodichloromethane	ND	37	ND	5.5	
79-01-6	Trichloroethene	450	37	83	6.9	
123-91-1	1,4-Dioxane	ND	37	ND	10	
80-62-6	Methyl Methacrylate	ND	74	ND	18	
142-82-5	n-Heptane	1,900	37	470	9.0	
10061-01-5	cis-1,3-Dichloropropene	ND	37	ND	8.1	
108-10-1	4-Methyl-2-pentanone	630	37	150	9.0	
10061-02-6	trans-1,3-Dichloropropene	ND	37	ND	8.1	
79-00-5	1,1,2-Trichloroethane	ND	37	ND	6.8	
108-88-3	Toluene	6,300	37	1,700	9.8	
591-78-6	2-Hexanone	ND	37	ND	9.0	
124-48-1	Dibromochloromethane	ND	37	ND	4.3	
106-93-4	1,2-Dibromoethane	ND	37	ND	4.8	
123-86-4	n-Butyl Acetate	ND	37	ND	7.8	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-43-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-004

Test Code: EPA TO-15 Modified

Date Collected: 12/29/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 1/3/17

Analyst: Lusine Hakobyan

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.030 Liter(s)

Test Notes:

Container ID: SSC00277

Canister Dilution Factor: 2.21

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	1,500	37	310	7.9	
127-18-4	Tetrachloroethene	640	37	94	5.4	
108-90-7	Chlorobenzene	ND	37	ND	8.0	
100-41-4	Ethylbenzene	3,800	37	880	8.5	
179601-23-1	m,p-Xylenes	7,400	74	1,700	17	
75-25-2	Bromoform	ND	37	ND	3.6	
100-42-5	Styrene	96	37	23	8.7	
95-47-6	o-Xylene	1,800	37	420	8.5	
111-84-2	n-Nonane	3,200	37	610	7.0	
79-34-5	1,1,2,2-Tetrachloroethane	ND	37	ND	5.4	
98-82-8	Cumene	550	37	110	7.5	
80-56-8	alpha-Pinene	4,300	37	780	6.6	
103-65-1	n-Propylbenzene	560	37	110	7.5	
622-96-8	4-Ethyltoluene	260	37	53	7.5	
108-67-8	1,3,5-Trimethylbenzene	450	37	92	7.5	
95-63-6	1,2,4-Trimethylbenzene	1,300	37	270	7.5	
100-44-7	Benzyl Chloride	ND	37	ND	7.1	
541-73-1	1,3-Dichlorobenzene	ND	37	ND	6.1	
106-46-7	1,4-Dichlorobenzene	ND	37	ND	6.1	
95-50-1	1,2-Dichlorobenzene	ND	37	ND	6.1	
5989-27-5	d-Limonene	6,900	37	1,200	6.6	
96-12-8	1,2-Dibromo-3-chloropropane	ND	37	ND	3.8	
120-82-1	1,2,4-Trichlorobenzene	ND	37	ND	5.0	
91-20-3	Naphthalene	ND	37	ND	7.0	
87-68-3	Hexachlorobutadiene	ND	37	ND	3.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-41-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-005

Test Code: EPA TO-15 Modified

Date Collected: 12/29/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 1/3/17

Analyst: Lusine Hakobyan

Date Analyzed: 1/5/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.020 Liter(s)

Test Notes:

Container ID: SSC00402

Canister Dilution Factor: 2.29

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	1,500	57	880	33	
75-71-8	Dichlorodifluoromethane (CFC 12)	4,100	57	830	12	
74-87-3	Chloromethane	ND	57	ND	28	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	2,900	57	410	8.2	
75-01-4	Vinyl Chloride	9,400	57	3,700	22	
106-99-0	1,3-Butadiene	ND	57	ND	26	
74-83-9	Bromomethane	ND	57	ND	15	
75-00-3	Chloroethane	ND	57	ND	22	
64-17-5	Ethanol	ND	570	ND	300	
75-05-8	Acetonitrile	ND	57	ND	34	
107-02-8	Acrolein	ND	230	ND	100	
67-64-1	Acetone	ND	570	ND	240	
75-69-4	Trichlorofluoromethane	ND	57	ND	10	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	570	ND	230	
107-13-1	Acrylonitrile	ND	57	ND	26	
75-35-4	1,1-Dichloroethene	ND	57	ND	14	
75-09-2	Methylene Chloride	ND	57	ND	16	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	57	ND	18	
76-13-1	Trichlorotrifluoroethane	ND	57	ND	7.5	
75-15-0	Carbon Disulfide	ND	570	ND	180	
156-60-5	trans-1,2-Dichloroethene	ND	57	ND	14	
75-34-3	1,1-Dichloroethane	ND	57	ND	14	
1634-04-4	Methyl tert-Butyl Ether	ND	57	ND	16	
108-05-4	Vinyl Acetate	ND	570	ND	160	
78-93-3	2-Butanone (MEK)	ND	570	ND	190	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-41-12292016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P1700001-005

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00402

Date Collected: 12/29/16  
 Date Received: 1/3/17  
 Date Analyzed: 1/5/17  
 Volume(s) Analyzed: 0.020 Liter(s)

Canister Dilution Factor: 2.29

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	97	57	24	14	
141-78-6	Ethyl Acetate	ND	110	ND	32	
110-54-3	n-Hexane	620	57	180	16	
67-66-3	Chloroform	ND	57	ND	12	
109-99-9	Tetrahydrofuran (THF)	ND	57	ND	19	
107-06-2	1,2-Dichloroethane	ND	57	ND	14	
71-55-6	1,1,1-Trichloroethane	ND	57	ND	10	
71-43-2	Benzene	490	57	150	18	
56-23-5	Carbon Tetrachloride	ND	57	ND	9.1	
110-82-7	Cyclohexane	410	110	120	33	
78-87-5	1,2-Dichloropropane	ND	57	ND	12	
75-27-4	Bromodichloromethane	ND	57	ND	8.5	
79-01-6	Trichloroethene	ND	57	ND	11	
123-91-1	1,4-Dioxane	ND	57	ND	16	
80-62-6	Methyl Methacrylate	ND	110	ND	28	
142-82-5	n-Heptane	920	57	230	14	
10061-01-5	cis-1,3-Dichloropropene	ND	57	ND	13	
108-10-1	4-Methyl-2-pentanone	ND	57	ND	14	
10061-02-6	trans-1,3-Dichloropropene	ND	57	ND	13	
79-00-5	1,1,2-Trichloroethane	ND	57	ND	10	
108-88-3	Toluene	550	57	150	15	
591-78-6	2-Hexanone	ND	57	ND	14	
124-48-1	Dibromochloromethane	ND	57	ND	6.7	
106-93-4	1,2-Dibromoethane	ND	57	ND	7.5	
123-86-4	n-Butyl Acetate	ND	57	ND	12	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-41-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-005

Test Code: EPA TO-15 Modified

Date Collected: 12/29/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 1/3/17

Analyst: Lusine Hakobyan

Date Analyzed: 1/5/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.020 Liter(s)

Test Notes:

Container ID: SSC00402

Canister Dilution Factor: 2.29

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	1,800	57	380	12	
127-18-4	Tetrachloroethene	ND	57	ND	8.4	
108-90-7	Chlorobenzene	ND	57	ND	12	
100-41-4	Ethylbenzene	910	57	210	13	
179601-23-1	m,p-Xylenes	2,200	110	510	26	
75-25-2	Bromoform	ND	57	ND	5.5	
100-42-5	Styrene	ND	57	ND	13	
95-47-6	o-Xylene	910	57	210	13	
111-84-2	n-Nonane	9,800	57	1,900	11	
79-34-5	1,1,2,2-Tetrachloroethane	ND	57	ND	8.3	
98-82-8	Cumene	240	57	48	12	
80-56-8	alpha-Pinene	1,300	57	220	10	
103-65-1	n-Propylbenzene	240	57	48	12	
622-96-8	4-Ethyltoluene	91	57	19	12	
108-67-8	1,3,5-Trimethylbenzene	520	57	110	12	
95-63-6	1,2,4-Trimethylbenzene	920	57	190	12	
100-44-7	Benzyl Chloride	ND	57	ND	11	
541-73-1	1,3-Dichlorobenzene	ND	57	ND	9.5	
106-46-7	1,4-Dichlorobenzene	ND	57	ND	9.5	
95-50-1	1,2-Dichlorobenzene	76	57	13	9.5	
5989-27-5	d-Limonene	90	57	16	10	
96-12-8	1,2-Dibromo-3-chloropropane	ND	57	ND	5.9	
120-82-1	1,2,4-Trichlorobenzene	ND	57	ND	7.7	
91-20-3	Naphthalene	ND	57	ND	11	
87-68-3	Hexachlorobutadiene	ND	57	ND	5.4	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Method Blank

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Cory Lewis

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 1/4/17

Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	ND	0.50	ND	0.29	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.50	ND	0.10	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.50	ND	0.072	
75-01-4	Vinyl Chloride	ND	0.50	ND	0.20	
106-99-0	1,3-Butadiene	ND	0.50	ND	0.23	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.50	ND	0.19	
64-17-5	Ethanol	ND	5.0	ND	2.7	
75-05-8	Acetonitrile	ND	0.50	ND	0.30	
107-02-8	Acrolein	ND	2.0	ND	0.87	
67-64-1	Acetone	ND	5.0	ND	2.1	
75-69-4	Trichlorofluoromethane	ND	0.50	ND	0.089	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	5.0	ND	2.0	
107-13-1	Acrylonitrile	ND	0.50	ND	0.23	
75-35-4	1,1-Dichloroethene	ND	0.50	ND	0.13	
75-09-2	Methylene Chloride	ND	0.50	ND	0.14	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.50	ND	0.16	
76-13-1	Trichlorotrifluoroethane	ND	0.50	ND	0.065	
75-15-0	Carbon Disulfide	ND	5.0	ND	1.6	
156-60-5	trans-1,2-Dichloroethene	ND	0.50	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.50	ND	0.12	
1634-04-4	Methyl tert-Butyl Ether	ND	0.50	ND	0.14	
108-05-4	Vinyl Acetate	ND	5.0	ND	1.4	
78-93-3	2-Butanone (MEK)	ND	5.0	ND	1.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Method Blank

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Cory Lewis

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 1/4/17

Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	0.50	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.0	ND	0.28	
110-54-3	n-Hexane	ND	0.50	ND	0.14	
67-66-3	Chloroform	ND	0.50	ND	0.10	
109-99-9	Tetrahydrofuran (THF)	ND	0.50	ND	0.17	
107-06-2	1,2-Dichloroethane	ND	0.50	ND	0.12	
71-55-6	1,1,1-Trichloroethane	ND	0.50	ND	0.092	
71-43-2	Benzene	ND	0.50	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.50	ND	0.080	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.50	ND	0.11	
75-27-4	Bromodichloromethane	ND	0.50	ND	0.075	
79-01-6	Trichloroethene	ND	0.50	ND	0.093	
123-91-1	1,4-Dioxane	ND	0.50	ND	0.14	
80-62-6	Methyl Methacrylate	ND	1.0	ND	0.24	
142-82-5	n-Heptane	ND	0.50	ND	0.12	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ND	0.11	
108-10-1	4-Methyl-2-pentanone	ND	0.50	ND	0.12	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ND	0.11	
79-00-5	1,1,2-Trichloroethane	ND	0.50	ND	0.092	
108-88-3	Toluene	ND	0.50	ND	0.13	
591-78-6	2-Hexanone	ND	0.50	ND	0.12	
124-48-1	Dibromochloromethane	ND	0.50	ND	0.059	
106-93-4	1,2-Dibromoethane	ND	0.50	ND	0.065	
123-86-4	n-Butyl Acetate	ND	0.50	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

Page 3 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Cory Lewis  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 1/4/17  
 Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.50	ND	0.11	
127-18-4	Tetrachloroethene	ND	0.50	ND	0.074	
108-90-7	Chlorobenzene	ND	0.50	ND	0.11	
100-41-4	Ethylbenzene	ND	0.50	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.0	ND	0.23	
75-25-2	Bromoform	ND	0.50	ND	0.048	
100-42-5	Styrene	ND	0.50	ND	0.12	
95-47-6	o-Xylene	ND	0.50	ND	0.12	
111-84-2	n-Nonane	ND	0.50	ND	0.095	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	ND	0.073	
98-82-8	Cumene	ND	0.50	ND	0.10	
80-56-8	alpha-Pinene	ND	0.50	ND	0.090	
103-65-1	n-Propylbenzene	ND	0.50	ND	0.10	
622-96-8	4-Ethyltoluene	ND	0.50	ND	0.10	
108-67-8	1,3,5-Trimethylbenzene	ND	0.50	ND	0.10	
95-63-6	1,2,4-Trimethylbenzene	ND	0.50	ND	0.10	
100-44-7	Benzyl Chloride	ND	0.50	ND	0.097	
541-73-1	1,3-Dichlorobenzene	ND	0.50	ND	0.083	
106-46-7	1,4-Dichlorobenzene	ND	0.50	ND	0.083	
95-50-1	1,2-Dichlorobenzene	ND	0.50	ND	0.083	
5989-27-5	d-Limonene	ND	0.50	ND	0.090	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.50	ND	0.052	
120-82-1	1,2,4-Trichlorobenzene	ND	0.50	ND	0.067	
91-20-3	Naphthalene	ND	0.50	ND	0.095	
87-68-3	Hexachlorobutadiene	ND	0.50	ND	0.047	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 1/4/17  
 Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	ND	0.50	ND	0.29	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.50	ND	0.10	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.50	ND	0.072	
75-01-4	Vinyl Chloride	ND	0.50	ND	0.20	
106-99-0	1,3-Butadiene	ND	0.50	ND	0.23	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.50	ND	0.19	
64-17-5	Ethanol	ND	5.0	ND	2.7	
75-05-8	Acetonitrile	ND	0.50	ND	0.30	
107-02-8	Acrolein	ND	2.0	ND	0.87	
67-64-1	Acetone	ND	5.0	ND	2.1	
75-69-4	Trichlorofluoromethane	ND	0.50	ND	0.089	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	5.0	ND	2.0	
107-13-1	Acrylonitrile	ND	0.50	ND	0.23	
75-35-4	1,1-Dichloroethene	ND	0.50	ND	0.13	
75-09-2	Methylene Chloride	ND	0.50	ND	0.14	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.50	ND	0.16	
76-13-1	Trichlorotrifluoroethane	ND	0.50	ND	0.065	
75-15-0	Carbon Disulfide	ND	5.0	ND	1.6	
156-60-5	trans-1,2-Dichloroethene	ND	0.50	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.50	ND	0.12	
1634-04-4	Methyl tert-Butyl Ether	ND	0.50	ND	0.14	
108-05-4	Vinyl Acetate	ND	5.0	ND	1.4	
78-93-3	2-Butanone (MEK)	ND	5.0	ND	1.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Method Blank

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Lusine Hakobyan

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 1/4/17

Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	0.50	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.0	ND	0.28	
110-54-3	n-Hexane	ND	0.50	ND	0.14	
67-66-3	Chloroform	ND	0.50	ND	0.10	
109-99-9	Tetrahydrofuran (THF)	ND	0.50	ND	0.17	
107-06-2	1,2-Dichloroethane	ND	0.50	ND	0.12	
71-55-6	1,1,1-Trichloroethane	ND	0.50	ND	0.092	
71-43-2	Benzene	ND	0.50	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.50	ND	0.080	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.50	ND	0.11	
75-27-4	Bromodichloromethane	ND	0.50	ND	0.075	
79-01-6	Trichloroethene	ND	0.50	ND	0.093	
123-91-1	1,4-Dioxane	ND	0.50	ND	0.14	
80-62-6	Methyl Methacrylate	ND	1.0	ND	0.24	
142-82-5	n-Heptane	ND	0.50	ND	0.12	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ND	0.11	
108-10-1	4-Methyl-2-pentanone	ND	0.50	ND	0.12	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ND	0.11	
79-00-5	1,1,2-Trichloroethane	ND	0.50	ND	0.092	
108-88-3	Toluene	ND	0.50	ND	0.13	
591-78-6	2-Hexanone	ND	0.50	ND	0.12	
124-48-1	Dibromochloromethane	ND	0.50	ND	0.059	
106-93-4	1,2-Dibromoethane	ND	0.50	ND	0.065	
123-86-4	n-Butyl Acetate	ND	0.50	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 3 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 1/4/17  
 Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.50	ND	0.11	
127-18-4	Tetrachloroethene	ND	0.50	ND	0.074	
108-90-7	Chlorobenzene	ND	0.50	ND	0.11	
100-41-4	Ethylbenzene	ND	0.50	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.0	ND	0.23	
75-25-2	Bromoform	ND	0.50	ND	0.048	
100-42-5	Styrene	ND	0.50	ND	0.12	
95-47-6	o-Xylene	ND	0.50	ND	0.12	
111-84-2	n-Nonane	ND	0.50	ND	0.095	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	ND	0.073	
98-82-8	Cumene	ND	0.50	ND	0.10	
80-56-8	alpha-Pinene	ND	0.50	ND	0.090	
103-65-1	n-Propylbenzene	ND	0.50	ND	0.10	
622-96-8	4-Ethyltoluene	ND	0.50	ND	0.10	
108-67-8	1,3,5-Trimethylbenzene	ND	0.50	ND	0.10	
95-63-6	1,2,4-Trimethylbenzene	ND	0.50	ND	0.10	
100-44-7	Benzyl Chloride	ND	0.50	ND	0.097	
541-73-1	1,3-Dichlorobenzene	ND	0.50	ND	0.083	
106-46-7	1,4-Dichlorobenzene	ND	0.50	ND	0.083	
95-50-1	1,2-Dichlorobenzene	ND	0.50	ND	0.083	
5989-27-5	d-Limonene	ND	0.50	ND	0.090	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.50	ND	0.052	
120-82-1	1,2,4-Trichlorobenzene	ND	0.50	ND	0.067	
91-20-3	Naphthalene	ND	0.50	ND	0.095	
87-68-3	Hexachlorobutadiene	ND	0.50	ND	0.047	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

**ALS ENVIRONMENTAL**

SURROGATE SPIKE RECOVERY RESULTS

Page 1 of 1

**Client:** Landau Associates, Inc.

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Cory Lewis

Sample Type: 6.0 L Silonite Canister(s)

Test Notes:

Date(s) Collected: 12/29/16

Date(s) Received: 1/3/17

Date(s) Analyzed: 1/4 - 1/5/17

Client Sample ID	ALS Sample ID	1,2-Dichloroethane-d4	Toluene-d8	Bromofluorobenzene	Acceptance Limits	Data Qualifier
		Percent Recovered	Percent Recovered	Percent Recovered		
Method Blank	P170104-MB	105	100	91	70-130	
Method Blank	P170104-MB	106	98	93	70-130	
Lab Control Sample	P170104-LCS	102	97	94	70-130	
Lab Control Sample	P170104-LCS	106	96	95	70-130	
Ambient-12292016	P1700001-001	107	97	91	70-130	
GP-38-12292016	P1700001-002	105	73	84	70-130	
GP-39-12292016	P1700001-003	105	85	94	70-130	
GP-43-12292016	P1700001-004	106	86	91	70-130	
GP-41-12292016	P1700001-005	108	89	96	70-130	

Surrogate percent recovery is verified and accepted based on the on-column result.

Reported results are shown in concentration units and as a result of the calculation, may vary slightly from the on-column percent recovery.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Lab Control Sample  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P170104-LCS

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Cory Lewis  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 1/4/17  
 Volume(s) Analyzed: 0.125 Liter(s)

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
115-07-1	Propene	210	191	91	52-127	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	188	90	68-109	
74-87-3	Chloromethane	210	180	86	51-130	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	177	84	66-114	
75-01-4	Vinyl Chloride	210	215	102	61-125	
106-99-0	1,3-Butadiene	210	231	110	62-144	
74-83-9	Bromomethane	210	193	92	73-123	
75-00-3	Chloroethane	210	206	98	69-122	
64-17-5	Ethanol	1,060	1050	99	62-124	
75-05-8	Acetonitrile	213	212	100	57-114	
107-02-8	Acrolein	212	182	86	62-116	
67-64-1	Acetone	1,060	1040	98	57-117	
75-69-4	Trichlorofluoromethane	210	182	87	63-98	
67-63-0	2-Propanol (Isopropyl Alcohol)	424	427	101	66-121	
107-13-1	Acrylonitrile	213	209	98	68-123	
75-35-4	1,1-Dichloroethene	213	198	93	76-118	
75-09-2	Methylene Chloride	212	199	94	60-118	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	212	217	102	65-126	
76-13-1	Trichlorotrifluoroethane	212	180	85	73-114	
75-15-0	Carbon Disulfide	213	206	97	57-102	
156-60-5	trans-1,2-Dichloroethene	213	204	96	74-123	
75-34-3	1,1-Dichloroethane	212	199	94	69-111	
1634-04-4	Methyl tert-Butyl Ether	213	191	90	69-113	
108-05-4	Vinyl Acetate	1,060	1190	112	76-128	
78-93-3	2-Butanone (MEK)	212	211	100	63-127	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170104-LCS

Test Code: EPA TO-15 Modified

Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: NA

Analyst: Cory Lewis

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.125 Liter(s)

Test Notes:

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
156-59-2	cis-1,2-Dichloroethene	212	202	95	72-117	
141-78-6	Ethyl Acetate	426	479	112	68-127	
110-54-3	n-Hexane	213	228	107	55-116	
67-66-3	Chloroform	212	192	91	70-109	
109-99-9	Tetrahydrofuran (THF)	213	195	92	72-113	
107-06-2	1,2-Dichloroethane	212	193	91	69-113	
71-55-6	1,1,1-Trichloroethane	212	188	89	72-115	
71-43-2	Benzene	212	194	92	65-107	
56-23-5	Carbon Tetrachloride	213	193	91	71-113	
110-82-7	Cyclohexane	425	409	96	71-115	
78-87-5	1,2-Dichloropropane	212	200	94	71-115	
75-27-4	Bromodichloromethane	214	206	96	75-118	
79-01-6	Trichloroethene	212	187	88	68-114	
123-91-1	1,4-Dioxane	213	208	98	81-131	
80-62-6	Methyl Methacrylate	424	419	99	72-130	
142-82-5	n-Heptane	213	205	96	68-116	
10061-01-5	cis-1,3-Dichloropropene	210	213	101	77-126	
108-10-1	4-Methyl-2-pentanone	213	214	100	69-126	
10061-02-6	trans-1,3-Dichloropropene	213	215	101	79-125	
79-00-5	1,1,2-Trichloroethane	212	198	93	75-119	
108-88-3	Toluene	212	185	87	59-118	
591-78-6	2-Hexanone	213	208	98	69-129	
124-48-1	Dibromochloromethane	213	193	91	74-136	
106-93-4	1,2-Dibromoethane	212	190	90	73-131	
123-86-4	n-Butyl Acetate	216	215	100	69-130	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.



# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 3 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170104-LCS

Test Code: EPA TO-15 Modified

Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: NA

Analyst: Cory Lewis

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.125 Liter(s)

Test Notes:

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
111-65-9	n-Octane	212	202	95	66-120	
127-18-4	Tetrachloroethene	213	179	84	65-130	
108-90-7	Chlorobenzene	212	184	87	68-120	
100-41-4	Ethylbenzene	212	197	93	68-122	
179601-23-1	m,p-Xylenes	424	409	96	68-123	
75-25-2	Bromoform	212	201	95	69-130	
100-42-5	Styrene	212	199	94	71-133	
95-47-6	o-Xylene	212	201	95	68-122	
111-84-2	n-Nonane	212	206	97	65-120	
79-34-5	1,1,2,2-Tetrachloroethane	212	223	105	69-130	
98-82-8	Cumene	212	193	91	70-123	
80-56-8	alpha-Pinene	213	199	93	70-128	
103-65-1	n-Propylbenzene	214	208	97	69-125	
622-96-8	4-Ethyltoluene	212	214	101	67-130	
108-67-8	1,3,5-Trimethylbenzene	212	196	92	67-124	
95-63-6	1,2,4-Trimethylbenzene	212	227	107	67-129	
100-44-7	Benzyl Chloride	212	245	116	79-138	
541-73-1	1,3-Dichlorobenzene	212	233	110	65-136	
106-46-7	1,4-Dichlorobenzene	213	192	90	66-141	
95-50-1	1,2-Dichlorobenzene	212	211	100	67-136	
5989-27-5	d-Limonene	212	238	112	71-134	
96-12-8	1,2-Dibromo-3-chloropropane	212	212	100	73-136	
120-82-1	1,2,4-Trichlorobenzene	212	231	109	64-134	
91-20-3	Naphthalene	214	241	113	62-136	
87-68-3	Hexachlorobutadiene	213	199	93	60-133	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Lab Control Sample  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P170104-LCS

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 1/4/17  
 Volume(s) Analyzed: 0.125 Liter(s)

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
115-07-1	Propene	210	193	92	52-127	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	189	90	68-109	
74-87-3	Chloromethane	210	173	82	51-130	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	174	82	66-114	
75-01-4	Vinyl Chloride	210	213	101	61-125	
106-99-0	1,3-Butadiene	210	221	105	62-144	
74-83-9	Bromomethane	210	199	95	73-123	
75-00-3	Chloroethane	210	209	100	69-122	
64-17-5	Ethanol	1,060	1060	100	62-124	
75-05-8	Acetonitrile	213	216	101	57-114	
107-02-8	Acrolein	212	188	89	62-116	
67-64-1	Acetone	1,060	1050	99	57-117	
75-69-4	Trichlorofluoromethane	210	184	88	63-98	
67-63-0	2-Propanol (Isopropyl Alcohol)	424	430	101	66-121	
107-13-1	Acrylonitrile	213	209	98	68-123	
75-35-4	1,1-Dichloroethene	213	199	93	76-118	
75-09-2	Methylene Chloride	212	196	92	60-118	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	212	219	103	65-126	
76-13-1	Trichlorotrifluoroethane	212	180	85	73-114	
75-15-0	Carbon Disulfide	213	205	96	57-102	
156-60-5	trans-1,2-Dichloroethene	213	208	98	74-123	
75-34-3	1,1-Dichloroethane	212	201	95	69-111	
1634-04-4	Methyl tert-Butyl Ether	213	193	91	69-113	
108-05-4	Vinyl Acetate	1,060	1130	107	76-128	
78-93-3	2-Butanone (MEK)	212	207	98	63-127	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170104-LCS

Test Code: EPA TO-15 Modified

Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: NA

Analyst: Lusine Hakobyan

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.125 Liter(s)

Test Notes:

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
156-59-2	cis-1,2-Dichloroethene	212	204	96	72-117	
141-78-6	Ethyl Acetate	426	473	111	68-127	
110-54-3	n-Hexane	213	226	106	55-116	
67-66-3	Chloroform	212	193	91	70-109	
109-99-9	Tetrahydrofuran (THF)	213	194	91	72-113	
107-06-2	1,2-Dichloroethane	212	197	93	69-113	
71-55-6	1,1,1-Trichloroethane	212	187	88	72-115	
71-43-2	Benzene	212	188	89	65-107	
56-23-5	Carbon Tetrachloride	213	192	90	71-113	
110-82-7	Cyclohexane	425	398	94	71-115	
78-87-5	1,2-Dichloropropane	212	198	93	71-115	
75-27-4	Bromodichloromethane	214	203	95	75-118	
79-01-6	Trichloroethene	212	183	86	68-114	
123-91-1	1,4-Dioxane	213	204	96	81-131	
80-62-6	Methyl Methacrylate	424	405	96	72-130	
142-82-5	n-Heptane	213	201	94	68-116	
10061-01-5	cis-1,3-Dichloropropene	210	210	100	77-126	
108-10-1	4-Methyl-2-pentanone	213	210	99	69-126	
10061-02-6	trans-1,3-Dichloropropene	213	214	100	79-125	
79-00-5	1,1,2-Trichloroethane	212	193	91	75-119	
108-88-3	Toluene	212	175	83	59-118	
591-78-6	2-Hexanone	213	198	93	69-129	
124-48-1	Dibromochloromethane	213	185	87	74-136	
106-93-4	1,2-Dibromoethane	212	181	85	73-131	
123-86-4	n-Butyl Acetate	216	206	95	69-130	

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# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 3 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170104-LCS

Test Code: EPA TO-15 Modified

Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: NA

Analyst: Lusine Hakobyan

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.125 Liter(s)

Test Notes:

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
111-65-9	n-Octane	212	195	92	66-120	
127-18-4	Tetrachloroethene	213	171	80	65-130	
108-90-7	Chlorobenzene	212	175	83	68-120	
100-41-4	Ethylbenzene	212	186	88	68-122	
179601-23-1	m,p-Xylenes	424	384	91	68-123	
75-25-2	Bromoform	212	191	90	69-130	
100-42-5	Styrene	212	187	88	71-133	
95-47-6	o-Xylene	212	190	90	68-122	
111-84-2	n-Nonane	212	196	92	65-120	
79-34-5	1,1,2,2-Tetrachloroethane	212	208	98	69-130	
98-82-8	Cumene	212	182	86	70-123	
80-56-8	alpha-Pinene	213	188	88	70-128	
103-65-1	n-Propylbenzene	214	194	91	69-125	
622-96-8	4-Ethyltoluene	212	199	94	67-130	
108-67-8	1,3,5-Trimethylbenzene	212	183	86	67-124	
95-63-6	1,2,4-Trimethylbenzene	212	209	99	67-129	
100-44-7	Benzyl Chloride	212	230	108	79-138	
541-73-1	1,3-Dichlorobenzene	212	215	101	65-136	
106-46-7	1,4-Dichlorobenzene	213	178	84	66-141	
95-50-1	1,2-Dichlorobenzene	212	193	91	67-136	
5989-27-5	d-Limonene	212	221	104	71-134	
96-12-8	1,2-Dibromo-3-chloropropane	212	200	94	73-136	
120-82-1	1,2,4-Trichlorobenzene	212	219	103	64-134	
91-20-3	Naphthalene	214	226	106	62-136	
87-68-3	Hexachlorobutadiene	213	191	90	60-133	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

**Transportation Corridor  
Landfill Gas Evaluation**  
(March 2017)

# Technical Memorandum

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**TO:** Ms. Joan Davenport, Strategic Project Manager  
Mr. Brett Sheffield, City Engineer  
City of Yakima

**FROM:** Cody Johnson, PE and Piper Roelen, PE

**DATE:** March 24, 2017

**RE:** **Transportation Corridor Landfill Gas Evaluation**  
**Former Boise Cascade Mill Site and Closed City of Yakima Landfill Site**  
**Yakima, Washington**  
**Facility/Site No. 1927**  
**LAI Project No. 1148009.010.015**

Landau Associates, Inc. (LAI) has prepared the following technical memorandum for the City of Yakima (City) to summarize landfill gas (LFG) monitoring activities and predicted LFG production rates at the former Boise Cascade Mill Site and the closed City Landfill Site (collectively referred to as the Site). The focus of our investigations was to collect Site-specific information regarding subsurface LFG conditions to support design of the planned transportation corridor that will be constructed across much of the Site. This investigation may also provide additional information that can be considered for incorporation into the ongoing remedial investigation (RI) efforts at the closed City Landfill Site.

## Site Background

The Site is located on the eastern edge of the City adjacent to Interstate 82 (I-82; Figure 1). The overall Site includes 20 parcels (19 parcels owned by LeeLynn, Inc. and Wiley Mt., Inc. and 1 parcel owned by OfficeMax Corporation), totaling approximately 207 acres. A BNSF-owned right-of-way (ROW) with railroad tracks runs in an east-west orientation through the middle of the Site. The closed municipal solid waste (MSW) landfill is located at the southern end of the Site and was operated by the City between 1963 and 1970. As part of landfill operations, MSW was placed in a former log pond that originally occupied the Site (City of Yakima 1996). When landfill operations ceased, the MSW was covered and the area brought to grade with a mixture of fill soil and wood debris. The Site was then used until 2010 for log storage, including temporary log storage and log-chipping operations by the tenant of the Landfill Site, Yakima Resources, LLC (Yakima Resources).

The planned transportation corridor that will extend across the Site includes the northern extension of Bravo Boulevard and the East-West Corridor from East H Street to the bridge crossing over I-82 and the Yakima River (Figure 1). The transportation corridor is being designed by the Lochner and HLA Engineering & Land Surveying, Inc. (HLA) team in consultation with the City and Yakima County (County). The proposed alignment for the transportation corridor will require construction activities, including subsurface disturbance, in many areas of the Site that are known to be underlain by varying amounts of wood debris and MSW resulting from historical operations. Based on the significant quantities of MSW and wood debris present throughout the project area, it is necessary to determine

how much gas may be produced during the degradation of these materials over time, and what constituents may be in the gas that may trigger health and safety or air emissions requirements.

The LFG monitoring and LFG generation modeling results summarized below are based on Site-specific data collected along the proposed roadway alignments. The information will be necessary to address technical design considerations with respect to the management of LFG generated by the wood debris and MSW during development of the transportation corridor design.

## **Landfill Gas Field Characterization**

The southern portion of the proposed roadway alignment will be constructed over the former MSW landfill. The landfill generates LFG which can create an inhalation and explosion hazard if not properly controlled and vented. In order to collect the additional data needed to support project design and planning for construction LFG controls, a network of LFG monitoring probes were installed and monitored, as described in the following sections.

## **Landfill Gas Probe Installation**

To evaluate LFG in the project area, 13 new LFG monitoring probes (GP-32 through GP-44) were installed along the proposed roadway alignment. The spacing of LFG probes along the alignments is approximately 400 feet (ft) between probes north of the railroad tracks (where no MSW is located and wood debris is less abundant) and approximately 250 ft between probes within the area of the former landfill. Five existing LFG probes (GP-5, GP-11, GP-18, GP-19, and GP-28) were previously installed as part of remedial investigation activities. The five existing LFG probes are located within or proximal to the alignments, and were used to limit the number of new installations required. The locations of the new and previously-existing LFG monitoring probes are presented on Figure 1.

The new LFG probes were installed in October 2016 using hollow-stem auger drilling methods, consistent with procedures and materials of construction used for previous LFG probe installations at the Site. A 3.25-inch outside diameter Dames & Moore sampler was used with a 300 pound hammer and a 30-inch drop to retrieve split spoon samples of the materials encountered, and measure the blow counts required to penetrate into the underlying material. Each boring was advanced to 10 feet below ground surface (ft BGS). The LFG probes were completed with 0.5-inch-diameter Schedule 40 PVC pipe with a 5-ft screen from 5 to 10 feet BGS. The screens were constructed with 0.03-inch to 0.04-inch machine-slotted perforations. The filter pack surrounding the screens consisted of pea gravel to facilitate soil vapor/LFG movement into the probe during purging and monitoring. The location and ground surface elevation of each new LFG probe was surveyed by HLA.

The LFG probes are considered temporary installations, and were completed with flush-mounted monuments encased in concrete, with an aboveground location marker, but no protective bollards

were installed around the monuments. The probes were constructed by a licensed well driller and an LAI field scientist observed the drilling cuttings and prepared a boring and installation log at each location. The boring logs for the LFG probes are provided in Appendix A.

## Landfill Gas Monitoring

LFG monitoring was conducted at the 13 new probes and the 5 existing monitoring points during 4 monitoring events completed on October 13, November 16, December 21, and December 29, 2016 as part of the LFG evaluation. The LFG measurements were collected during conditions of falling barometric pressure to minimize potential atmospheric dilution effects. A Landtec GEM 5000 soil vapor/LFG analyzer was used to monitor *in situ* concentrations of methane, oxygen, carbon dioxide, and balance gases (the mixture of all other gases making up the balance of the air sample), to evaluate for potential soil-vapor impacts from degrading MSW or wood debris.

In addition to the data collected using the portable LFG analyzer, samples of LFG were collected during the second and fourth monitoring events at the four LFG monitoring probe locations with the highest concentrations of methane based on evaluation of the initial monitoring event result (GP-38, GP-39, GP41, and GP-43). The samples were collected into certified-clean stainless steel Summa canisters with Silonite linings for laboratory analysis of total reduced sulfur by ASTM International (ASTM) standard D-5504, fixed gases (methane, carbon dioxide, carbon monoxide, oxygen, and nitrogen) by ASTM D-1945, non-methane organic compounds (NMOCs) by US Environmental Protection Agency (EPA) Method 25C, and volatile organic compounds (VOCs) by EPA Compendium Method TO-15.

The field measurement results are presented in Table 1. A summary of the laboratory analytical results is presented in Table 2 and the analytical laboratory reports are included in Appendix B.

## Discussion of Results

Based on the monitoring and sampling results, the MSW and wood debris continues to generate LFG in the project area, as evidenced by elevated levels of methane and carbon dioxide, and depressed concentrations of oxygen. As anticipated, the highest concentrations of methane were detected in areas of buried MSW, ranging from approximately 48 to 72 percent by volume (pbv). Lower methane concentrations were detected outside the landfill boundaries where only buried wood debris is present, ranging from approximately 1 to 20 pbv. Methane was typically not detected at monitoring points where MSW or wood debris is not present, except at locations in close proximity to MSW or wood debris deposits. Figure 2 shows the limits of the MSW landfill and presents the concentrations of methane detected during the four 2016 monitoring events.

The elevated levels of methane identified by the monitoring results confirm that LFG control will be a necessary part of construction throughout areas on and adjacent to the landfill because of potential explosive hazards.



Although methane is the primary constituent of interest in the LFG, other parameters were analyzed to provide additional information about the processes occurring in the subsurface. This information will support design of the mitigation system, support air permitting efforts, and provide an indication where odorous compounds or VOCs are present, which may need to be addressed as part of the mitigation system.

The laboratory fixed-gas results are similar to the concentrations measured using the hand-held LFG analyzer, confirming the usability of the field-collected data for design. Carbon monoxide is one of the parameters reported in the fixed-gas analysis. The lack of carbon monoxide in the samples indicates combustion is not occurring in the waste mass. This is an important finding because of the relatively thin layer of soil cover over the MSW. Carbon dioxide, methane, and oxygen results appear to be consistent with the conceptual site model: degradable waste is continuing to produce LFG and at elevated concentrations that warrant mitigation considerations during construction.

Elevated concentrations of hydrogen sulfide (H<sub>2</sub>S) were also detected in several samples. These detections will be an important consideration in developing health and safety plans for construction, and also indicate the areas most likely to have odor concerns that will need to be addressed as part of the long-term mitigation system. The most notable of these observations was a detection of 14,000 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) H<sub>2</sub>S in GP-39 on November 11, 2016.

Static pressure measurements were low across the landfill, ranging generally from -0.55 to 0.11 inches of water (in. H<sub>2</sub>O). The pressure measurements will be used in assessing where areas of migration concern are located. The high pressure measured at monitoring probes GP-39 and GP-42 of (12.84 in. H<sub>2</sub>O and 9.90 in. H<sub>2</sub>O, respectively) are considered anomalous. Although the monitored parameter levels varied somewhat between the four monitoring events, the events indicated generally similar conditions for the purposes of designing an appropriate LFG control system.

The results of VOC testing indicate detectable concentrations of VOCs in the LFG coming from within the MSW landfill boundaries. The VOCs detected are those typically associated with LFG; however, they are present at relatively low concentrations in comparison to landfills with more recent deposits. For reference, the total mass of non-methane VOCs in LFG is typically about 840 parts per million (ppm), normalized to hexane (EPA 2008). This is equivalent to approximately 3,000,000  $\mu\text{g}/\text{m}^3$  (the unit of measurement in which the landfill VOC data are presented in Table 2). The highest observed total VOC concentration (expressed as the sum of all detected VOCs) was at GP-39 in the sample collected on November 16 29, 2016, with a concentration of approximately 76,500  $\mu\text{g}/\text{m}^3$ —less than 3 percent of the concentration typically present in LFG. The VOC data are used in combination with the LFG generation estimates discussed below to evaluate emissions from the landfill. The estimate of emissions will be a required element of the construction design and permitting process.

---

## Landfill Gas Generation Modeling

This section summarizes the LFG production rate evaluation for the Site. The LFG production rate was estimated using the EPA's LandGEM spreadsheet model—the industry standard approach for estimating LFG emissions for regulatory compliance and a tool for LFG control system design. The estimate is based on the waste age, type, quantity of buried waste, and the subsurface environment.

### Modeling Approach

LandGEM is a spreadsheet-based model prepared by EPA that estimates the overall flow rate of LFG from a MSW landfill based on user input regarding the amount of waste buried, the year of burial, and other parameters developed by EPA based on landfills across the US. Emissions factors used in the model are from the Compilation of Air Pollutant Emission Factors (AP-42; EPA 1998). The model allows variation of parameters affecting the overall LFG production capacity of the waste (given infinite time), and the rate at which the LFG is released—each constrained to typically observed ranges.

Two models were prepared based on assumptions regarding future site conditions. Scenario 1 models the LFG generated by the wood debris and MSW present on the Landfill Site, the area where the highest concentrations of methane were observed, and where the buried mass of waste is most concentrated. Scenario 2 is similar, but assumes the wood debris and MSW beneath the roadway is removed and replaced with structural fill for geotechnical purposes, as described in LAI's draft technical memo (LAI 2016). This option is discussed in that technical memorandum as a way to reduce long-term maintenance costs associated with repair of differential settlement damage that could be caused by the continued degradation of the wood debris or MSW beneath the proposed roadway alignment. If that action is taken based on geotechnical considerations, the model results for Scenario 2 described herein will provide the information needed to support design and permitting efforts for LFG mitigation.

### Scenario 1

According to the Remedial Investigation Report (SLR 2009) prepared by SLR International Corporation (SLR), approximately 408,500 cubic yards (CY) of MSW was buried on the Landfill Site between 1963 and 1970. Based on this volume, and a typical unit weight of 1.5 tons per CY, the total mass of MSW on the Landfill Site is estimated to be approximately 612,750 tons. The volume of wood debris present at the Site was evaluated using observations of the thickness of wood debris in logs of explorations (i.e., test pits, soil borings, monitoring wells) advanced on the Landfill Site by SLR (SLR 2009, 2010). The total estimated volume of buried wood debris at the Site was estimated to be 1,418,500 CY. Based on a unit weight of 0.4 tons per CY this corresponds to a total mass of 567,400 tons. This includes wood debris buried on the Mill Site and the Landfill Site. Because of the proximity of portions of the roadway alignment to areas of buried wood debris on the Mill Site and the potential for surface capping during site development, it is appropriate to combine these potential methane sources in the

landfill gas estimation model. It should be noted that Yakima Resources is conducting ongoing wood debris salvage operations, so the actual volume of wood debris is likely lower. However, there is insufficient data to estimate the volume of wood debris that has been removed. The LFG generation rate and mass determined using the LandGEM model should therefore be considered to be conservative.

It is unknown when the wood debris was first deposited on the Landfill Site. The earliest record indicating that the Landfill Site was used for wood storage is a 1920 Sanborn Map showing a log pond on the Site (URS 2003). The years of waste acceptance for the wood debris were therefore set at 1920 to 2006 for estimating the potential gas generation from this material. Assuming the total mass of wood debris was buried throughout this period, the annual wood debris acceptance rate is approximately 6,600 tons per year. The MSW acceptance rate was assumed also to be consistent throughout the 8 years of operation from 1963 to 1970, resulting in an acceptance rate of approximately 76,600 tons per year. Because LandGEM limits the landfill acceptance period to 80 years, three individual modeling runs were executed to account for the contributions from: the first 80 years of wood debris deposition, the last 6 years of wood debris deposition, and the 8 years of MSW acceptance. The combined results of the three models represents the total generation rate.

LandGEM requires user inputs for the methane generation rate ( $k$ ) and potential methane generation capacity ( $L_0$ ) of the waste, and non-methane organic compounds (NMOCs) concentration and methane content at the site. The model provides standard inputs, but also allows for site-specific user inputs when additional data is available. The selected values for each are discussed below:

- **Methane Generation Rate:** Two different  $k$  values were selected for the MSW and wood debris model runs. For the MSW, the Clean Air Act (CAA) value for arid areas (defined as areas receiving less than 25 inches of rain per year of  $0.02 \text{ year}^{-1}$ ) was selected from the model standard inputs. The CAA value is conservative and is required when determining whether a landfill is subject to the control requirements of the New Source Performance Standards/Emissions Guidelines (NSPS/EG) or National Emissions Standards for Hazardous Air Pollutants Compliance standards (NESHAPS). Due to the typically lower surface area of wood debris compared to MSW and the higher concentration of non-methane generating material, a lower  $k$  value of  $0.01 \text{ year}^{-1}$  was selected for the wood debris model runs. This value is based on a study conducted by the National Council for Air and Stream Improvement (NCASI) regarding decomposition of forest products in solid waste landfills (NCASI 2004).
- **Potential Methane Generation Capacity:** Similar to the  $k$  values, different  $L_0$  values were selected for the MSW and wood debris model runs. For the MSW, the CAA standard value for arid areas of 170 cubic meters per megagram was used. For the wood debris, an  $L_0$  value of 200 was selected based on the NCASI study.
- **NMOC Concentration:** A value of 67 parts per million by volume (ppmv) as hexane was used for all model runs. This parameter is site-specific and independent of the waste type, so a single value for all model runs is appropriate. The value was determined by averaging the

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NMOC concentrations from the October 13 and December 27 LFG sampling events and then converting from ppmv as methane to ppmv as hexane.

- **Methane Content:** Similar to the NMOC concentration, this parameter is also site-specific and independent of waste type, so a single value of 42 pbv was used for all model runs. This value was determined by averaging the non-zero field-measured methane results from all four LFG monitoring events conducted between October 13 and December 27, 2016.

The modeling results for Scenario 1 indicate an estimated average LFG gas generation rate from wood debris of 101 cubic feet per minute (cfm) and 112 cfm from MSW for a combined total LFG generation rate of 213 cfm for year 2017. Figure 3 presents the total combined LFG generation curve developed by combining the output from the three modeling runs discussed above. Table 3 presents a summary of the model output for total LFG and methane production from 2017 through 2060. Appendix C contains the LandGEM model report, which includes a summary of inputs and tables providing yearly predicted values for total LFG, NMOCs, carbon dioxide, and methane production from 1920 through 2060.

## Scenario 2

Scenario 2 assumes the biodegradable material is removed from beneath the roadway during construction and replaced with structural fill. This will result in an overall reduction in the amount of LFG-generating material at the Site. It is estimated that approximately 117,500 in-place CY of MSW and 46,900 in-place CY of wood debris is present below the proposed 150-ft-wide roadway alignment, assuming 1H:1V cut slopes downward from the limits of the roadway (LAI 2016). These volumes correspond to 176,250 tons of MSW and 18,760 tons of wood debris.

The LFG generation modeling runs for this scenario were set up in a similar manner as for Scenario 1, but with a subtraction of the masses of wood debris and MSW noted above in 2017. The other model parameters used for this scenario were identical to Scenario 1.

The modeling results for Scenario 2 indicate an estimated average LFG gas generation rate from wood debris of 97.6 cfm and 79.6 cfm from MSW for a combined total LFG generation rate of approximately 177 cfm for year 2017. Figure 4 presents the total combined LFG generation curve developed by combining the output from the three modeling runs discussed above. Table 4 presents a summary of the model output for total LFG and methane production from 2017 through 2060. Appendix D contains the LandGEM model report which includes a summary of inputs and tables providing yearly predicted values for total LFG, NMOCs, carbon dioxide, and methane production from 1920 through 2060.

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## Conclusion

This data report is intended to provide the raw data that will be necessary during future design and permitting efforts. Some preliminary conclusions can be drawn from the raw data without requiring further evaluation. Based on the results of the additional field LFG monitoring and the modeling efforts, it is apparent that the wood debris and MSW at the Site are generating significant quantities of LFG at and near the proposed construction area, and will continue to do so into the foreseeable future. As a result, LFG mitigation will be required as part of construction for the roadway alignment, as well as for future development and/or capping scenarios on the Landfill Site. The methane and total LFG production rates included in Tables 3 and 4 provide data that can be used for LFG mitigation design.

Although LFG emissions have been occurring at the Site for decades in an uncontrolled manner, the thin soil cover present at the surface likely allows the gases to ventilate relatively freely to the atmosphere with little migration beyond the limits of the waste. Paving over areas that generate gas can cause accumulation of the gas to unsafe or unhealthy levels, and can promote lateral migration. Construction will need to provide for controlled ventilation to prevent accumulation of gases beneath the relatively impermeable surface. Construction will also need to provide for the prevention of migration—including through utility trenches that may be a part of the construction plans. The vents installed for mitigation will be considered new sources of air pollution by the State of Washington, even though the gases currently pass through the soil to the atmosphere in an uncontrolled manner. The new source review process will require further evaluation of the generation rate and VOC concentration data provided herein, in order to determine if treatment of the ventilated gases, or air permitting is required. In order to evaluate whether an air permit (or substantive requirements thereof) will be required, an estimate of the total annual emissions for hazardous and toxic air pollutants will be required. The LFG production rates, combined with the VOC data provided in Table 2 can be used for this calculation to evaluate compliance with CAA permitting requirements as well as Model Toxics Control Act (MTCA) cleanup requirements (because this is a MTCA cleanup site) .

## Limitations

This technical memorandum has been prepared for the exclusive use of the City of Yakima for specific application to the Former Boise Cascade Mill Site and Closed City of Yakima Landfill Site Transportation Corridor LFG Evaluation. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of LAI. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by LAI, shall be at the user's sole risk. LAI warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily

exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

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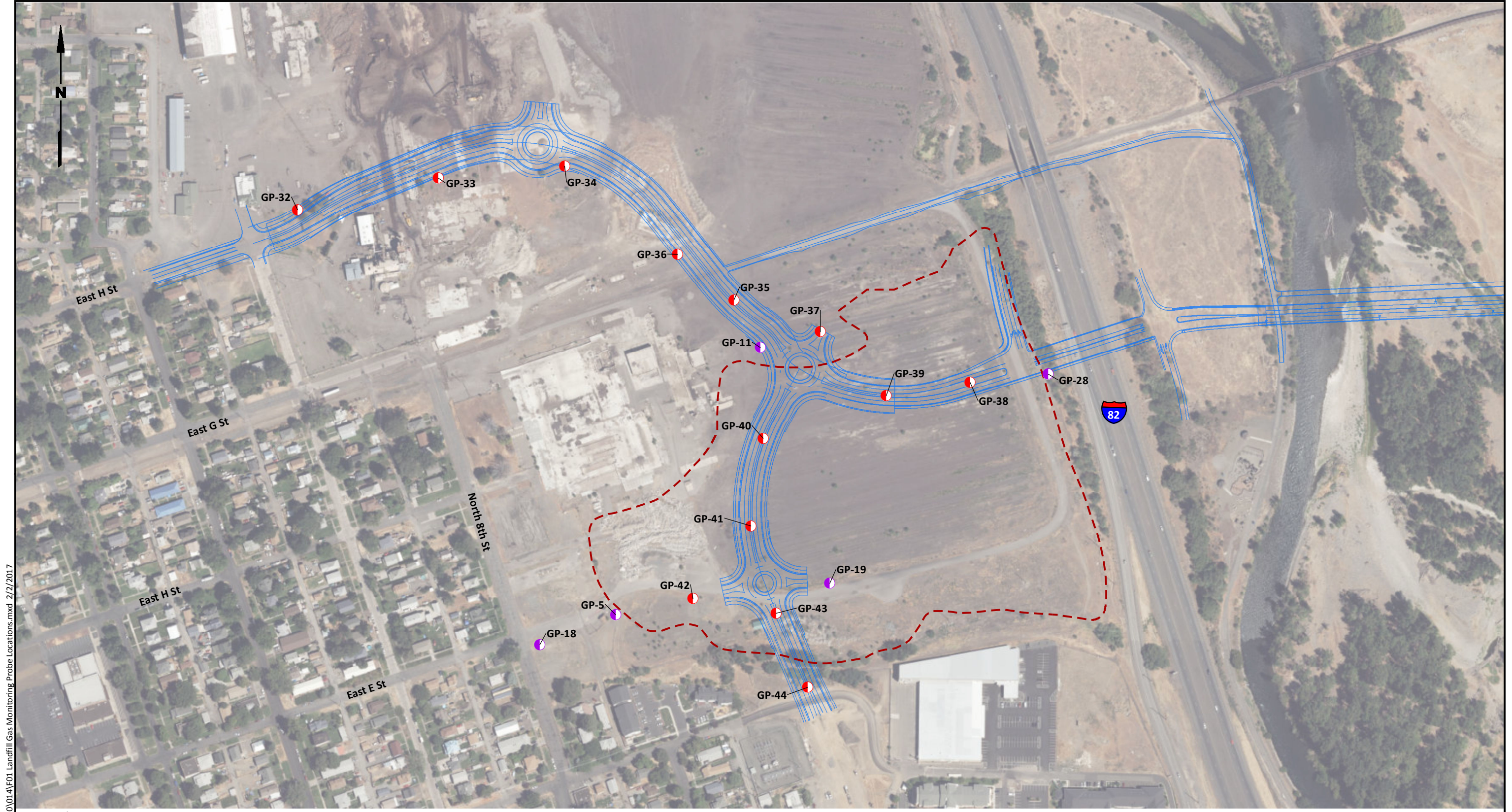
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Attachments: Figure 1. Landfill Gas Monitoring Probe Locations  
Figure 2. Landfill Gas Monitoring Results  
Figure 3. LandGEM Model Emissions for Scenario 1  
Figure 4. LandGEM Model Emissions for Scenario 2  
Table 1. Landfill Gas Monitoring Field Measurements  
Table 2. Landfill Gas Monitoring Data – Analytical Results  
Table 3. Scenario 1: Total LFG and Methane Production  
Table 4. Scenario 2: Total LFG and Methane Production  
Appendix A. Landfill Gas Probe Installation Logs  
Appendix B. Analytical Laboratory Reports  
Appendix C. LandGEM Model Summary – Scenario 1  
Appendix D. LandGEM Model Summary – Scenario 2

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## References

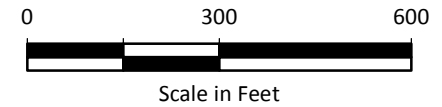
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- Legend**
- Gas Probe Location and Designation - LAI 2016
  - Existing Gas Probe Location and Designation
  - Extent of Municipal Solid Waste

**Note**  
 1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



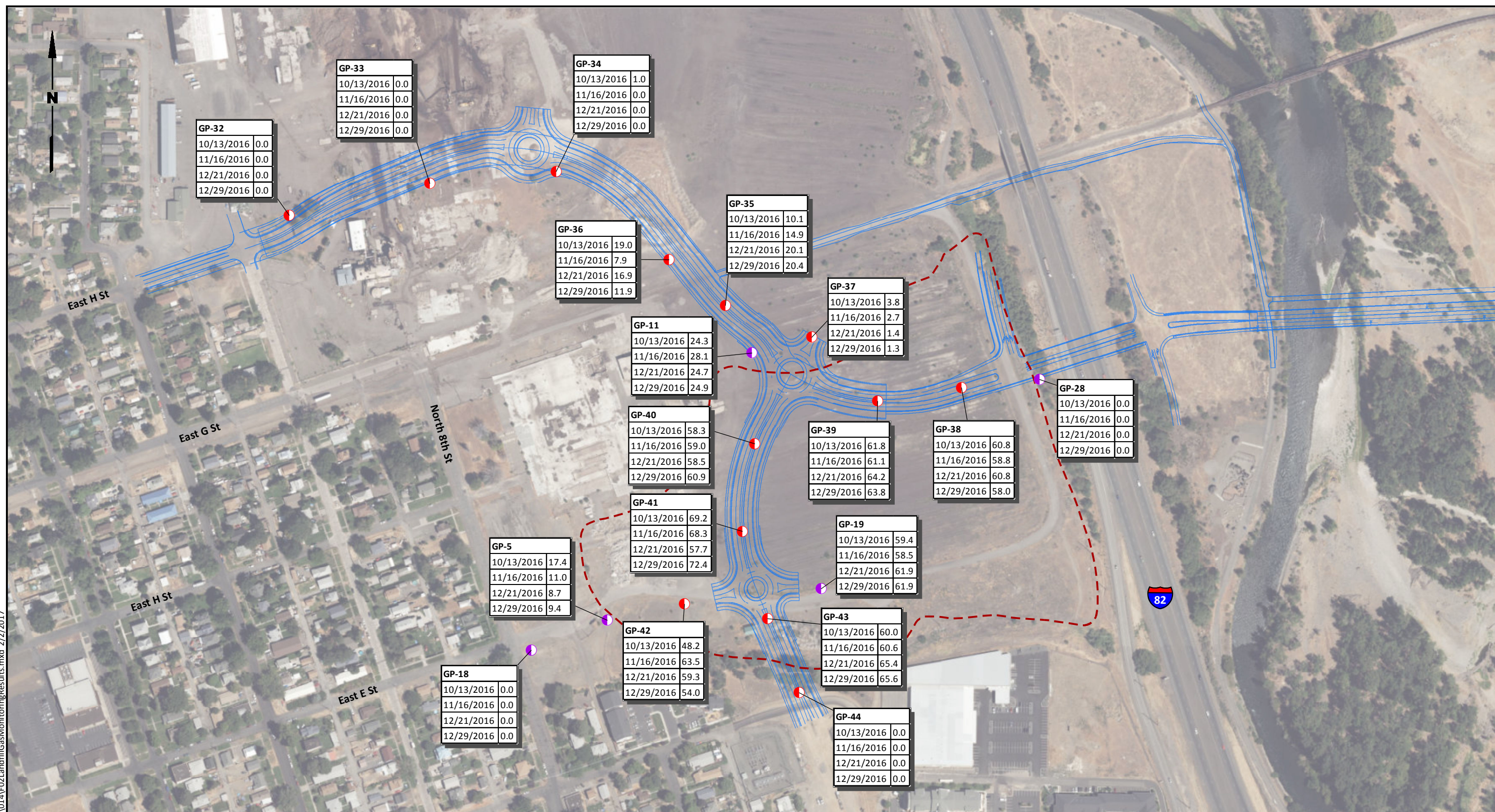
Data Source: SLR 2009; Esri World Imagery.

Closed City of Yakima Landfill Site Yakima, Washington	<b>Landfill Gas Monitoring          Probe Locations</b>	Figure <b>1</b>
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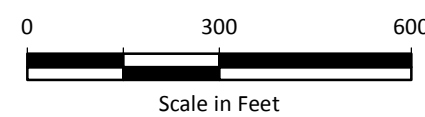
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**Legend**

- Gas Probe Location and Designation - LAI 2016
- Existing Gas Probe Location and Designation
- - - Extent of Municipal Solid Waste

Monitoring Date	Methane Concentration (% by volume)
10/13/2016	0.0
11/16/2016	0.0
12/21/2016	0.0
12/29/2016	0.0



**Note**

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.  
Data Source: SLR 2009; Esri World Imagery.

### LandGEM Model Emissions for Scenario 1

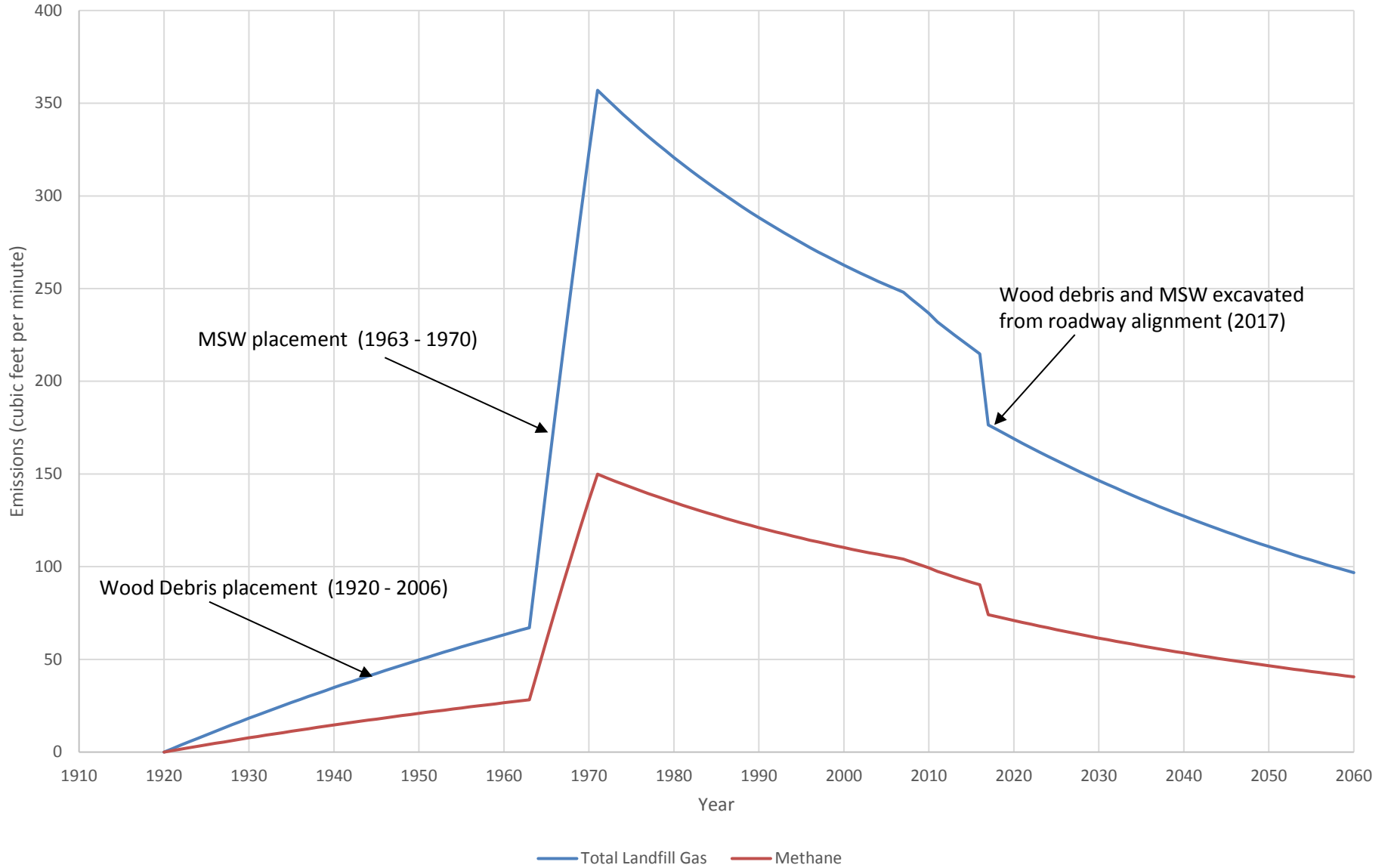


Closed City of Yakima  
Landfill Site  
Yakima, Washington

**LandGEM Model Emissions for  
Scenario 1**

Figure  
**3**

### LandGEM Model Emissions for Scenario 2



**Table 1**  
**Landfill Gas Monitoring Field Measurements**  
**Transportation Corridor**  
**Yakima, Washington**

Monitoring Point	Methane (pbv)				Carbon Dioxide (pbv)				Oxygen (pbv)				Balance Gasses (pbv)				Static Pressure (inches of water)			
	10/13/16	11/16/16	12/21/16	12/29/16	10/13/16	11/16/16	12/21/16	12/29/16	10/13/16	11/16/16	12/21/16	12/29/16	10/13/16	11/16/16	12/21/16	12/29/16	10/13/16	11/16/16	12/21/16	12/29/16
GP-5	17.4	11.0	8.7	9.4	23.0	17.5	16.9	17.2	0.0	0.7	0.0	0.3	59.6	70.9	74.4	73.10	0.03	-0.03	-0.02	0.01
GP-11	24.3	28.1	24.7	24.9	31.3	34.3	32.2	32.3	0.0	0.0	0.0	0.2	44.4	37.6	43.1	42.6	0.03	0.03	0.00	0.00
GP-18	0.0	0.0	0.0	0.0	1.6	2.0	1.5	1.5	20.3	19.3	18.9	19.9	78.0	78.7	79.6	78.5	-0.02	0.02	-0.01	-0.03
GP-19	59.4	58.5	61.9	61.9	40.5	41.5	38.1	37.8	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.05	-0.02	0.01	0.05
GP-28	0.0	0.0	0.0	0.0	19.6	18.8	11.7	11.5	3.3	4.8	9.9	10.2	77.1	76.4	78.3	78.2	-0.02	-0.01	-0.01	-0.01
GP-32	0.0	0.0	0.0	0.0	1.5	1.6	1.2	1.2	20.2	20.0	19.8	20.2	78.3	78.4	79.1	78.5	0.00	0.00	0.02	0.02
GP-33	0.0	0.0	0.0	0.0	9.8	10.8	10.0	10.4	7.3	5.6	4.6	6.5	82.9	83.6	85.4	83.0	0.00	-0.02	0.01	-0.01
GP-34	1.0	0.0	0.0	0.0	7.0	12.9	3.2	3.6	0.0	0.2	16.9	17.5	92.0	86.8	79.9	78.8	-0.01	-0.01	0.00	-0.01
GP-35	10.1	14.9	20.1	20.4	23.5	24.7	25.0	25.6	0.0	0.0	0.0	0.2	66.4	60.4	54.8	53.8	-0.03	0.04	-0.55	0.04
GP-36	19.0	9.9	16.9	11.9	32.6	27.5	26.3	22.0	0.0	0.0	0.0	0.3	48.4	62.5	56.8	65.8	0.00	-0.04	-0.01	-0.01
GP-37	3.8	2.7	1.4	1.3	23.8	25.7	21.7	21.3	0.0	0.0	0.0	0.2	72.4	71.6	76.9	77.2	0.01	0.02	-0.22	0.01
GP-38	60.8	58.8	60.8	58.0	38.1	41.2	39.2	39.1	0.0	0.0	0.0	0.3	1.1	0.0	0.0	2.6	-0.01	-0.02	0.00	0.06
GP-39	61.8	61.1	64.2	63.8	38.2	38.9	35.8	35.8	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.05	-0.04	0.05	12.84
GP-40	58.3	59.0	58.5	60.9	38.9	41.0	33.8	37.1	0.0	0.0	0.0	0.2	2.9	0.0	7.7	1.8	0.12	0.07	0.11	0.09
GP-41	69.2	68.3	57.7	72.4	30.3	31.7	22.9	27.3	0.0	0.0	0.0	0.2	0.6	0.0	19.4	1.8	0.12	0.01	0.11	0.11
GP-42	48.2	63.5	59.3	54.0	36.7	35.9	30.5	29.5	0.0	0.0	0.0	0.3	15.1	0.9	10.2	16.2	0.05	0.02	0.04	9.90
GP-43	60.0	60.6	65.4	65.6	40.0	39.4	34.6	34.1	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.02	-0.05	0.00	0.00
GP-44	0.0	0.0	0.0	0.0	2.3	3.6	3.0	3.0	19.1	17.5	16.6	18.0	78.6	78.9	80.4	78.9	-0.02	0.02	0.00	0.01
Ambient	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	21.7	21.1	19.2	20.9	78.1	78.8	80.7	78.8	0.00	0.01	0.00	0.00

pbv = percent by volume

**Table 2**  
**Landfill Gas Monitoring Data - Analytical Results**  
**Transportation Corridor**  
**Yakima, Washington**

Analyte	Cas No	Sample ID, Laboratory ID, Sample Date, and Results									
		Ambient-11162016 P1605444-003 11/16/2016	Ambient-12292016 P1700001-001 12/29/2016	GP-38-11162016 P1605444-005 11/16/2016	GP-38-12292016 P1700001-002 12/29/2016	GP-39-11162016 P1605444-004 11/16/2016	GP-39-12292016 P1700001-003 12/29/2016	GP-41-11162016 P1605444-002 11/16/2016	GP-41-12292016 P1700001-005 12/29/2016	GP-43-11162016 P1605444-001 11/16/2016	GP-43-12292016 P1700001-004 12/29/2016
<b>ASTM D1946 (% v/v)</b>											
Oxygen	7782-44-7	<b>22.0</b>	<b>22.2</b>	<b>1.72</b>	<b>0.286</b>	0.13 U	0.22 U	<b>0.254</b>	<b>0.376</b>	<b>7.30</b>	<b>0.380</b>
Nitrogen	7727-37-9	<b>77.9</b>	<b>77.8</b>	<b>8.71</b>	<b>5.76</b>	<b>0.668</b>	<b>1.18</b>	<b>4.02</b>	<b>26.2</b>	<b>2.82</b>	
Carbon Monoxide	630-08-0	0.12 U	0.22 U	0.15 U	0.22 U	0.13 U	0.22 U	0.15 U	0.23 U	0.14 U	0.22 U
Methane	74-82-8	0.12 U	0.22 U	<b>55.1</b>	<b>57.9</b>	<b>64.0</b>	<b>66.0</b>	<b>57.5</b>	<b>70.5</b>	<b>42.6</b>	<b>65.9</b>
Carbon Dioxide	124-38-9	0.12 U	0.22 U	<b>34.4</b>	<b>36.0</b>	<b>35.2</b>	<b>32.6</b>	<b>32.0</b>	<b>25.1</b>	<b>23.9</b>	<b>30.8</b>
<b>EPA 25C Modified (ppmV)</b>											
Total Gaseous Nonmethane Organics (TGNMO) as Methane		1.2 U	2.2 U	<b>220</b>	<b>250</b>	<b>630</b>	<b>600</b>	<b>640</b>	<b>310</b>	<b>350</b>	<b>230</b>
<b>ASTM D 5504-12 (µg/m3)</b>											
Hydrogen Sulfide	7783-06-4	8.3 U	15 U	10 U	<b>3,400</b>	<b>14,000</b>	<b>12,000</b>	10 U	<b>640</b>	<b>10,000</b>	<b>5,100</b>
Carbonyl Sulfide	463-58-1	15 U	27 U	<b>63</b>	27 U	16 U	27 U	18 U	28 U	17 U	27 U
Methyl Mercaptan	74-93-1	12 U	22 U	14 U	<b>38</b>	<b>37</b>	22 U	14 U	23 U	<b>59</b>	<b>30</b>
Ethyl Mercaptan	75-08-1	15 U	28 U	19 U	27 U	<b>39</b>	<b>28</b>	19 U	29 U	<b>45</b>	28 U
Dimethyl Sulfide	75-18-3	15 U	28 U	19 U	27 U	17 U	28 U	19 U	29 U	<b>47</b>	<b>110</b>
Carbon Disulfide	75-15-0	9.3 U	17 U	11 U	17 U	10 U	17 U	11 U	<b>110</b>	11 U	17 U
Isopropyl Mercaptan	75-33-2	19 U	34 U	23 U	34 U	21 U	34 U	23 U	36 U	21 U	34 U
tert-Butyl Mercaptan	75-66-1	22 U	41 U	27 U	40 U	25 U	40 U	27 U	42 U	25 U	41 U
n-Propyl Mercaptan	107-03-9	19 U	34 U	23 U	34 U	21 U	34 U	23 U	36 U	21 U	34 U
Ethyl Methyl Sulfide	624-89-5	19 U	34 U	23 U	34 U	21 U	34 U	23 U	36 U	21 U	34 U
Thiophene	110-02-1	20 U	38 U	25 U	37 U	23 U	38 U	25 U	39 U	24 U	38 U
Isobutyl Mercaptan	513-44-0	22 U	41 U	27 U	40 U	25 U	40 U	27 U	42 U	25 U	41 U
Diethyl Sulfide	352-93-2	22 U	41 U	27 U	40 U	25 U	40 U	27 U	42 U	25 U	41 U
n-Butyl Mercaptan	109-79-5	22 U	41 U	27 U	40 U	25 U	40 U	27 U	42 U	25 U	41 U
Dimethyl Disulfide	624-92-0	11 U	21 U	14 U	21 U	13 U	21 U	14 U	22 U	13 U	21 U
3-Methylthiophene	616-44-4	24 U	44 U	29 U	43 U	27 U	44 U	29 U	46 U	28 U	44 U
Tetrahydrothiophene	110-01-0	21 U	40 U	26 U	39 U	24 U	39 U	26 U	41 U	25 U	40 U
2,5-Dimethylthiophene	638-02-8	27 U	50 U	33 U	50 U	31 U	50 U	34 U	53 U	32 U	51 U
2-Ethylthiophene	872-55-9	27 U	50 U	33 U	50 U	31 U	50 U	34 U	53 U	32 U	51 U
Diethyl Disulfide	110-81-6	15 U	27 U	18 U	27 U	17 U	27 U	18 U	29 U	17 U	28 U
<b>EPA TO-15 Modified (µg/m³)</b>											
Propene	115-07-1	<b>1.3</b>	<b>3.4</b>	<b>800</b>	<b>870</b>	<b>800</b>	<b>1,200</b>	<b>500</b>	<b>1,500</b>	<b>800</b>	<b>1,200</b>
Dichlorodifluoromethane (CFC 12)	75-71-8	<b>2.2</b>	<b>2.1</b>	<b>110</b>	<b>53</b>	<b>970</b>	<b>1,100</b>	<b>1,100</b>	<b>4,100</b>	<b>1,600</b>	<b>1,500</b>
Chloromethane	74-87-3	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	76-14-2	0.60 U	1.1 U	<b>1,400</b>	<b>1,100</b>	<b>1,100</b>	<b>1,300</b>	<b>980</b>	<b>2,900</b>	<b>980</b>	<b>1,200</b>
Vinyl Chloride	75-01-4	0.60 U	1.1 U	<b>90</b>	<b>78</b>	<b>6,600</b>	<b>11,000</b>	<b>3,700</b>	<b>9,400</b>	<b>3,900</b>	<b>5,400</b>
1,3-Butadiene	106-99-0	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Bromomethane	74-83-9	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Chloroethane	75-00-3	0.60 U	1.1 U	37 U	26 U	170 U	<b>83</b>	150 U	57 U	69 U	37 U
Ethanol	64-17-5	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	690 U	370 U
Acetonitrile	75-05-8	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Acrolein	107-02-8	2.4 U	4.4 U	150 U	43 U	670 U	220 U	590 U	230 U	280 U	150 U
Acetone	67-64-1	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	<b>4,200</b>	<b>970</b>
Trichlorofluoromethane	75-69-4	<b>1.1</b>	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	<b>510</b>	<b>430</b>
2-Propanol (Isopropyl Alcohol)	67-63-0	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	<b>1,700</b>	370 U
Acrylonitrile	107-13-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,1-Dichloroethene	75-35-4	0.60 U	1.1 U	37 U	<b>11</b>	170 U	55 U	150 U	57 U	<b>99</b>	<b>81</b>
Methylene Chloride	75-09-2	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	<b>110</b>	<b>85</b>
3-Chloro-1-propene (Allyl Chloride)	107-05-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Trichlorotrifluoroethane	76-13-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Carbon Disulfide	75-15-0	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	690 U	370 U
trans-1,2-Dichloroethene	156-60-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	<b>150</b>	<b>120</b>
1,1-Dichloroethane	75-34-3	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Methyl tert-Butyl Ether	1634-04-4	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Vinyl Acetate	108-05-4	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	690 U	370 U
2-Butanone (MEK)	78-93-3	6.0 U	11 U	370 U	110 U	1,700 U	550 U	1,500 U	570 U	<b>5,500</b>	<b>1,500</b>
cis-1,2-Dichloroethene	156-59-2	0.60 U	1.1 U	37 U	<b>21</b>	<b>1,500</b>	<b>380</b>	<b>970</b>	<b>97</b>	<b>5,100</b>	<b>2,800</b>
Ethyl Acetate	141-78-6	1.2 U	<b>3.3</b>	73 U	22 U	340 U	110 U	290 U	110 U	140 U	74 U
n-Hexane	110-54-3	0.60 U	1.1 U	<b>830</b>	<b>920</b>	<b>820</b>	<b>840</b>	<b>400</b>	<b>620</b>	<b>660</b>	<b>580</b>
Chloroform	67-66-3	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Tetrahydrofuran (THF)	109-99-9	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	<b>1,100</b>	<b>910</b>
1,2-Dichloroethane	107-06-2	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,1,1-Trichloroethane	71-55-6	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Benzene	71-43-2	<b>0.60</b>	1.1 U	<b>78</b>	<b>70</b>	<b>410</b>	<b>450</b>	<b>220</b>	<b>490</b>	<b>370</b>	<b>340</b>
Carbon Tetrachloride	56-23-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Cyclohexane	110-82-7	1.2 U	2.2 U	<b>1,800</b>	<b>2,200</b>	<b>2,800</b>	<b>3,000</b>	<b>320</b>	<b>410</b>	<b>580</b>	<b>500</b>
1,2-Dichloropropane	78-87-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Bromodichloromethane	75-27-4	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Trichloroethene	79-01-6	0.60 U	1.1 U	37 U	<b>19</b>	170 U	<b>77</b>	150 U	57 U	<b>460</b>	<b>450</b>
1,4-Dioxane	123-91-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Methyl Methacrylate	80-62-6	1.2 U	2.2 U	73 U	22 U	340 U	110 U	290 U	110 U	140 U	74 U
n-Heptane	142-82-5	0.60 U	1.1 U	<b>2,200</b>	<b>3,100</b>	<b>2,000</b>	<b>2,400</b>	<b>490</b>	<b>920</b>	<b>2,000</b>	<b>1,900</b>
cis-1,3-Dichloropropene	10061-01-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
4-Methyl-2-pentanone	108-10-1	0.60 U	1.1 U	37 U	11 U	170 U	<b>78</b>	150 U	57 U	<b>1,000</b>	<b>630</b>
trans-1,3-Dichloropropene	10061-02-6	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,1,2-Trichloroethane	79-00-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Toluene	108-88-3	<b>2.2</b>	1.1 U	<b>110</b>	<b>54</b>	<b>1,900</b>	<b>1,400</b>	<b>260</b>	<b>550</b>	<b>8,400</b>	<b>6,300</b>
2-Hexanone	591-78-6	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Dibromochloromethane	124-48-1	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
1,2-Dibromoethane	106-93-4	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
n-Butyl Acetate	123-86-4	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
n-Octane	111-65-9	0.60 U	1.1 U	<b>490</b>	<b>260</b>	<b>1,700</b>	<b>1,900</b>	<b>320</b>	<b>1,800</b>	<b>1,800</b>	<b>1,500</b>
Tetrachloroethene	127-18-4	0.60 U	1.1 U	37 U	11 U	170 U	67 U	<b>230</b>	57 U	<b>810</b>	<b>640</b>
Chlorobenzene	108-90-7	0.60 U	1.1 U	37 U	<b>190</b>	170 U	55 U	150 U	57 U	<b>96</b>	37 U
Ethylbenzene	100-41-4	0.60 U	1.1 U	<b>38</b>	<b>62</b>	<b>3,800</b>	<b>4,200</b>	150 U	<b>910</b>	<b>4,500</b>	<b>3,800</b>
m,p-Xylenes	179601-23-1	1.2 U	2.2 U	<b>1,200</b>	<b>440</b>	<b>7,600</b>	<b>8,600</b>	290 U	<b>2,200</b>	<b>8,600</b>	<b>7,400</b>
Bromoform	75-25-2	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	69 U	37 U
Styrene	100-42-5	0.60 U	1.1 U	37 U	11 U	170 U	55 U	150 U	57 U	<b>160</b>	<b>96</b>
o-Xylene	95-47-6	0.60 U	1.1 U	<b>430</b>	<b>130</b>	<b>2,800</b>	<b>3,200</b>	150 U</			

**Table 3**  
**Scenario 1: Total LFG and Methane Production**  
**Transportation Corridor**  
**Yakima, Washington**

Year	Total landfill gas (av ft <sup>3</sup> /min)			Methane (av ft <sup>3</sup> /min)		
	Wood Debris	MSW	Combined	Wood Debris	MSW	Combined
2017	1.01E+02	1.12E+02	2.13E+02	4.24E+01	4.69E+01	8.93E+01
2018	9.99E+01	1.09E+02	2.09E+02	4.20E+01	4.60E+01	8.80E+01
2019	9.90E+01	1.07E+02	2.06E+02	4.16E+01	4.51E+01	8.66E+01
2020	9.80E+01	1.05E+02	2.03E+02	4.11E+01	4.42E+01	8.53E+01
2021	9.70E+01	1.03E+02	2.00E+02	4.07E+01	4.33E+01	8.40E+01
2022	9.60E+01	1.01E+02	1.97E+02	4.03E+01	4.24E+01	8.28E+01
2023	9.51E+01	9.91E+01	1.94E+02	3.99E+01	4.16E+01	8.15E+01
2024	9.41E+01	9.71E+01	1.91E+02	3.95E+01	4.08E+01	8.03E+01
2025	9.32E+01	9.52E+01	1.88E+02	3.91E+01	4.00E+01	7.91E+01
2026	9.23E+01	9.33E+01	1.86E+02	3.87E+01	3.92E+01	7.79E+01
2027	9.13E+01	9.14E+01	1.83E+02	3.84E+01	3.84E+01	7.68E+01
2028	9.04E+01	8.96E+01	1.80E+02	3.80E+01	3.76E+01	7.56E+01
2029	8.95E+01	8.79E+01	1.77E+02	3.76E+01	3.69E+01	7.45E+01
2030	8.86E+01	8.61E+01	1.75E+02	3.72E+01	3.62E+01	7.34E+01
2031	8.78E+01	8.44E+01	1.72E+02	3.69E+01	3.55E+01	7.23E+01
2032	8.69E+01	8.27E+01	1.70E+02	3.65E+01	3.48E+01	7.12E+01
2033	8.60E+01	8.11E+01	1.67E+02	3.61E+01	3.41E+01	7.02E+01
2034	8.52E+01	7.95E+01	1.65E+02	3.58E+01	3.34E+01	6.92E+01
2035	8.43E+01	7.79E+01	1.62E+02	3.54E+01	3.27E+01	6.81E+01
2036	8.35E+01	7.64E+01	1.60E+02	3.51E+01	3.21E+01	6.71E+01
2037	8.27E+01	7.49E+01	1.58E+02	3.47E+01	3.14E+01	6.62E+01
2038	8.18E+01	7.34E+01	1.55E+02	3.44E+01	3.08E+01	6.52E+01
2039	8.10E+01	7.19E+01	1.53E+02	3.40E+01	3.02E+01	6.42E+01
2040	8.02E+01	7.05E+01	1.51E+02	3.37E+01	2.96E+01	6.33E+01
2041	7.94E+01	6.91E+01	1.49E+02	3.34E+01	2.90E+01	6.24E+01
2042	7.86E+01	6.77E+01	1.46E+02	3.30E+01	2.85E+01	6.15E+01
2043	7.78E+01	6.64E+01	1.44E+02	3.27E+01	2.79E+01	6.06E+01
2044	7.71E+01	6.51E+01	1.42E+02	3.24E+01	2.73E+01	5.97E+01
2045	7.63E+01	6.38E+01	1.40E+02	3.20E+01	2.68E+01	5.88E+01
2046	7.55E+01	6.25E+01	1.38E+02	3.17E+01	2.63E+01	5.80E+01
2047	7.48E+01	6.13E+01	1.36E+02	3.14E+01	2.57E+01	5.72E+01
2048	7.40E+01	6.01E+01	1.34E+02	3.11E+01	2.52E+01	5.63E+01
2049	7.33E+01	5.89E+01	1.32E+02	3.08E+01	2.47E+01	5.55E+01
2050	7.26E+01	5.77E+01	1.30E+02	3.05E+01	2.42E+01	5.47E+01
2051	7.19E+01	5.66E+01	1.28E+02	3.02E+01	2.38E+01	5.39E+01
2052	7.11E+01	5.55E+01	1.27E+02	2.99E+01	2.33E+01	5.32E+01
2053	7.04E+01	5.44E+01	1.25E+02	2.96E+01	2.28E+01	5.24E+01
2054	6.97E+01	5.33E+01	1.23E+02	2.93E+01	2.24E+01	5.17E+01
2055	6.90E+01	5.22E+01	1.21E+02	2.90E+01	2.19E+01	5.09E+01
2056	6.83E+01	5.12E+01	1.20E+02	2.87E+01	2.15E+01	5.02E+01
2057	6.77E+01	5.02E+01	1.18E+02	2.84E+01	2.11E+01	4.95E+01
2058	6.70E+01	4.92E+01	1.16E+02	2.81E+01	2.07E+01	4.88E+01
2059	6.63E+01	4.82E+01	1.15E+02	2.79E+01	2.03E+01	4.81E+01
2060	6.57E+01	4.73E+01	1.13E+02	2.76E+01	1.99E+01	4.74E+01

**Table 4**  
**Scenario 2: Total LFG and Methane Production**  
**Transportation Corridor**  
**Yakima, Washington**

Year	Total landfill gas (av ft <sup>3</sup> /min)			Methane (av ft <sup>3</sup> /min)		
	Wood Debris	MSW	Combined	Wood Debris	MSW	Combined
2017	9.76E+01	7.96E+01	1.77E+02	4.10E+01	3.34E+01	7.44E+01
2018	9.66E+01	7.80E+01	1.75E+02	4.06E+01	3.28E+01	7.33E+01
2019	9.57E+01	7.64E+01	1.72E+02	4.02E+01	3.21E+01	7.23E+01
2020	9.47E+01	7.49E+01	1.70E+02	3.98E+01	3.15E+01	7.13E+01
2021	9.38E+01	7.34E+01	1.67E+02	3.94E+01	3.08E+01	7.02E+01
2022	9.29E+01	7.20E+01	1.65E+02	3.90E+01	3.02E+01	6.92E+01
2023	9.19E+01	7.06E+01	1.62E+02	3.86E+01	2.96E+01	6.82E+01
2024	9.10E+01	6.92E+01	1.60E+02	3.82E+01	2.91E+01	6.73E+01
2025	9.01E+01	6.78E+01	1.58E+02	3.78E+01	2.85E+01	6.63E+01
2026	8.92E+01	6.65E+01	1.56E+02	3.75E+01	2.79E+01	6.54E+01
2027	8.83E+01	6.51E+01	1.53E+02	3.71E+01	2.74E+01	6.45E+01
2028	8.74E+01	6.39E+01	1.51E+02	3.67E+01	2.68E+01	6.35E+01
2029	8.66E+01	6.26E+01	1.49E+02	3.64E+01	2.63E+01	6.26E+01
2030	8.57E+01	6.14E+01	1.47E+02	3.60E+01	2.58E+01	6.18E+01
2031	8.49E+01	6.01E+01	1.45E+02	3.56E+01	2.53E+01	6.09E+01
2032	8.40E+01	5.89E+01	1.43E+02	3.53E+01	2.48E+01	6.00E+01
2033	8.32E+01	5.78E+01	1.41E+02	3.49E+01	2.43E+01	5.92E+01
2034	8.24E+01	5.66E+01	1.39E+02	3.46E+01	2.38E+01	5.84E+01
2035	8.15E+01	5.55E+01	1.37E+02	3.42E+01	2.33E+01	5.76E+01
2036	8.07E+01	5.44E+01	1.35E+02	3.39E+01	2.29E+01	5.68E+01
2037	7.99E+01	5.33E+01	1.33E+02	3.36E+01	2.24E+01	5.60E+01
2038	7.91E+01	5.23E+01	1.31E+02	3.32E+01	2.20E+01	5.52E+01
2039	7.83E+01	5.12E+01	1.30E+02	3.29E+01	2.15E+01	5.44E+01
2040	7.76E+01	5.02E+01	1.28E+02	3.26E+01	2.11E+01	5.37E+01
2041	7.68E+01	4.92E+01	1.26E+02	3.23E+01	2.07E+01	5.29E+01
2042	7.60E+01	4.83E+01	1.24E+02	3.19E+01	2.03E+01	5.22E+01
2043	7.53E+01	4.73E+01	1.23E+02	3.16E+01	1.99E+01	5.15E+01
2044	7.45E+01	4.64E+01	1.21E+02	3.13E+01	1.95E+01	5.08E+01
2045	7.38E+01	4.54E+01	1.19E+02	3.10E+01	1.91E+01	5.01E+01
2046	7.30E+01	4.45E+01	1.18E+02	3.07E+01	1.87E+01	4.94E+01
2047	7.23E+01	4.37E+01	1.16E+02	3.04E+01	1.83E+01	4.87E+01
2048	7.16E+01	4.28E+01	1.14E+02	3.01E+01	1.80E+01	4.80E+01
2049	7.09E+01	4.20E+01	1.13E+02	2.98E+01	1.76E+01	4.74E+01
2050	7.02E+01	4.11E+01	1.11E+02	2.95E+01	1.73E+01	4.67E+01
2051	6.95E+01	4.03E+01	1.10E+02	2.92E+01	1.69E+01	4.61E+01
2052	6.88E+01	3.95E+01	1.08E+02	2.89E+01	1.66E+01	4.55E+01
2053	6.81E+01	3.87E+01	1.07E+02	2.86E+01	1.63E+01	4.49E+01
2054	6.74E+01	3.80E+01	1.05E+02	2.83E+01	1.59E+01	4.43E+01
2055	6.68E+01	3.72E+01	1.04E+02	2.80E+01	1.56E+01	4.37E+01
2056	6.61E+01	3.65E+01	1.03E+02	2.78E+01	1.53E+01	4.31E+01
2057	6.54E+01	3.58E+01	1.01E+02	2.75E+01	1.50E+01	4.25E+01
2058	6.48E+01	3.50E+01	9.98E+01	2.72E+01	1.47E+01	4.19E+01
2059	6.41E+01	3.43E+01	9.85E+01	2.69E+01	1.44E+01	4.14E+01
2060	6.35E+01	3.37E+01	9.72E+01	2.67E+01	1.41E+01	4.08E+01

# Landfill Gas Probe Logs



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## Recent Explorations

# Soil Classification System

	MAJOR DIVISIONS	CLEAN GRAVEL (Little or no fines)	GRAPHIC SYMBOL	LETTER SYMBOL <sup>(1)</sup>	TYPICAL DESCRIPTIONS <sup>(2)(3)</sup>
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL  (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		<b>GW</b>	Well-graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		<b>GP</b>	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		<b>GM</b>	Silty gravel; gravel/sand/silt mixture(s)
	SAND AND SANDY SOIL  (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		<b>SW</b>	Well-graded sand; gravelly sand; little or no fines
		CLEAN SAND (Little or no fines)		<b>SP</b>	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)		<b>SM</b>	Silty sand; sand/silt mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY  (Liquid limit less than 50)	CLEAN SAND (Little or no fines)		<b>ML</b>	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
		GRAVEL WITH FINES (Appreciable amount of fines)		<b>CL</b>	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
		GRAVEL WITH FINES (Appreciable amount of fines)		<b>OL</b>	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY  (Liquid limit greater than 50)	CLEAN SAND (Little or no fines)		<b>MH</b>	Inorganic silt; micaceous or diatomaceous fine sand
		GRAVEL WITH FINES (Appreciable amount of fines)		<b>CH</b>	Inorganic clay of high plasticity; fat clay
		GRAVEL WITH FINES (Appreciable amount of fines)		<b>OH</b>	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL		<b>PT</b>	Peat; humus; swamp soil with high organic content	

OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		<b>AC or PC</b>	Asphalt concrete pavement or Portland cement pavement
ROCK		<b>RK</b>	Rock (See Rock Classification)
WOOD		<b>WD</b>	Wood, lumber, wood chips
DEBRIS		<b>DB</b>	Construction debris, garbage


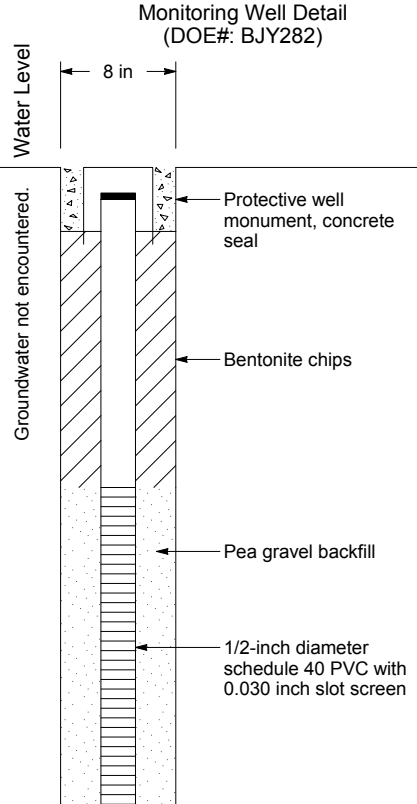
- Notes:
- USCS letter symbols correspond to symbols used by the Unified Soil Classification System and ASTM classification methods. Dual letter symbols (e.g., SP-SM for sand or gravel) indicate soil with an estimated 5-15% fines. Multiple letter symbols (e.g., ML/CL) indicate borderline or multiple soil classifications.
  - Soil descriptions are based on the general approach presented in the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the Standard Test Method for Classification of Soils for Engineering Purposes, as outlined in ASTM D 2487.
  - Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:
    - Primary Constituent: > 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
    - Secondary Constituents: > 30% and ≤ 50% - "very gravelly," "very sandy," "very silty," etc.
    - > 15% and ≤ 30% - "gravelly," "sandy," "silty," etc.
    - Additional Constituents: > 5% and ≤ 15% - "with gravel," "with sand," "with silt," etc.
    - ≤ 5% - "with trace gravel," "with trace sand," "with trace silt," etc., or not noted.
  - Soil density or consistency descriptions are based on judgement using a combination of sampler penetration blow counts, drilling or excavating conditions, field tests, and laboratory tests, as appropriate.

Drilling and Sampling Key		Field and Lab Test Data
SAMPLER TYPE	SAMPLE NUMBER & INTERVAL	
Code	Description	Code
a	3.25-inch O.D., 2.42-inch I.D. Split Spoon	PP = 1.0
b	2.00-inch O.D., 1.50-inch I.D. Split Spoon	TV = 0.5
c	Shelby Tube	PID = 100
d	Grab Sample	W = 10
e	Single-Tube Core Barrel	D = 120
f	Double-Tube Core Barrel	-200 = 60
g	2.50-inch O.D., 2.00-inch I.D. WSDOT	GS
h	3.00-inch O.D., 2.375-inch I.D. Mod. California	AL
i	Other - See text if applicable	GT
1	300-lb Hammer, 30-inch Drop	CA
2	140-lb Hammer, 30-inch Drop	
3	Pushed	
4	Vibrocore (Rotasonic/Geoprobe)	
5	Other - See text if applicable	

**Groundwater**

- Approximate water level at time of drilling (ATD)
- Approximate water level at time other than ATD

# GP-32

SAMPLE DATA				SOIL PROFILE		GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol
						SP-SM
				Drilling Method: <u>Hollow-stem Auger</u> Ground Elevation (ft): <u>1071.53</u>		Monitoring Well Detail (DOE#: BJY282)
0						Water Level 
2						Groundwater not encountered.
4						
6						
8						
10						

Boring Completed 10/12/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/12/16  
Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/8/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG

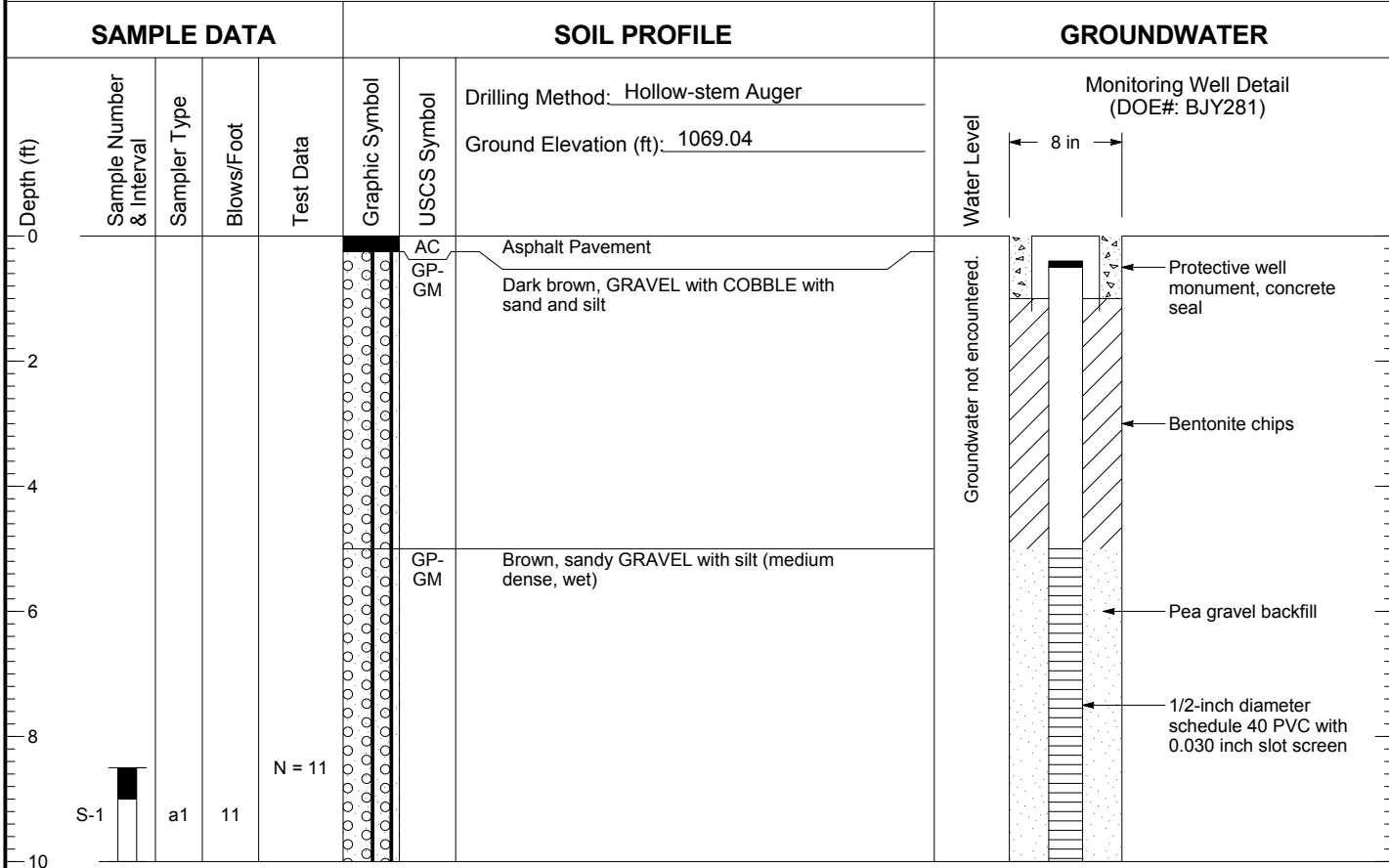


Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-32

Figure  
**A-2**

# GP-33



Boring Completed 10/12/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/12/16  
Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/8/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG

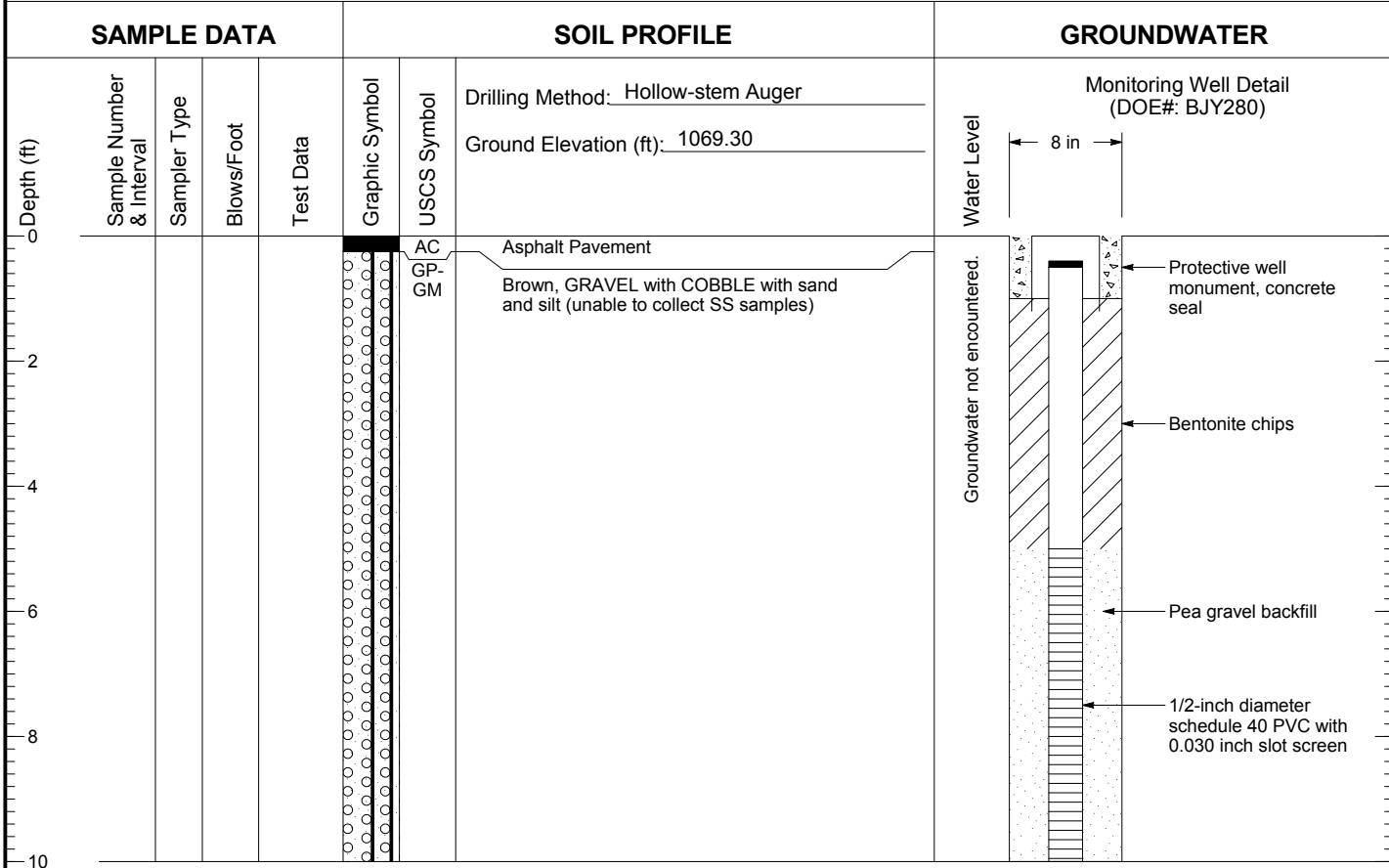


Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-33

Figure  
**A-3**

# GP-34



Boring Completed 10/12/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/12/16  
Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/8/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG





Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-34

Figure  
**A-4**

# GP-35

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Monitoring Well Detail (DOE#: BJY278)  Water Level <div style="text-align: center;"> <span style="font-size: 2em;">←</span> 8 in <span style="font-size: 2em;">→</span> </div>
	S-1	a1	32	PID=15; LEL=6; N = 32		WD	
						GP-GM	Groundwater not encountered.  Protective well monument, concrete seal  Bentonite chips  Pea gravel backfill  1/2-inch diameter schedule 40 PVC with 0.030 inch slot screen
						Reddish brown, WOOD debris (dense, moist)          Brown, GRAVEL with COBBLE with sand and silt (unable to collect SS sample)	

Boring Completed 10/11/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16  
Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/8/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG



Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-35

Figure  
**A-5**

# GP-36

SAMPLE DATA				SOIL PROFILE			GROUNDWATER
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Monitoring Well Detail (DOE#: BJY279)
	S-1	a1		PID=13; LEL=0		SP-SM	<div style="text-align: center;">Water Level</div> <div style="text-align: center;">8 in</div> <div style="text-align: center;">Groundwater not encountered.</div> <div style="text-align: center;">Protective well monument, concrete seal</div> <div style="text-align: center;">Bentonite chips</div> <div style="text-align: center;">Pea gravel backfill</div> <div style="text-align: center;">1/2-inch diameter schedule 40 PVC with 0.030 inch slot screen</div>
S-2	a1					ML	

Drilling Method: Hollow-stem Auger  
Ground Elevation (ft): 1064.53

Brown, very gravelly, fine SAND with silt with wood debris (unable to collect SS samples)

Brown to gray, sandy SILT with wood debris and gravel (unable to collect SS samples)

Boring Completed 10/12/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/12/16  
Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/8/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG



Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-36

Figure  
**A-6**

# GP-37

SAMPLE DATA				SOIL PROFILE			GROUNDWATER	
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Monitoring Well Detail (DOE#: BJY277)	
	Drilling Method: <u>Hollow-stem Auger</u> Ground Elevation (ft): <u>1065.82</u>							Water Level
0								
2	S-1	a1	15	PID=1; LEL=5; N = 15		WD		
4							Groundwater not encountered.	
6								
8	S-2	a1	9	PID=10.4; LEL=7; N = 5			Groundwater not encountered.	
10								

Boring Completed 10/11/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16  
Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/8/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG



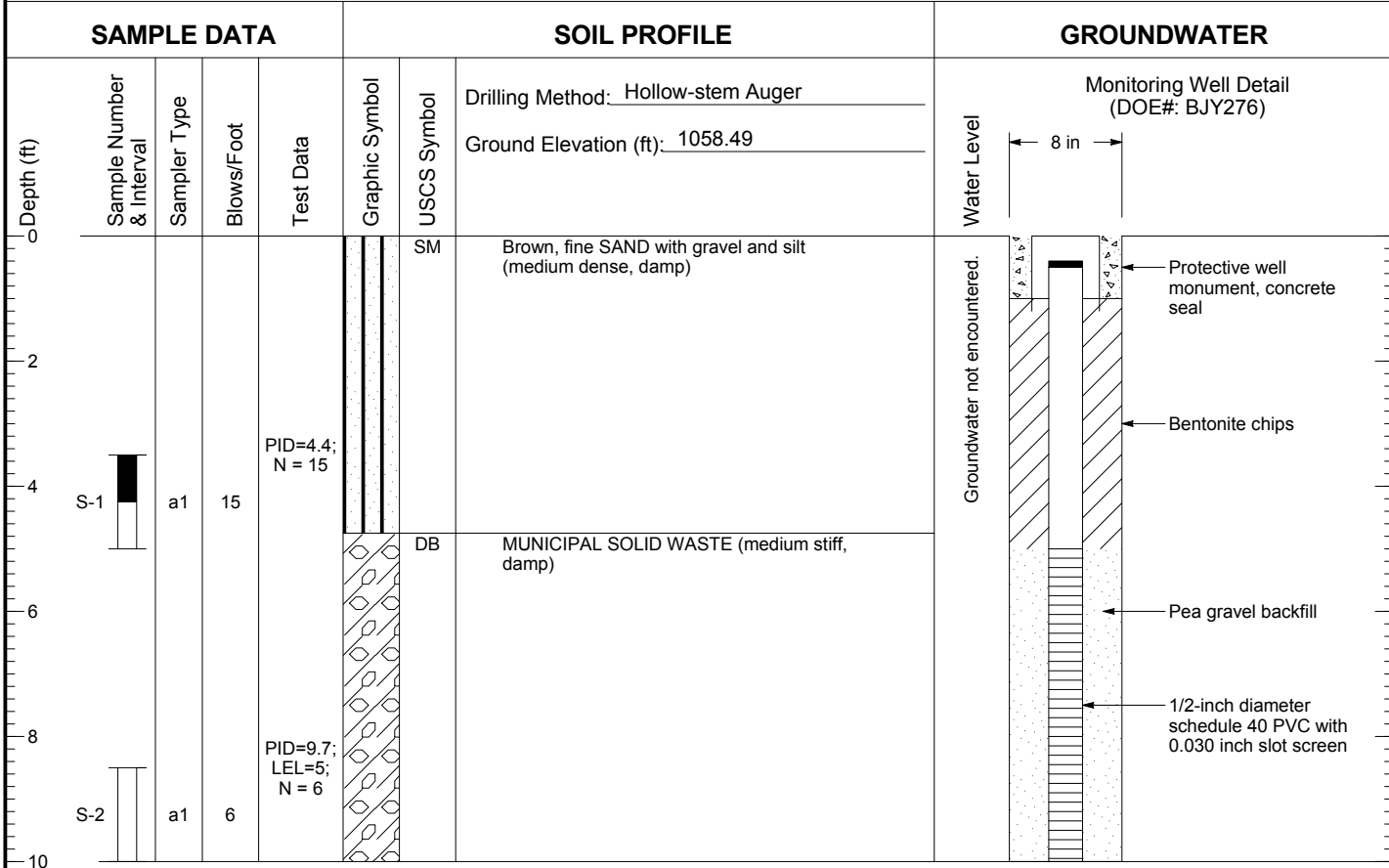
Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-37

Figure  
**A-7**



# GP-38



Boring Completed 10/11/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16  
Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/8/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG

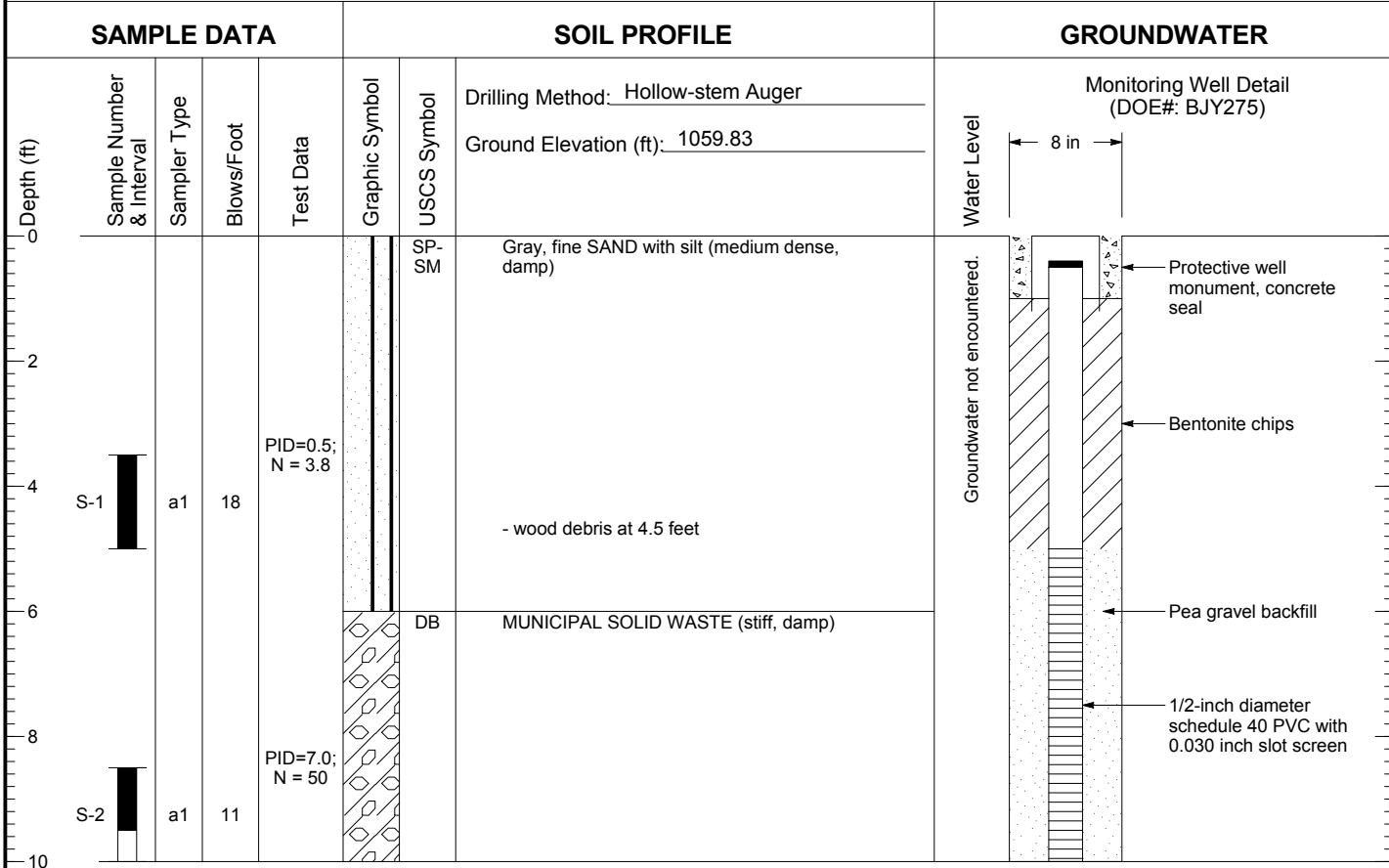


Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-38

Figure  
**A-8**

# GP-39



Boring Completed 10/11/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16  
Total Depth of Monitoring Well = 10.0 ft.

1148009.010.013 12/8/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG

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

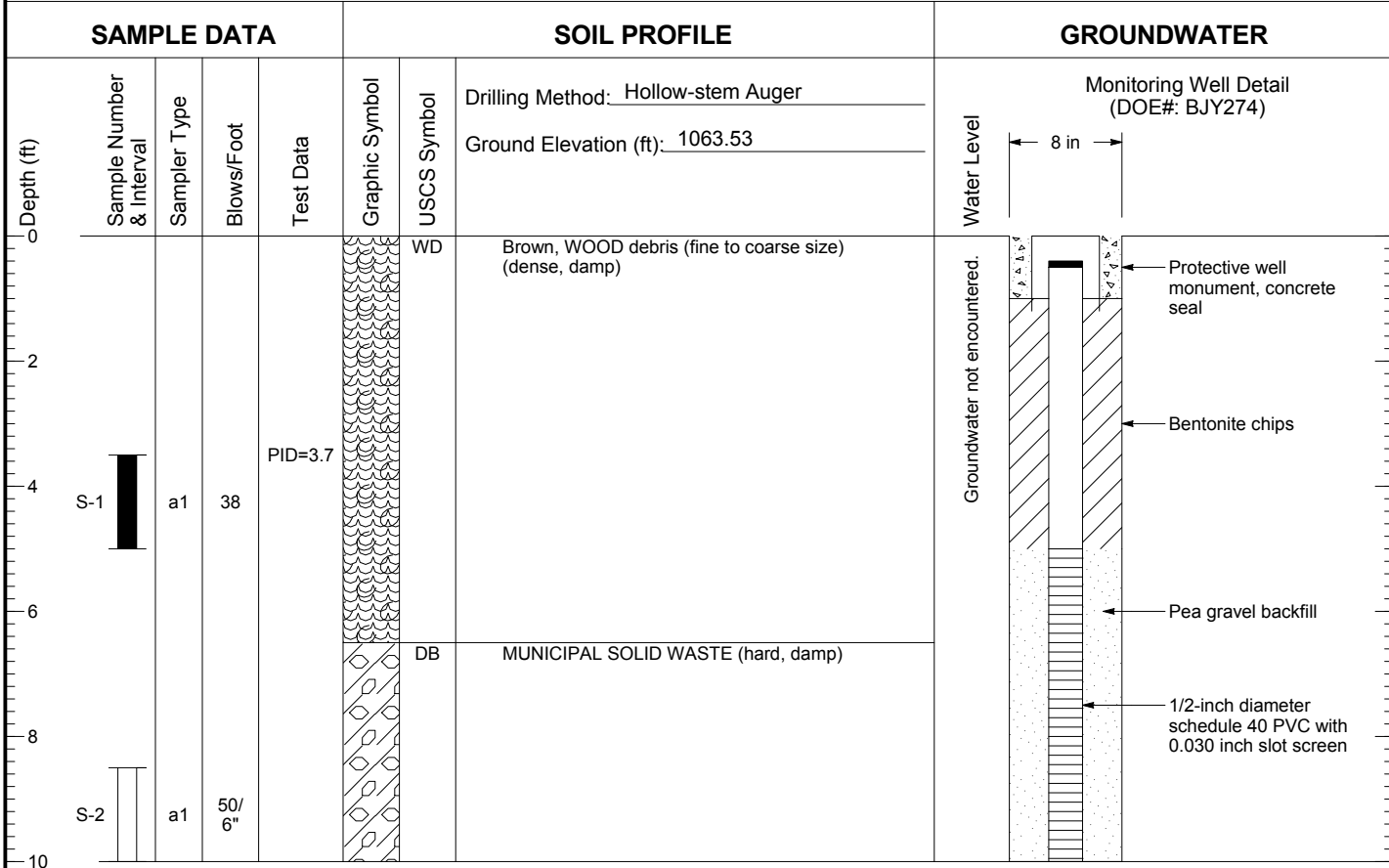


Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-39

Figure  
**A-9**

# GP-40



Boring Completed 10/11/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16  
Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/8/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG

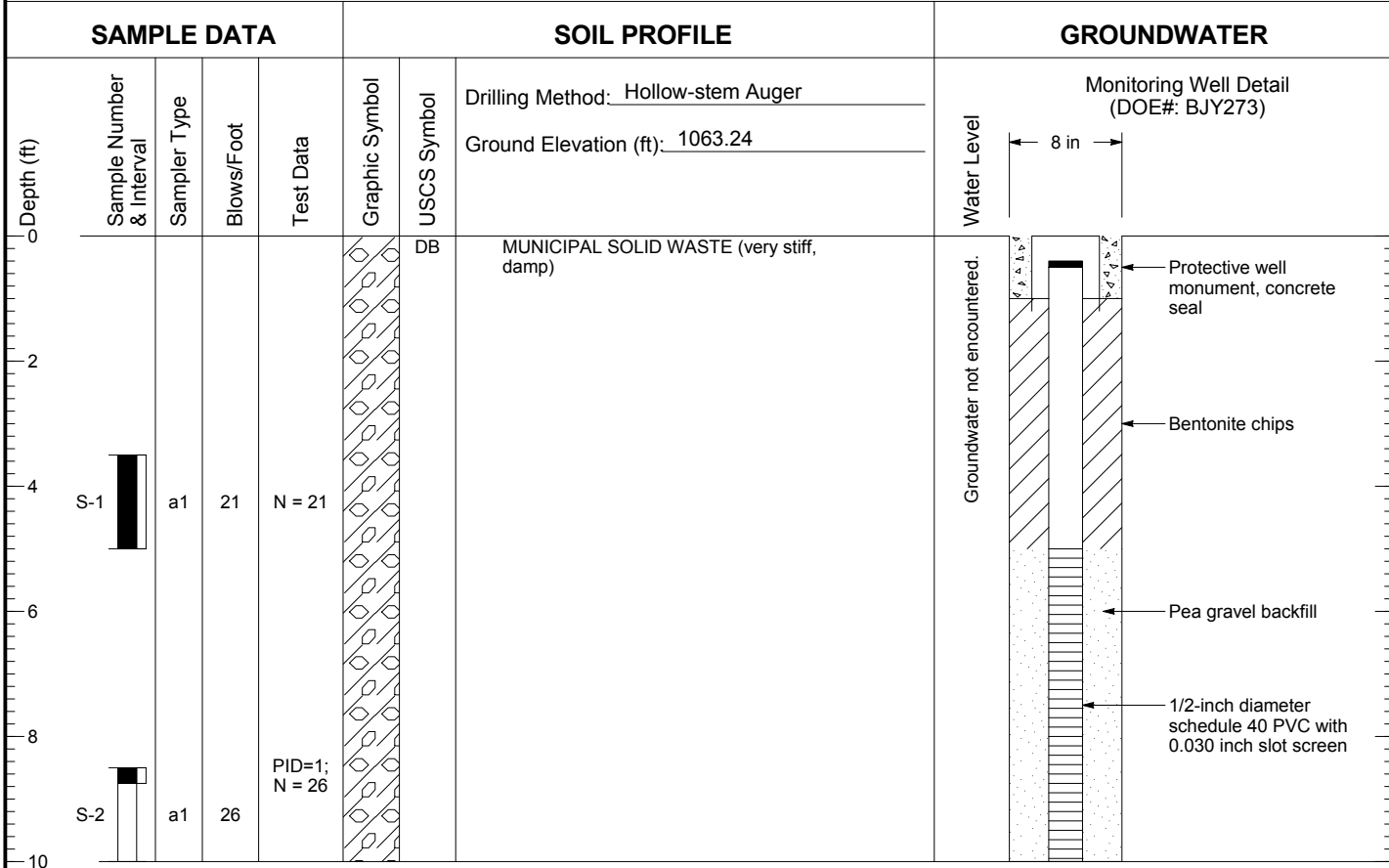


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Yakima, Washington

Log of Monitoring Well GP-40

Figure  
**A-10**

# GP-41



Boring Completed 10/10/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/10/16  
Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/8/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG



Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-41

Figure  
**A-11**

# GP-42

SAMPLE DATA				SOIL PROFILE			GROUNDWATER	
Depth (ft)	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Drilling Method: Hollow-stem Auger Ground Elevation (ft): 1063.03	
	S-1	a1	11	N = 11	[Symbol]	SM	Monitoring Well Detail (DOE#: BJY272) Water Level 8 in Groundwater not encountered. Protective well monument, concrete seal Bentonite chips Pea gravel backfill 1/2-inch diameter schedule 40 PVC with 0.030 inch slot screen	
S-2	a1	20	N = 20	[Symbol]	SP-SM	Brown, SAND with silt and gravel to very silty, fine SAND with wood debris (medium dense, dry)  Gray, SAND with silt and gravel (medium dense, damp)		

Boring Completed 10/11/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/11/16  
Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/8/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG



Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-42

Figure  
**A-12**

# GP-43

SAMPLE DATA					SOIL PROFILE		GROUNDWATER
Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol
	Drilling Method: <u>Hollow-stem Auger</u>		Ground Elevation (ft): <u>1058.77</u>		Monitoring Well Detail (DOE#: BJY271)		
0	1058						Water Level
2	1056						8 in
4	1054	S-1	a1	18	PID=9.2;LEL=4; N = 17	[Pattern]	DB
6	1052						MUNICIPAL SOLID WASTE (stiff to very stiff, damp)
8	1050	S-2	a1	10	N = 10	[Pattern]	DB
10							Groundwater not encountered.

Boring Completed 10/10/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/10/16  
Total Depth of Monitoring Well = 10.0 ft.

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG W/ ELEVATION

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



Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-43

Figure  
**A-13**

# GP-44

SAMPLE DATA						SOIL PROFILE		GROUNDWATER	
Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	Test Data	Graphic Symbol	USCS Symbol	Drilling Method: <u>Hollow-stem Auger</u> Ground Elevation (ft): <u>1059.03</u>	
	0					SP-SM		Monitoring Well Detail (DOE#: BJY283) Water Level 8 in	
1058						SP-SM		Light brown, medium SAND with silt and trace gravel (unable to collect SS samples)	
2								Groundwater not encountered.	
1056								Protective well monument, concrete seal	
4								Bentonite chips	
1054								Pea gravel backfill	
6								1/2 diameter schedule, 40 PVC screen (0.030 inch slot)	
1052								1050	
8								10	
1050								12	
10								14	
12								16	
14								18	
16								20	
18								22	
20								24	

Boring Completed 10/12/16  
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 10/12/16  
Total Depth of Monitoring Well = 10.0 ft.

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

1148009.010.013 12/2/16 N:\PROJECTS\1148009.010.013.GPJ WELL LOG W/ ELEVATION



Transportation Corridor Project  
Yakima, Washington

Log of Monitoring Well GP-44

Figure  
**A-14**

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## Previous Explorations

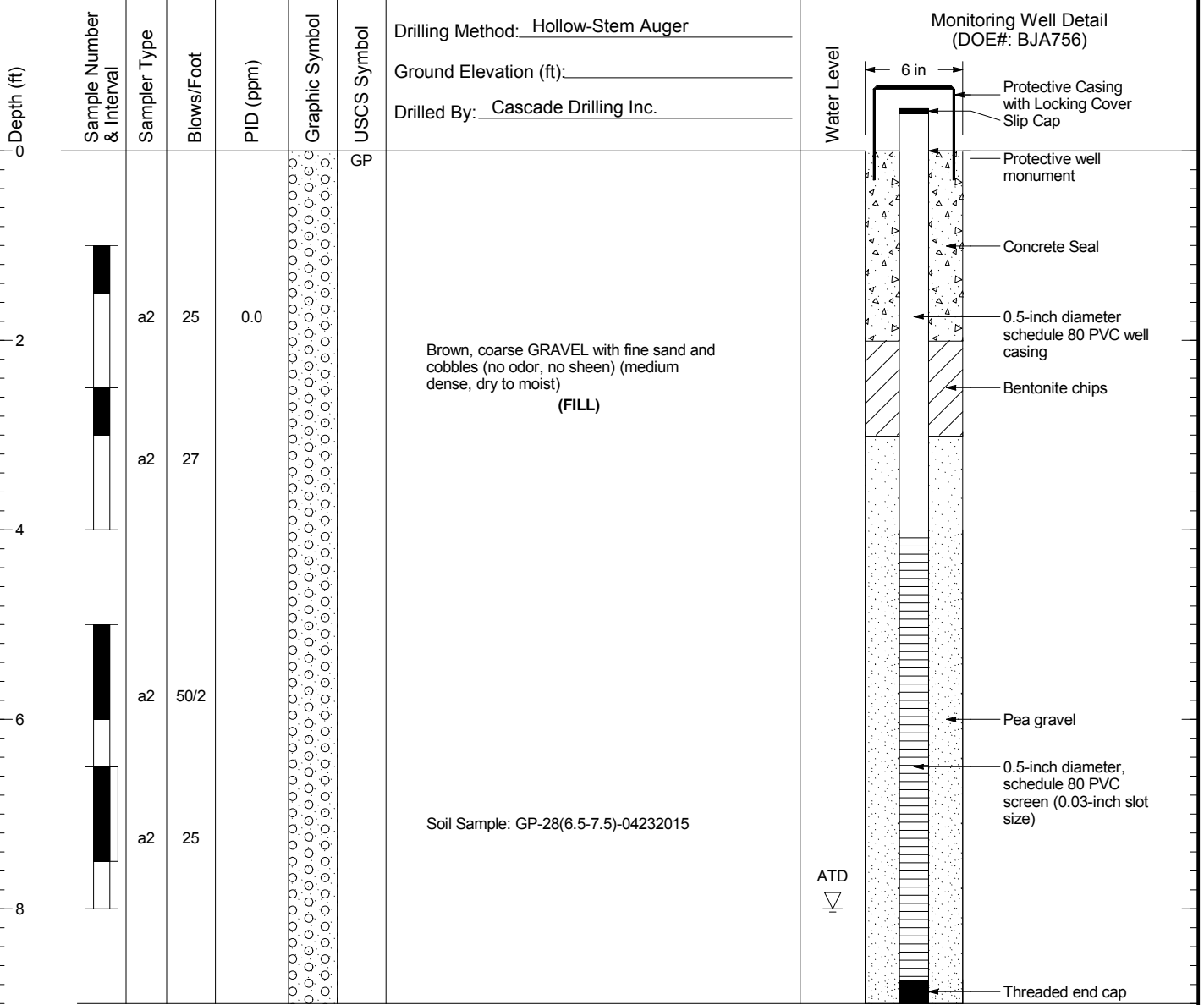


# GP-28

## SAMPLE DATA

## SOIL PROFILE

## GROUNDWATER



Boring Completed 04/23/15  
Total Depth of Boring = 9.0 ft.

Monitoring Well Completed 04/23/15  
Total Depth of Monitoring Well = 9.0 ft.

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

1148008.03 7/29/15 N:\PROJECTS\1148008.030.GPJ WELL LOG



Closed City of Yakima Landfill  
Yakima, Washington

Log of Monitoring Well GP-28

Figure  
**A-15**



22122 20th Avenue SE  
 Bothell, Washington 98021  
 Telephone: 425.402.8800  
 SLR International Corp Fax: 425.402.8488

CLIENT City of Yakima PROJECT NAME Former City of Yakima Landfill  
 PROJECT NUMBER 001.0221.00004 PROJECT LOCATION Yakima, Washington  
 DATE STARTED 2/17/09 COMPLETED 2/17/09 GROUND ELEVATION 1063.51 ft HOLE SIZE 8.5" Diameter  
 DRILLING CONTRACTOR Cascade Drilling GROUND WATER LEVELS:  
 DRILLING METHOD Hollow Stem Auger  AT TIME OF DRILLING 17.0 ft / Elev 1046.5 ft  
 LOGGED BY B. Robinson CHECKED BY \_\_\_\_\_ AT END OF \_\_\_\_\_  
 NOTES \_\_\_\_\_ AFTER DRILLING \_\_\_\_\_

DEPTH (ft)	INTERVAL	TYPE	NAME	RECOVERY %	BLOW COUNTS PER FOOT (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	PROBE DIAGRAM
0.0									
2.5						SM		SILTY SAND, dark brown, some silt, little fine to medium well-rounded gravel, moist, organic, wood waste.	Concrete
	D&M			60	21			@ 3.0 feet: Becomes light olive brown, fine-grained, medium-dense sand, no gravel.	Hydrated bentonite chips
4.5									1059.0
5.0						ML		SANDY SILT, olive gray, some fine-grained sand, trace organics, 1/2" lenses of brown organics, stiff.	
	D&M		GP5-S1	100	11			@ 7.0 feet: Becomes moist to wet and grades to SILTY SAND.	1"-diameter Sch. 40 PVC blank riser
7.5									
	D&M		GP5-S2	80	39			SANDY GRAVEL, olive gray, fine to coarse, rounded to well-rounded, some medium- to coarse-grained sand, dense, damp.	2x12 Colorado silica sand pack
8.0									1055.5
10.0						GW			
	D&M		GP5-S3	45	53			@ 12.5 feet: Broken cobble in sampler, no recovery.	1"-diameter Sch. 40 PVC
12.5									
	D&M			20	50/6"				

**REMARKS**  
 SS = Samples collected by using an 18-inch-long, 3.0-inch outside diameter Dames & Moore split-barrel sampler driven by a 300 lb. autohammer with a 24-inch drop.  
 Water level at time of drilling.

SLR GP LOG YAKIMA SOIL BORINGS.GPJ GINT US.GDT 3/25/09



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 Bothell, Washington 98021  
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 SLR International Corp Fax: 425.402.8488

CLIENT City of Yakima

PROJECT NAME Former City of Yakima Landfill

PROJECT NUMBER 001.0221.00004

PROJECT LOCATION Yakima, Washington

DEPTH (ft)	INTERVAL	TYPE	NAME	RECOVERY %	BLOW COUNTS PER FOOT (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	PROBE DIAGRAM
15.0						GW		SANDY GRAVEL, olive gray, fine to coarse, rounded to well-rounded, some medium- to coarse-grained sand, dense, damp. (continued) SAND, olive gray, medium-grained, trace coarse-grained sand, trace fine gravel, loose, moist.	
		D&M	GP5-S4	90	11	SP		SANDY GRAVEL, light olive brown, fine to coarse, well-rounded, some fine- to coarse-grained sand, very dense, moist. @ 17.0 feet: Becomes wet.	
17.5		D&M		90	50/6"	GW		@ 17.5 feet: Broken cobble in sampler, no recovery.	

Boring completed at 18.0 feet.

**SOIL VAPOR PROBE COMPLETION DETAILS:**

- +3.1 to 0 feet: 1"-diameter Sch. 40 PVC blank riser encased in an 8"-diameter protective steel monument set in concrete with three protective concrete-filled steel bollards.
- 0 to 9.7 feet: 1"-diameter Sch. 40 PVC blank riser.
- 9.7 to 14.2 feet: 1"-diameter Sch. 40 PVC 0.020"-slotted screen.
- 14.2 to 14.5 feet: 1"-diameter Sch. 40 PVC end cap.

- 0 to 2 feet: Concrete.
- 2 to 9 feet: Hydrated bentonite chips.
- 9 to 18 feet: 2x12 Colorado silica sand.

**REMARKS**

SS = Samples collected by using an 18-inch-long, 3.0-inch outside diameter Dames & Moore split-barrel sampler driven by a 300 lb. autohammer with a 24-inch drop.

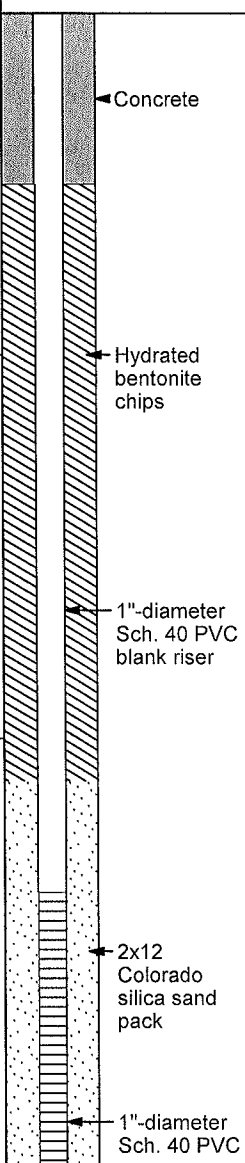
∇ Water level at time of drilling.



22122 20th Avenue SE  
 Bothell, Washington 98021  
 Telephone: 425.402.8800  
 SLR International Corp Fax: 425.402.8488

CLIENT City of Yakima PROJECT NAME Former City of Yakima Landfill  
 PROJECT NUMBER 001.0221.00004 PROJECT LOCATION Yakima, Washington  
 DATE STARTED 2/19/09 COMPLETED 2/19/09 GROUND ELEVATION 1065.58 ft HOLE SIZE 8.5" Diameter  
 DRILLING CONTRACTOR Cascade Drilling GROUND WATER LEVELS:  
 DRILLING METHOD Hollow Stem Auger AT TIME OF DRILLING Dry  
 LOGGED BY B. Robinson CHECKED BY \_\_\_\_\_ AT END OF \_\_\_\_\_  
 NOTES \_\_\_\_\_ AFTER DRILLING \_\_\_\_\_

DEPTH (ft)	INTERVAL	TYPE	NAME	RECOVERY %	BLOW COUNTS PER FOOT (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	PROBE DIAGRAM
0.0								WOOD WASTE, bark mulch, some silty sand, little gravel.	
2.5									
4.0									
5.0								SILTY SAND, fine- to coarse-grained, some silt, little fine to coarse well-rounded gravel, few wood waste, medium dense, moist.	
7.5									
8.5									
10.0								WOOD WASTE, reddish brown, bark mulch and wood chips, moist.	
12.5									



**REMARKS**

SS = Samples collected by using an 18-inch-long, 3.0-inch outside diameter Dames & Moore split-barrel sampler driven by a 300 lb. wireline hammer.

∇ Water level at time of drilling.

SLR GP LOG YAKIMA SOIL BORINGS.GPJ GINT US.GDT 3/25/09



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 Bothell, Washington 98021  
 Telephone: 425.402.8800  
 SLR International Corp Fax: 425.402.8488

CLIENT City of Yakima

PROJECT NAME Former City of Yakima Landfill

PROJECT NUMBER 001.0221.00004

PROJECT LOCATION Yakima, Washington

DEPTH (ft)	INTERVAL	TYPE	NAME	RECOVERY %	BLOW COUNTS PER FOOT (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	PROBE DIAGRAM
15.0								<b>WOOD WASTE</b> , reddish brown, bark mulch and wood chips, moist. <i>(continued)</i>	<p>0.020"-slotted screen</p> <p>End cap</p>
	X	D&M			50/5"			<p>@ 15.0 feet: Piece of wood caught in sampler, no recovery, moist.</p> <p>Boring completed at 15.5 feet.</p>	

**SOIL VAPOR PROBE COMPLETION DETAILS:**

- +2.8 to 0 feet: 1"-diameter Sch. 40 PVC blank riser encased in an 8"-diameter protective steel monument set in concrete with three protective concrete-filled steel bollards.
- 0 to 10.3 feet: 1"-diameter Sch. 40 PVC blank riser.
- 10.3 to 15 feet: 1"-diameter Sch. 40 PVC 0.020"-slotted screen.
- 15 to 15.4 feet: 1"-diameter Sch. 40 PVC end cap.
- 0 to 2 feet: Concrete.
- 2 to 9 feet: Hydrated bentonite chips.
- 9 to 15.5 feet: 2x12 Colorado silica sand.

**REMARKS**

SS = Samples collected by using an 18-inch-long, 3.0-inch outside diameter Dames & Moore split-barrel sampler driven by a 300 lb. wireline hammer.

∇ Water level at time of drilling.



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CLIENT City of Yakima PROJECT NAME Former City of Yakima Landfill  
 PROJECT NUMBER 001.0221.00004 PROJECT LOCATION Yakima, Washington  
 DATE STARTED 4/17/09 COMPLETED 4/17/09 GROUND ELEVATION \_\_\_\_\_ HOLE SIZE 8.5" Diameter  
 DRILLING DRILLING CONTRACTOR Cascade Drilling GROUND WATER LEVELS:  
 DRILLING DRILLING METHOD Hollow Stem Auger AT TIME OF DRILLING ---  
 LOGGED BY C. Lee CHECKED BY \_\_\_\_\_ AT END OF ---  
 NOTES \_\_\_\_\_ AFTER DRILLING ---

DEPTH (ft)	INTERVAL	TYPE	NAME	RECOVERY %	BLOW COUNTS PER FOOT (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	PROBE DIAGRAM
0.0									
2.5		D&M		0	26			GRAVEL, gray, coarse, some cobbles up to 8"-diameter, little fine-grained sand, damp.  @ 1.5 feet: No recovery.	Concrete Hydrated bentonite chips
5.0		D&M		25	16	GP		@ 3.5 feet: Medium to coarse gravel, little fractured cobbles, trace fine- to medium-grained sand, loose.	1"-diameter Sch. 40 PVC blank riser
7.5		D&M		10	71			@ 6.5 feet: Some fractured cobbles, few fine- to medium-grained sand, very dense, dry.	2x12 Colorado silica sand pack
11.0									1"-diameter Sch. 40 PVC 0.020"-slotted screen
12.5		D&M		80	51	GP		SANDY GRAVEL, gray, coarse, some fractured cobbles, little brown fine- to medium-grained sand, medium-dense, damp.	

**REMARKS**

SS = Samples collected by using an 18-inch-long, 3.0-inch outside diameter Dames & Moore split-barrel sampler driven by a 300 lb. wireline hammer.  
 Did not encounter water in boring.

SLR GP LOG YAKIMA SOIL BORINGS.GPJ GINT US.GDT 4/23/09





22122 20th Avenue SE  
Bothell, Washington 98021  
Telephone: 425.402.8800  
SLR International Corp Fax: 425.402.8488

**CLIENT** City of Yakima **PROJECT NAME** Former City of Yakima Landfill  
**PROJECT NUMBER** 001.0221.00006 **PROJECT LOCATION** Yakima, Washington  
**DATE STARTED** 11/4/09 **COMPLETED** 11/4/09 **GROUND ELEVATION** 1060.71 ft **HOLE SIZE** 8.5" Diameter  
**DRILLING CONTRACTOR** Cascade Drilling **GROUND WATER LEVELS:**  
**DRILLING METHOD** Hollow Stem Auger **AT TIME OF DRILLING** 14.5 ft / Elev 1046.2 ft  
**LOGGED BY** C. Lee **CHECKED BY** \_\_\_\_\_ **AT END OF** ---  
**NOTES** \_\_\_\_\_ **AFTER DRILLING** ---

DEPTH (ft)	INTERVAL	TYPE	NAME	RECOVERY %	BLOW COUNTS PER FOOT (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	PROBE DIAGRAM
0.0									
0.5						WW		WOOD WASTE, sawdust, bark, ash.	
1060.2						SM		SILTY SAND, dark reddish-brown, fine-grained, little fines, few fine gravel, very moist.	Concrete
2.0								MUNICIPAL SOLID WASTE, medium dense, moist.	
2.5		D&M		30	30			@ 2.5 feet: Paper, wood, glass.	
5.0		D&M		60	22			@ 5 feet: Fiber, wood, soil/decomposable (50% by volume).	Hydrated bentonite chips
7.5		D&M		60	18	MSW		@ 7.5 feet: Paper, plastic, soil/decomposable (20% by volume).	1"-diameter Sch. 40 PVC blank riser
10.0		D&M		50	19			@ 10 feet: Paper, plastic, fiber, soil/decomposable (10% by volume).	2x12 Colorado silica sand pack
12.5									

**REMARKS**

D&M = Samples collected by using an 18-inch-long, 3.0-inch outside diameter Dames & Moore split-barrel sampler driven by a 300 lb. wireline hammer.

∇ Water level at time of drilling.

(Continued Next Page)

SLR.GP.LOG YAKIMA SOIL BORINGS.GPJ GINT U.S.GDT 11/19/09






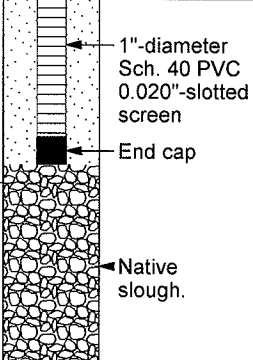

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Bothell, Washington 98021  
Telephone: 425.402.8800  
SLR International Corp Fax: 425.402.8488

CLIENT City of Yakima

PROJECT NAME Former City of Yakima Landfill

PROJECT NUMBER 001.0221.00006

PROJECT LOCATION Yakima, Washington

DEPTH (ft)	INTERVAL	TYPE	NAME	RECOVERY %	BLOW COUNTS PER FOOT (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	PROBE DIAGRAM
12.5									
		D&M		70	10	MSW		<b>MUNICIPAL SOLID WASTE</b> , medium dense, moist. <i>(continued)</i> @ 12.5 feet: Wood, plastic, glass, soil/decomposable (25% by volume).	
							14.5 ▽	<b>SILTY SAND</b> , gray, fine-grained, little fines, very dense, wet.	
15.0		D&M		70	62	SM		1046.2	
							16.5		1044.2

Boring completed at 16.5 feet.

**SOIL VAPOR PROBE COMPLETION DETAILS:**

- +3 to 9.2 feet: 1"-diameter Sch. 40 PVC blank riser.
- 9.2 to 14 feet: 1"-diameter Sch. 40 PVC 0.020"-slotted screen.
- 14 to 14.3 feet: 1"-diameter Sch. 40 PVC end cap.
- 0 to 1.5 feet: Concrete.
- 1.5 to 7 feet: Hydrated bentonite chips.
- 7 to 14.3 feet: 2x12 Colorado silica sand.
- 14.3 to 16.5 feet: Native slough.

**REMARKS**

D&M = Samples collected by using an 18-inch-long, 3.0-inch outside diameter Dames & Moore split-barrel sampler driven by a 300 lb. wireline hammer.

▽ Water level at time of drilling.

# Analytical Laboratory Reports



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F: +1 805 526 7270  
[www.alsglobal.com](http://www.alsglobal.com)

## LABORATORY REPORT

December 7, 2016

Cody Johnson  
Landau Associates, Inc.  
130 2nd Ave. South  
Edmonds, WA 98020

**RE: Transportation Corridor Investigation / 1148009.010.014**

Dear Cody:

Enclosed are the results of the samples submitted to our laboratory on November 21, 2016. For your reference, these analyses have been assigned our service request number P1605444.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at [www.alsglobal.com](http://www.alsglobal.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**ALS | Environmental**

By Kate Kaneko at 11:24 am, 12/07/16

Kate Kaneko  
Project Manager



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[www.alsglobal.com](http://www.alsglobal.com)

Client: Landau Associates, Inc. Service Request No: P1605444  
Project: Transportation Corridor Investigation / 1148009.010.014

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## CASE NARRATIVE

The samples were received intact under chain of custody on November 21, 2016 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

### Fixed Gases Analysis

The samples were analyzed for fixed gases (oxygen, nitrogen, carbon monoxide, methane and carbon dioxide) according to ASTM D1946 (single injection) using a gas chromatograph equipped with a thermal conductivity detector (TCD). This procedure is described in laboratory SOP VOA-EPA3C. This method is included on the laboratory's DoD-ELAP scope of accreditation, however it is not part of the NELAP accreditation.

### Sulfur Analysis

The samples were also analyzed for twenty sulfur compounds per ASTM D 5504-12 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan. This method is included on the laboratory's NELAP scope of accreditation, however it is not part of the DoD-ELAP accreditation.

### Total Gaseous Non-Methane Organics as Methane Analysis

The samples were also analyzed for total gaseous non-methane organics as methane according to modified EPA Method 25C. The analyses included a single sample injection (method modification) analyzed by gas chromatography using flame ionization detection/total combustion analysis. This method is not included on the laboratory's NELAP or DoD-ELAP scope of accreditation.

### Volatile Organic Compound Analysis

The samples were also analyzed for volatile organic compounds in accordance with EPA Method TO-15 from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition (EPA/625/R-96/010b), January, 1999. This procedure is described in laboratory SOP VOA-TO15. The analytical system was comprised of a gas chromatograph / mass spectrometer (GC/MS) interfaced to a whole-air preconcentrator. The method was



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Client: Landau Associates, Inc.

Service Request No: P1605444

Project: Transportation Corridor Investigation / 1148009.010.014

---

## CASE NARRATIVE

modified to include the use of helium as a diluent gas in place of zero-grade air for container pressurization. When necessary, analytical sample volumes were adjusted by a correction factor for containers pressurized with helium. A summary sheet has been included listing the affected samples. This method is included on the laboratory's NELAP and DoD-ELAP scope of accreditation. Any analytes flagged with an X are not included on the NELAP or DoD-ELAP accreditation.

The containers were cleaned, prior to sampling, down to the method reporting limit (MRL) reported for this project. Please note, projects which require reporting below the MRL could have results between the MRL and method detection limit (MDL) that are biased high.

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*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.*

*Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.*



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ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
Arizona DHS	<a href="http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home">http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home</a>	AZ0694
Florida DOH (NELAP)	<a href="http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm">http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm</a>	E871020
Louisiana DEQ (NELAP)	<a href="http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx">http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx</a>	05071
Maine DHHS	<a href="http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm">http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm</a>	2016036
Minnesota DOH (NELAP)	<a href="http://www.health.state.mn.us/accreditation">http://www.health.state.mn.us/accreditation</a>	977273
New Jersey DEP (NELAP)	<a href="http://www.nj.gov/dep/oqa/">http://www.nj.gov/dep/oqa/</a>	CA009
New York DOH (NELAP)	<a href="http://www.wadsworth.org/labcert/elap/elap.html">http://www.wadsworth.org/labcert/elap/elap.html</a>	11221
Oregon PHD (NELAP)	<a href="http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx">http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx</a>	4068-003
Pennsylvania DEP	<a href="http://www.depweb.state.pa.us/labs">http://www.depweb.state.pa.us/labs</a>	68-03307 (Registration)
PJLA (DoD ELAP)	<a href="http://www.pjlabs.com/search-accredited-labs">http://www.pjlabs.com/search-accredited-labs</a>	65818 (Testing)
Texas CEQ (NELAP)	<a href="http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html">http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html</a>	T104704413-16-7
Utah DOH (NELAP)	<a href="http://health.utah.gov/lab/environmental-lab-certification/">http://health.utah.gov/lab/environmental-lab-certification/</a>	CA01627201 6-6
Washington DOE	<a href="http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html">http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html</a>	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at [www.alsglobal.com](http://www.alsglobal.com), or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

# ALS ENVIRONMENTAL

## DETAIL SUMMARY REPORT

Client: Landau Associates, Inc.  
 Project ID: Transportation Corridor Investigation / 1148009.010.014

Service Request: P1605444

Date Received: 11/21/2016  
 Time Received: 10:15

ASTM D1946-90(2006) - Fxd Gases Can	ASTM D5504-08 - Sulfur Can	25C Modified - TGNMO+ 1X Can	TO-15 - VOC Cans
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Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)	ASTM D1946-90(2006) - Fxd Gases Can	ASTM D5504-08 - Sulfur Can	25C Modified - TGNMO+ 1X Can	TO-15 - VOC Cans
GP-43-11162016	P1605444-001	Air	11/16/2016	16:24	SSC00302	-1.61	3.31	X	X	X	X
GP-41-11162016	P1605444-002	Air	11/16/2016	16:32	SSC00106	-2.49	3.27	X	X	X	X
Ambient-11162016	P1605444-003	Air	11/16/2016	17:00	SSC00078	0.54	3.47	X	X	X	X
GP-39-11162016	P1605444-004	Air	11/16/2016	16:48	SSC00347	-1.25	3.36	X	X	X	X
GP-38-11162016	P1605444-005	Air	11/16/2016	17:33	SSC00127	-2.22	3.48	X	X	X	X



**ALS ENVIRONMENTAL**  
**Sample Volume Correction for Helium Pressurization**  
**for SCAN Analysis**

<u>Sample ID</u>	<u>Pi</u>	<u>Pf</u>	<u>Sample Volume (L)</u>	<u>Adjusted Volume (L)</u>
P1605444-003	0.54	3.47	0.930	1.00
P1605444-005	-2.22	3.48	0.018	0.0200





**ALS Environmental  
Sample Acceptance Check Form**

Client: Landau Associates, Inc. Work order: P1605444  
 Project: Transportation Corridor Investigation / 1148009.010.014  
 Sample(s) received on: 11/21/16 Date opened: 11/21/16 by: ADAVID

*Note:* This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

- |   | Yes                                 | No                       | N/A                                 |
|---|-------------------------------------|--------------------------|-------------------------------------|
| 1 Were <b>sample containers</b> properly marked with client sample ID?  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 2 Did <b>sample containers</b> arrive in good condition?  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 3 Were <b>chain-of-custody</b> papers used and filled out?  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 4 Did <b>sample container labels</b> and/or tags agree with custody papers?                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 5 Was <b>sample volume</b> received adequate for analysis?  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 6 Are samples within specified holding times?   | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 7 Was proper <b>temperature</b> (thermal preservation) of cooler at receipt adhered to?                         | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 8 Were <b>custody seals</b> on outside of cooler/Box/Container?   | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| Location of seal(s)? _____ Sealing Lid?   | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| Were signature and date included?   | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| Were seals intact?  | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| 9 Do containers have appropriate <b>preservation</b> , according to method/SOP or Client specified information? | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Is there a client indication that the submitted samples are <b>pH</b> preserved?                                | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Were <b>VOA vials</b> checked for presence/absence of air bubbles?  | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?       | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 10 <b>Tubes:</b> Are the tubes capped and intact?   | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 11 <b>Badges:</b> Are the badges properly capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| Are dual bed badges separated and individually capped and intact?   | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1605444-001.01	6.0 L Silonite Can					
P1605444-002.01	6.0 L Silonite Can					
P1605444-003.01	6.0 L Silonite Can					
P1605444-004.01	6.0 L Silonite Can					
P1605444-005.01	6.0 L Silonite Can					

Explain any discrepancies: (include lab sample ID numbers): \_\_\_\_\_

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-43-11162016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P1605444-001

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Adam McAfee  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00302

Date Collected: 11/16/16  
 Date Received: 11/21/16  
 Date Analyzed: 11/29/16  
 Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -1.61      Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	<b>Oxygen*</b>	<b>7.30</b>	0.14	
7727-37-9	<b>Nitrogen</b>	<b>26.2</b>	0.14	
630-08-0	Carbon Monoxide	ND	0.14	
74-82-8	<b>Methane</b>	<b>42.6</b>	0.14	
124-38-9	<b>Carbon Dioxide</b>	<b>23.9</b>	0.14	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-41-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-002

Test Code: ASTM D1946

Instrument ID: HP5890 II/GC1/TCD

Analyst: Adam McAfee

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00106

Date Collected: 11/16/16

Date Received: 11/21/16

Date Analyzed: 11/29/16

Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -2.49

Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	<b>Oxygen*</b>	<b>0.254</b>	0.15	
7727-37-9	<b>Nitrogen</b>	<b>10.2</b>	0.15	
630-08-0	Carbon Monoxide	ND	0.15	
74-82-8	<b>Methane</b>	<b>57.5</b>	0.15	
124-38-9	<b>Carbon Dioxide</b>	<b>32.0</b>	0.15	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Landau Associates, Inc.

**Client Sample ID:** Ambient-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-003

Test Code: ASTM D1946

Instrument ID: HP5890 II/GC1/TCD

Analyst: Adam McAfee

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00078

Date Collected: 11/16/16

Date Received: 11/21/16

Date Analyzed: 11/29/16

Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): 0.54

Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	22.0	0.12	
7727-37-9	Nitrogen	77.9	0.12	
630-08-0	Carbon Monoxide	ND	0.12	
74-82-8	Methane	ND	0.12	
124-38-9	Carbon Dioxide	ND	0.12	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-39-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-004

Test Code: ASTM D1946

Instrument ID: HP5890 II/GC1/TCD

Analyst: Adam McAfee

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00347

Date Collected: 11/16/16

Date Received: 11/21/16

Date Analyzed: 11/29/16

Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -1.25

Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.13	
7727-37-9	<b>Nitrogen</b>	<b>0.668</b>	0.13	
630-08-0	Carbon Monoxide	ND	0.13	
74-82-8	<b>Methane</b>	<b>64.0</b>	0.13	
124-38-9	<b>Carbon Dioxide</b>	<b>35.2</b>	0.13	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-38-11162016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P1605444-005

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Adam McAfee  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00127

Date Collected: 11/16/16  
 Date Received: 11/21/16  
 Date Analyzed: 11/29/16  
 Volume(s) Analyzed: 0.10 ml(s)

Initial Pressure (psig): -2.22      Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	<b>Oxygen*</b>	<b>1.72</b>	0.15	
7727-37-9	<b>Nitrogen</b>	<b>8.71</b>	0.15	
630-08-0	Carbon Monoxide	ND	0.15	
74-82-8	<b>Methane</b>	<b>55.1</b>	0.15	
124-38-9	<b>Carbon Dioxide</b>	<b>34.4</b>	0.15	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P161129-MB

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Adam McAfee  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 11/29/16  
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.



# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

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**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P161129-LCS

Test Code: ASTM D1946

Instrument ID: HP5890 II/GC1/TCD

Analyst: Adam McAfee

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 11/29/16

Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppmV	Result ppmV	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
7782-44-7	Oxygen*	50,000	<b>52,000</b>	<b>104</b>	97-108	
7727-37-9	Nitrogen	50,000	<b>51,700</b>	<b>103</b>	89-113	
630-08-0	Carbon Monoxide	50,000	<b>51,400</b>	<b>103</b>	98-108	
74-82-8	Methane	50,000	<b>49,600</b>	<b>99</b>	94-111	
124-38-9	Carbon Dioxide	50,000	<b>49,600</b>	<b>99</b>	94-104	

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-43-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-001

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00302

Date Collected: 11/16/16  
 Time Collected: 16:24  
 Date Received: 11/21/16  
 Date Analyzed: 11/23/16  
 Time Analyzed: 07:45  
 Volume(s) Analyzed: 1.0 ml(s)

Initial Pressure (psig): -1.61      Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	10,000	9.6	7,200	6.9	
463-58-1	Carbonyl Sulfide	ND	17	ND	6.9	
74-93-1	Methyl Mercaptan	59	14	30	6.9	
75-08-1	Ethyl Mercaptan	45	18	18	6.9	
75-18-3	Dimethyl Sulfide	47	18	19	6.9	
75-15-0	Carbon Disulfide	ND	11	ND	3.5	
75-33-2	Isopropyl Mercaptan	ND	21	ND	6.9	
75-66-1	tert-Butyl Mercaptan	ND	25	ND	6.9	
107-03-9	n-Propyl Mercaptan	ND	21	ND	6.9	
624-89-5	Ethyl Methyl Sulfide	ND	21	ND	6.9	
110-02-1	Thiophene	ND	24	ND	6.9	
513-44-0	Isobutyl Mercaptan	ND	25	ND	6.9	
352-93-2	Diethyl Sulfide	ND	25	ND	6.9	
109-79-5	n-Butyl Mercaptan	ND	25	ND	6.9	
624-92-0	Dimethyl Disulfide	ND	13	ND	3.5	
616-44-4	3-Methylthiophene	ND	28	ND	6.9	
110-01-0	Tetrahydrothiophene	ND	25	ND	6.9	
638-02-8	2,5-Dimethylthiophene	ND	32	ND	6.9	
872-55-9	2-Ethylthiophene	ND	32	ND	6.9	
110-81-6	Diethyl Disulfide	ND	17	ND	3.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-41-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-002

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00106

Date Collected: 11/16/16  
 Time Collected: 16:32  
 Date Received: 11/21/16  
 Date Analyzed: 11/23/16  
 Time Analyzed: 07:58  
 Volume(s) Analyzed: 1.0 ml(s)

Initial Pressure (psig): -2.49      Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	10	ND	7.4	
463-58-1	Carbonyl Sulfide	ND	18	ND	7.4	
74-93-1	Methyl Mercaptan	ND	14	ND	7.4	
75-08-1	Ethyl Mercaptan	ND	19	ND	7.4	
75-18-3	Dimethyl Sulfide	ND	19	ND	7.4	
75-15-0	Carbon Disulfide	ND	11	ND	3.7	
75-33-2	Isopropyl Mercaptan	ND	23	ND	7.4	
75-66-1	tert-Butyl Mercaptan	ND	27	ND	7.4	
107-03-9	n-Propyl Mercaptan	ND	23	ND	7.4	
624-89-5	Ethyl Methyl Sulfide	ND	23	ND	7.4	
110-02-1	Thiophene	ND	25	ND	7.4	
513-44-0	Isobutyl Mercaptan	ND	27	ND	7.4	
352-93-2	Diethyl Sulfide	ND	27	ND	7.4	
109-79-5	n-Butyl Mercaptan	ND	27	ND	7.4	
624-92-0	Dimethyl Disulfide	ND	14	ND	3.7	
616-44-4	3-Methylthiophene	ND	29	ND	7.4	
110-01-0	Tetrahydrothiophene	ND	26	ND	7.4	
638-02-8	2,5-Dimethylthiophene	ND	34	ND	7.4	
872-55-9	2-Ethylthiophene	ND	34	ND	7.4	
110-81-6	Diethyl Disulfide	ND	18	ND	3.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** Ambient-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-003

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00078

Date Collected: 11/16/16  
 Time Collected: 17:00  
 Date Received: 11/21/16  
 Date Analyzed: 11/23/16  
 Time Analyzed: 08:10  
 Volume(s) Analyzed: 1.0 ml(s)

Initial Pressure (psig): 0.54      Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	8.3	ND	6.0	
463-58-1	Carbonyl Sulfide	ND	15	ND	6.0	
74-93-1	Methyl Mercaptan	ND	12	ND	6.0	
75-08-1	Ethyl Mercaptan	ND	15	ND	6.0	
75-18-3	Dimethyl Sulfide	ND	15	ND	6.0	
75-15-0	Carbon Disulfide	ND	9.3	ND	3.0	
75-33-2	Isopropyl Mercaptan	ND	19	ND	6.0	
75-66-1	tert-Butyl Mercaptan	ND	22	ND	6.0	
107-03-9	n-Propyl Mercaptan	ND	19	ND	6.0	
624-89-5	Ethyl Methyl Sulfide	ND	19	ND	6.0	
110-02-1	Thiophene	ND	20	ND	6.0	
513-44-0	Isobutyl Mercaptan	ND	22	ND	6.0	
352-93-2	Diethyl Sulfide	ND	22	ND	6.0	
109-79-5	n-Butyl Mercaptan	ND	22	ND	6.0	
624-92-0	Dimethyl Disulfide	ND	11	ND	3.0	
616-44-4	3-Methylthiophene	ND	24	ND	6.0	
110-01-0	Tetrahydrothiophene	ND	21	ND	6.0	
638-02-8	2,5-Dimethylthiophene	ND	27	ND	6.0	
872-55-9	2-Ethylthiophene	ND	27	ND	6.0	
110-81-6	Diethyl Disulfide	ND	15	ND	3.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-39-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-004

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00347

Date Collected: 11/16/16  
 Time Collected: 16:48  
 Date Received: 11/21/16  
 Date Analyzed: 11/23/16  
 Time Analyzed: 08:24  
 Volume(s) Analyzed: 1.0 ml(s)

Initial Pressure (psig): -1.25      Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	14,000	9.3	10,000	6.7	
463-58-1	Carbonyl Sulfide	ND	16	ND	6.7	
74-93-1	Methyl Mercaptan	37	13	19	6.7	
75-08-1	Ethyl Mercaptan	39	17	15	6.7	
75-18-3	Dimethyl Sulfide	ND	17	ND	6.7	
75-15-0	Carbon Disulfide	ND	10	ND	3.4	
75-33-2	Isopropyl Mercaptan	ND	21	ND	6.7	
75-66-1	tert-Butyl Mercaptan	ND	25	ND	6.7	
107-03-9	n-Propyl Mercaptan	ND	21	ND	6.7	
624-89-5	Ethyl Methyl Sulfide	ND	21	ND	6.7	
110-02-1	Thiophene	ND	23	ND	6.7	
513-44-0	Isobutyl Mercaptan	ND	25	ND	6.7	
352-93-2	Diethyl Sulfide	ND	25	ND	6.7	
109-79-5	n-Butyl Mercaptan	ND	25	ND	6.7	
624-92-0	Dimethyl Disulfide	ND	13	ND	3.4	
616-44-4	3-Methylthiophene	ND	27	ND	6.7	
110-01-0	Tetrahydrothiophene	ND	24	ND	6.7	
638-02-8	2,5-Dimethylthiophene	ND	31	ND	6.7	
872-55-9	2-Ethylthiophene	ND	31	ND	6.7	
110-81-6	Diethyl Disulfide	ND	17	ND	3.4	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-38-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-005

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00127

Date Collected: 11/16/16  
 Time Collected: 17:33  
 Date Received: 11/21/16  
 Date Analyzed: 11/23/16  
 Time Analyzed: 08:37  
 Volume(s) Analyzed: 1.0 ml(s)

Initial Pressure (psig): -2.22      Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	10	ND	7.3	
463-58-1	Carbonyl Sulfide	<b>63</b>	18	<b>26</b>	7.3	
74-93-1	Methyl Mercaptan	ND	14	ND	7.3	
75-08-1	Ethyl Mercaptan	ND	19	ND	7.3	
75-18-3	Dimethyl Sulfide	ND	19	ND	7.3	
75-15-0	Carbon Disulfide	ND	11	ND	3.7	
75-33-2	Isopropyl Mercaptan	ND	23	ND	7.3	
75-66-1	tert-Butyl Mercaptan	ND	27	ND	7.3	
107-03-9	n-Propyl Mercaptan	ND	23	ND	7.3	
624-89-5	Ethyl Methyl Sulfide	ND	23	ND	7.3	
110-02-1	Thiophene	ND	25	ND	7.3	
513-44-0	Isobutyl Mercaptan	ND	27	ND	7.3	
352-93-2	Diethyl Sulfide	ND	27	ND	7.3	
109-79-5	n-Butyl Mercaptan	ND	27	ND	7.3	
624-92-0	Dimethyl Disulfide	ND	14	ND	3.7	
616-44-4	3-Methylthiophene	ND	29	ND	7.3	
110-01-0	Tetrahydrothiophene	ND	26	ND	7.3	
638-02-8	2,5-Dimethylthiophene	ND	33	ND	7.3	
872-55-9	2-Ethylthiophene	ND	33	ND	7.3	
110-81-6	Diethyl Disulfide	ND	18	ND	3.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P161123-MB

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Time Collected: NA  
 Date Received: NA  
 Date Analyzed: 11/23/16  
 Time Analyzed: 07:26  
 Volume(s) Analyzed: 1.0 ml(s)

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	
463-58-1	Carbonyl Sulfide	ND	12	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-08-1	Ethyl Mercaptan	ND	13	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
75-15-0	Carbon Disulfide	ND	7.8	ND	2.5	
75-33-2	Isopropyl Mercaptan	ND	16	ND	5.0	
75-66-1	tert-Butyl Mercaptan	ND	18	ND	5.0	
107-03-9	n-Propyl Mercaptan	ND	16	ND	5.0	
624-89-5	Ethyl Methyl Sulfide	ND	16	ND	5.0	
110-02-1	Thiophene	ND	17	ND	5.0	
513-44-0	Isobutyl Mercaptan	ND	18	ND	5.0	
352-93-2	Diethyl Sulfide	ND	18	ND	5.0	
109-79-5	n-Butyl Mercaptan	ND	18	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	
616-44-4	3-Methylthiophene	ND	20	ND	5.0	
110-01-0	Tetrahydrothiophene	ND	18	ND	5.0	
638-02-8	2,5-Dimethylthiophene	ND	23	ND	5.0	
872-55-9	2-Ethylthiophene	ND	23	ND	5.0	
110-81-6	Diethyl Disulfide	ND	12	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** Lab Control Sample  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P161123-LCS

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 11/23/16  
 Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppbV	Result ppbV	% Recovery	ALS	
					Acceptance Limits	Data Qualifier
7783-06-4	Hydrogen Sulfide	1,000	<b>1,080</b>	<b>108</b>	75-148	
463-58-1	Carbonyl Sulfide	1,000	<b>1,050</b>	<b>105</b>	70-137	
74-93-1	Methyl Mercaptan	1,000	<b>1,040</b>	<b>104</b>	72-139	



**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

**Total Gaseous Nonmethane Organics (TGNMO) as Methane**

Test Code: EPA Method 25C Modified  
 Instrument ID: HP5890 II/GC1/FID/TCA  
 Analyst: Adam McAfee  
 Sampling Media: 6.0 L Silonite Canister(s)  
 Test Notes:

Date(s) Collected: 11/16/16  
 Date Received: 11/21/16  
 Date Analyzed: #N/A

Client Sample ID	ALS Sample ID	Canister Dilution Factor	Injection Volume ml(s)	Result ppmV	MRL ppmV	Data Qualifier
GP-43-11162016	P1605444-001	1.38	0.50	<b>350</b>	1.4	
GP-41-11162016	P1605444-002	1.47	0.50	<b>640</b>	1.5	
Ambient-11162016	P1605444-003	1.19	0.50	ND	1.2	
GP-39-11162016	P1605444-004	1.34	0.50	<b>630</b>	1.3	
GP-38-11162016	P1605444-005	1.46	0.50	<b>220</b>	1.5	
Method Blank	P161129-MB	1.00	0.50	ND	1.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Lab Control Sample  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
ALS Sample ID: P161129-LCS

Test Code: EPA Method 25C Modified  
Instrument ID: HP5890 II/GC1/FID/TCA  
Analyst: Adam McAfee  
Sampling Media: 6.0 L Silonite Canister  
Test Notes:

Date Collected: NA  
Date Received: NA  
Date Analyzed: 11/29/16  
Volume(s) Analyzed: NA ml(s)

Compound	Spike Amount ppmV	Result ppmV	% Recovery	ALS Acceptance Limits
Total Gaseous Nonmethane Organics (TGNMO) as Methane	300	266	89	85-121

Data  
Qualifier

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# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-43-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-001

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.010 Liter(s)

Test Notes:

Container ID: SSC00302

Initial Pressure (psig): -1.61      Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	800	69	470	40	
75-71-8	Dichlorodifluoromethane (CFC 12)	1,600	69	330	14	
74-87-3	Chloromethane	ND	69	ND	33	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	980	69	140	9.9	
75-01-4	Vinyl Chloride	3,900	69	1,500	27	
106-99-0	1,3-Butadiene	ND	69	ND	31	
74-83-9	Bromomethane	ND	69	ND	18	
75-00-3	Chloroethane	ND	69	ND	26	
64-17-5	Ethanol	ND	690	ND	370	
75-05-8	Acetonitrile	ND	69	ND	41	
107-02-8	Acrolein	ND	280	ND	120	
67-64-1	Acetone	4,200	690	1,800	290	
75-69-4	Trichlorofluoromethane	510	69	91	12	
67-63-0	2-Propanol (Isopropyl Alcohol)	1,700	690	690	280	
107-13-1	Acrylonitrile	ND	69	ND	32	
75-35-4	1,1-Dichloroethene	99	69	25	17	
75-09-2	Methylene Chloride	110	69	32	20	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	69	ND	22	
76-13-1	Trichlorotrifluoroethane	ND	69	ND	9.0	
75-15-0	Carbon Disulfide	ND	690	ND	220	
156-60-5	trans-1,2-Dichloroethene	150	69	38	17	
75-34-3	1,1-Dichloroethane	ND	69	ND	17	
1634-04-4	Methyl tert-Butyl Ether	ND	69	ND	19	
108-05-4	Vinyl Acetate	ND	690	ND	200	
78-93-3	2-Butanone (MEK)	5,500	690	1,900	230	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-43-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-001

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.010 Liter(s)

Test Notes:

Container ID: SSC00302

Initial Pressure (psig): -1.61      Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	5,100	69	1,300	17	
141-78-6	Ethyl Acetate	ND	140	ND	38	
110-54-3	n-Hexane	660	69	190	20	
67-66-3	Chloroform	ND	69	ND	14	
109-99-9	Tetrahydrofuran (THF)	1,100	69	360	23	
107-06-2	1,2-Dichloroethane	ND	69	ND	17	
71-55-6	1,1,1-Trichloroethane	ND	69	ND	13	
71-43-2	Benzene	370	69	120	22	
56-23-5	Carbon Tetrachloride	ND	69	ND	11	
110-82-7	Cyclohexane	580	140	170	40	
78-87-5	1,2-Dichloropropane	ND	69	ND	15	
75-27-4	Bromodichloromethane	ND	69	ND	10	
79-01-6	Trichloroethene	460	69	86	13	
123-91-1	1,4-Dioxane	ND	69	ND	19	
80-62-6	Methyl Methacrylate	ND	140	ND	34	
142-82-5	n-Heptane	2,000	69	500	17	
10061-01-5	cis-1,3-Dichloropropene	ND	69	ND	15	
108-10-1	4-Methyl-2-pentanone	1,000	69	240	17	
10061-02-6	trans-1,3-Dichloropropene	ND	69	ND	15	
79-00-5	1,1,2-Trichloroethane	ND	69	ND	13	
108-88-3	Toluene	8,400	69	2,200	18	
591-78-6	2-Hexanone	ND	69	ND	17	
124-48-1	Dibromochloromethane	ND	69	ND	8.1	
106-93-4	1,2-Dibromoethane	ND	69	ND	9.0	
123-86-4	n-Butyl Acetate	ND	69	ND	15	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-43-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-001

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.010 Liter(s)

Test Notes:

Container ID: SSC00302

Initial Pressure (psig): -1.61      Final Pressure (psig): 3.31

Canister Dilution Factor: 1.38

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	1,800	69	380	15	
127-18-4	Tetrachloroethene	810	69	120	10	
108-90-7	Chlorobenzene	96	69	21	15	
100-41-4	Ethylbenzene	4,500	69	1,000	16	
179601-23-1	m,p-Xylenes	8,600	140	2,000	32	
75-25-2	Bromoform	ND	69	ND	6.7	
100-42-5	Styrene	160	69	38	16	
95-47-6	o-Xylene	2,200	69	510	16	
111-84-2	n-Nonane	3,200	69	610	13	
79-34-5	1,1,2,2-Tetrachloroethane	ND	69	ND	10	
98-82-8	Cumene	750	69	150	14	
80-56-8	alpha-Pinene	4,100	69	730	12	
103-65-1	n-Propylbenzene	690	69	140	14	
622-96-8	4-Ethyltoluene	290	69	59	14	
108-67-8	1,3,5-Trimethylbenzene	550	69	110	14	
95-63-6	1,2,4-Trimethylbenzene	1,500	69	310	14	
100-44-7	Benzyl Chloride	ND	69	ND	13	
541-73-1	1,3-Dichlorobenzene	ND	69	ND	11	
106-46-7	1,4-Dichlorobenzene	ND	69	ND	11	
95-50-1	1,2-Dichlorobenzene	ND	69	ND	11	
5989-27-5	d-Limonene	8,000	69	1,400	12	
96-12-8	1,2-Dibromo-3-chloropropane	ND	69	ND	7.1	
120-82-1	1,2,4-Trichlorobenzene	ND	69	ND	9.3	
91-20-3	Naphthalene	ND	69	ND	13	
87-68-3	Hexachlorobutadiene	ND	69	ND	6.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-41-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-002

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.0050 Liter(s)

Test Notes:

Container ID: SSC00106

Initial Pressure (psig): -2.49      Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	500	150	290	85	
75-71-8	Dichlorodifluoromethane (CFC 12)	1,100	150	210	30	
74-87-3	Chloromethane	ND	150	ND	71	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	980	150	140	21	
75-01-4	Vinyl Chloride	3,700	150	1,500	58	
106-99-0	1,3-Butadiene	ND	150	ND	66	
74-83-9	Bromomethane	ND	150	ND	38	
75-00-3	Chloroethane	ND	150	ND	56	
64-17-5	Ethanol	ND	1,500	ND	780	
75-05-8	Acetonitrile	ND	150	ND	88	
107-02-8	Acrolein	ND	590	ND	260	
67-64-1	Acetone	ND	1,500	ND	620	
75-69-4	Trichlorofluoromethane	ND	150	ND	26	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	1,500	ND	600	
107-13-1	Acrylonitrile	ND	150	ND	68	
75-35-4	1,1-Dichloroethene	ND	150	ND	37	
75-09-2	Methylene Chloride	ND	150	ND	42	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	150	ND	47	
76-13-1	Trichlorotrifluoroethane	ND	150	ND	19	
75-15-0	Carbon Disulfide	ND	1,500	ND	470	
156-60-5	trans-1,2-Dichloroethene	ND	150	ND	37	
75-34-3	1,1-Dichloroethane	ND	150	ND	36	
1634-04-4	Methyl tert-Butyl Ether	ND	150	ND	41	
108-05-4	Vinyl Acetate	ND	1,500	ND	420	
78-93-3	2-Butanone (MEK)	ND	1,500	ND	500	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-41-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-002

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.0050 Liter(s)

Test Notes:

Container ID: SSC00106

Initial Pressure (psig): -2.49      Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	970	150	250	37	
141-78-6	Ethyl Acetate	ND	290	ND	82	
110-54-3	n-Hexane	400	150	110	42	
67-66-3	Chloroform	ND	150	ND	30	
109-99-9	Tetrahydrofuran (THF)	ND	150	ND	50	
107-06-2	1,2-Dichloroethane	ND	150	ND	36	
71-55-6	1,1,1-Trichloroethane	ND	150	ND	27	
71-43-2	Benzene	220	150	69	46	
56-23-5	Carbon Tetrachloride	ND	150	ND	23	
110-82-7	Cyclohexane	320	290	93	85	
78-87-5	1,2-Dichloropropane	ND	150	ND	32	
75-27-4	Bromodichloromethane	ND	150	ND	22	
79-01-6	Trichloroethene	ND	150	ND	27	
123-91-1	1,4-Dioxane	ND	150	ND	41	
80-62-6	Methyl Methacrylate	ND	290	ND	72	
142-82-5	n-Heptane	490	150	120	36	
10061-01-5	cis-1,3-Dichloropropene	ND	150	ND	32	
108-10-1	4-Methyl-2-pentanone	ND	150	ND	36	
10061-02-6	trans-1,3-Dichloropropene	ND	150	ND	32	
79-00-5	1,1,2-Trichloroethane	ND	150	ND	27	
108-88-3	Toluene	260	150	70	39	
591-78-6	2-Hexanone	ND	150	ND	36	
124-48-1	Dibromochloromethane	ND	150	ND	17	
106-93-4	1,2-Dibromoethane	ND	150	ND	19	
123-86-4	n-Butyl Acetate	ND	150	ND	31	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-41-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-002

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.0050 Liter(s)

Test Notes:

Container ID: SSC00106

Initial Pressure (psig): -2.49      Final Pressure (psig): 3.27

Canister Dilution Factor: 1.47

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	320	150	69	31	
127-18-4	Tetrachloroethene	230	150	34	22	
108-90-7	Chlorobenzene	ND	150	ND	32	
100-41-4	Ethylbenzene	ND	150	ND	34	
179601-23-1	m,p-Xylenes	ND	290	ND	68	
75-25-2	Bromoform	ND	150	ND	14	
100-42-5	Styrene	ND	150	ND	35	
95-47-6	o-Xylene	ND	150	ND	34	
111-84-2	n-Nonane	480	150	91	28	
79-34-5	1,1,2,2-Tetrachloroethane	ND	150	ND	21	
98-82-8	Cumene	ND	150	ND	30	
80-56-8	alpha-Pinene	ND	150	ND	26	
103-65-1	n-Propylbenzene	ND	150	ND	30	
622-96-8	4-Ethyltoluene	ND	150	ND	30	
108-67-8	1,3,5-Trimethylbenzene	ND	150	ND	30	
95-63-6	1,2,4-Trimethylbenzene	ND	150	ND	30	
100-44-7	Benzyl Chloride	ND	150	ND	28	
541-73-1	1,3-Dichlorobenzene	ND	150	ND	24	
106-46-7	1,4-Dichlorobenzene	ND	150	ND	24	
95-50-1	1,2-Dichlorobenzene	ND	150	ND	24	
5989-27-5	d-Limonene	ND	150	ND	26	
96-12-8	1,2-Dibromo-3-chloropropane	ND	150	ND	15	
120-82-1	1,2,4-Trichlorobenzene	ND	150	ND	20	
91-20-3	Naphthalene	ND	150	ND	28	
87-68-3	Hexachlorobutadiene	ND	150	ND	14	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** Ambient-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-003

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 12/5/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 1.00 Liter(s)

Test Notes:

Container ID: SSC00078

Initial Pressure (psig): 0.54      Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	1.3	0.60	0.78	0.35	
75-71-8	Dichlorodifluoromethane (CFC 12)	2.2	0.60	0.45	0.12	
74-87-3	Chloromethane	ND	0.60	ND	0.29	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.60	ND	0.085	
75-01-4	Vinyl Chloride	ND	0.60	ND	0.23	
106-99-0	1,3-Butadiene	ND	0.60	ND	0.27	
74-83-9	Bromomethane	ND	0.60	ND	0.15	
75-00-3	Chloroethane	ND	0.60	ND	0.23	
64-17-5	Ethanol	ND	6.0	ND	3.2	
75-05-8	Acetonitrile	ND	0.60	ND	0.35	
107-02-8	Acrolein	ND	2.4	ND	1.0	
67-64-1	Acetone	ND	6.0	ND	2.5	
75-69-4	Trichlorofluoromethane	1.1	0.60	0.20	0.11	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	6.0	ND	2.4	
107-13-1	Acrylonitrile	ND	0.60	ND	0.27	
75-35-4	1,1-Dichloroethene	ND	0.60	ND	0.15	
75-09-2	Methylene Chloride	ND	0.60	ND	0.17	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.60	ND	0.19	
76-13-1	Trichlorotrifluoroethane	ND	0.60	ND	0.078	
75-15-0	Carbon Disulfide	ND	6.0	ND	1.9	
156-60-5	trans-1,2-Dichloroethene	ND	0.60	ND	0.15	
75-34-3	1,1-Dichloroethane	ND	0.60	ND	0.15	
1634-04-4	Methyl tert-Butyl Ether	ND	0.60	ND	0.17	
108-05-4	Vinyl Acetate	ND	6.0	ND	1.7	
78-93-3	2-Butanone (MEK)	ND	6.0	ND	2.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** Ambient-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-003

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 12/5/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 1.00 Liter(s)

Test Notes:

Container ID: SSC00078

Initial Pressure (psig): 0.54      Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	0.60	ND	0.15	
141-78-6	Ethyl Acetate	ND	1.2	ND	0.33	
110-54-3	n-Hexane	ND	0.60	ND	0.17	
67-66-3	Chloroform	ND	0.60	ND	0.12	
109-99-9	Tetrahydrofuran (THF)	ND	0.60	ND	0.20	
107-06-2	1,2-Dichloroethane	ND	0.60	ND	0.15	
71-55-6	1,1,1-Trichloroethane	ND	0.60	ND	0.11	
71-43-2	Benzene	<b>0.60</b>	0.60	<b>0.19</b>	0.19	
56-23-5	Carbon Tetrachloride	ND	0.60	ND	0.095	
110-82-7	Cyclohexane	ND	1.2	ND	0.35	
78-87-5	1,2-Dichloropropane	ND	0.60	ND	0.13	
75-27-4	Bromodichloromethane	ND	0.60	ND	0.089	
79-01-6	Trichloroethene	ND	0.60	ND	0.11	
123-91-1	1,4-Dioxane	ND	0.60	ND	0.17	
80-62-6	Methyl Methacrylate	ND	1.2	ND	0.29	
142-82-5	n-Heptane	ND	0.60	ND	0.15	
10061-01-5	cis-1,3-Dichloropropene	ND	0.60	ND	0.13	
108-10-1	4-Methyl-2-pentanone	ND	0.60	ND	0.15	
10061-02-6	trans-1,3-Dichloropropene	ND	0.60	ND	0.13	
79-00-5	1,1,2-Trichloroethane	ND	0.60	ND	0.11	
108-88-3	Toluene	<b>2.2</b>	0.60	<b>0.59</b>	0.16	
591-78-6	2-Hexanone	ND	0.60	ND	0.15	
124-48-1	Dibromochloromethane	ND	0.60	ND	0.070	
106-93-4	1,2-Dibromoethane	ND	0.60	ND	0.077	
123-86-4	n-Butyl Acetate	ND	0.60	ND	0.13	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** Ambient-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-003

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 12/5/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 1.00 Liter(s)

Test Notes:

Container ID: SSC00078

Initial Pressure (psig): 0.54      Final Pressure (psig): 3.47

Canister Dilution Factor: 1.19

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.60	ND	0.13	
127-18-4	Tetrachloroethene	ND	0.60	ND	0.088	
108-90-7	Chlorobenzene	ND	0.60	ND	0.13	
100-41-4	Ethylbenzene	ND	0.60	ND	0.14	
179601-23-1	m,p-Xylenes	ND	1.2	ND	0.27	
75-25-2	Bromoform	ND	0.60	ND	0.058	
100-42-5	Styrene	ND	0.60	ND	0.14	
95-47-6	o-Xylene	ND	0.60	ND	0.14	
111-84-2	n-Nonane	ND	0.60	ND	0.11	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.60	ND	0.087	
98-82-8	Cumene	ND	0.60	ND	0.12	
80-56-8	alpha-Pinene	ND	0.60	ND	0.11	
103-65-1	n-Propylbenzene	ND	0.60	ND	0.12	
622-96-8	4-Ethyltoluene	ND	0.60	ND	0.12	
108-67-8	1,3,5-Trimethylbenzene	ND	0.60	ND	0.12	
95-63-6	1,2,4-Trimethylbenzene	ND	0.60	ND	0.12	
100-44-7	Benzyl Chloride	ND	0.60	ND	0.11	
541-73-1	1,3-Dichlorobenzene	ND	0.60	ND	0.099	
106-46-7	1,4-Dichlorobenzene	ND	0.60	ND	0.099	
95-50-1	1,2-Dichlorobenzene	ND	0.60	ND	0.099	
5989-27-5	d-Limonene	ND	0.60	ND	0.11	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.60	ND	0.062	
120-82-1	1,2,4-Trichlorobenzene	ND	0.60	ND	0.080	
91-20-3	Naphthalene	ND	0.60	ND	0.11	
87-68-3	Hexachlorobutadiene	ND	0.60	ND	0.056	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-39-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-004

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.0040 Liter(s)

Test Notes:

Container ID: SSC00347

Initial Pressure (psig): -1.25      Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	800	170	460	97	
75-71-8	Dichlorodifluoromethane (CFC 12)	970	170	200	34	
74-87-3	Chloromethane	ND	170	ND	81	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	1,100	170	150	24	
75-01-4	Vinyl Chloride	6,600	170	2,600	66	
106-99-0	1,3-Butadiene	ND	170	ND	76	
74-83-9	Bromomethane	ND	170	ND	43	
75-00-3	Chloroethane	ND	170	ND	64	
64-17-5	Ethanol	ND	1,700	ND	890	
75-05-8	Acetonitrile	ND	170	ND	100	
107-02-8	Acrolein	ND	670	ND	290	
67-64-1	Acetone	ND	1,700	ND	710	
75-69-4	Trichlorofluoromethane	ND	170	ND	30	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	1,700	ND	680	
107-13-1	Acrylonitrile	ND	170	ND	77	
75-35-4	1,1-Dichloroethene	ND	170	ND	42	
75-09-2	Methylene Chloride	ND	170	ND	48	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	170	ND	54	
76-13-1	Trichlorotrifluoroethane	ND	170	ND	22	
75-15-0	Carbon Disulfide	ND	1,700	ND	540	
156-60-5	trans-1,2-Dichloroethene	ND	170	ND	42	
75-34-3	1,1-Dichloroethane	ND	170	ND	41	
1634-04-4	Methyl tert-Butyl Ether	ND	170	ND	46	
108-05-4	Vinyl Acetate	ND	1,700	ND	480	
78-93-3	2-Butanone (MEK)	ND	1,700	ND	570	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-39-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-004

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.0040 Liter(s)

Test Notes:

Container ID: SSC00347

Initial Pressure (psig): -1.25      Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	1,500	170	380	42	
141-78-6	Ethyl Acetate	ND	340	ND	93	
110-54-3	n-Hexane	820	170	230	48	
67-66-3	Chloroform	ND	170	ND	34	
109-99-9	Tetrahydrofuran (THF)	ND	170	ND	57	
107-06-2	1,2-Dichloroethane	ND	170	ND	41	
71-55-6	1,1,1-Trichloroethane	ND	170	ND	31	
71-43-2	Benzene	410	170	130	52	
56-23-5	Carbon Tetrachloride	ND	170	ND	27	
110-82-7	Cyclohexane	2,800	340	820	97	
78-87-5	1,2-Dichloropropane	ND	170	ND	36	
75-27-4	Bromodichloromethane	ND	170	ND	25	
79-01-6	Trichloroethene	ND	170	ND	31	
123-91-1	1,4-Dioxane	ND	170	ND	46	
80-62-6	Methyl Methacrylate	ND	340	ND	82	
142-82-5	n-Heptane	2,000	170	490	41	
10061-01-5	cis-1,3-Dichloropropene	ND	170	ND	37	
108-10-1	4-Methyl-2-pentanone	ND	170	ND	41	
10061-02-6	trans-1,3-Dichloropropene	ND	170	ND	37	
79-00-5	1,1,2-Trichloroethane	ND	170	ND	31	
108-88-3	Toluene	1,900	170	500	44	
591-78-6	2-Hexanone	ND	170	ND	41	
124-48-1	Dibromochloromethane	ND	170	ND	20	
106-93-4	1,2-Dibromoethane	ND	170	ND	22	
123-86-4	n-Butyl Acetate	ND	170	ND	35	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 3 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-39-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-004

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.0040 Liter(s)

Test Notes:

Container ID: SSC00347

Initial Pressure (psig): -1.25      Final Pressure (psig): 3.36

Canister Dilution Factor: 1.34

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	1,700	170	360	36	
127-18-4	Tetrachloroethene	ND	170	ND	25	
108-90-7	Chlorobenzene	ND	170	ND	36	
100-41-4	Ethylbenzene	3,800	170	870	39	
179601-23-1	m,p-Xylenes	7,600	340	1,700	77	
75-25-2	Bromoform	ND	170	ND	16	
100-42-5	Styrene	ND	170	ND	39	
95-47-6	o-Xylene	2,800	170	640	39	
111-84-2	n-Nonane	13,000	170	2,500	32	
79-34-5	1,1,2,2-Tetrachloroethane	ND	170	ND	24	
98-82-8	Cumene	690	170	140	34	
80-56-8	alpha-Pinene	1,200	170	220	30	
103-65-1	n-Propylbenzene	1,000	170	210	34	
622-96-8	4-Ethyltoluene	470	170	95	34	
108-67-8	1,3,5-Trimethylbenzene	1,500	170	310	34	
95-63-6	1,2,4-Trimethylbenzene	3,400	170	700	34	
100-44-7	Benzyl Chloride	ND	170	ND	32	
541-73-1	1,3-Dichlorobenzene	ND	170	ND	28	
106-46-7	1,4-Dichlorobenzene	ND	170	ND	28	
95-50-1	1,2-Dichlorobenzene	ND	170	ND	28	
5989-27-5	d-Limonene	620	170	110	30	
96-12-8	1,2-Dibromo-3-chloropropane	ND	170	ND	17	
120-82-1	1,2,4-Trichlorobenzene	ND	170	ND	23	
91-20-3	Naphthalene	ND	170	ND	32	
87-68-3	Hexachlorobutadiene	ND	170	ND	16	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-38-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-005

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.020 Liter(s)

Test Notes:

Container ID: SSC00127

Initial Pressure (psig): -2.22      Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	800	37	460	21	
75-71-8	Dichlorodifluoromethane (CFC 12)	110	37	23	7.4	
74-87-3	Chloromethane	ND	37	ND	18	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	1,400	37	190	5.2	
75-01-4	Vinyl Chloride	90	37	35	14	
106-99-0	1,3-Butadiene	ND	37	ND	17	
74-83-9	Bromomethane	ND	37	ND	9.4	
75-00-3	Chloroethane	ND	37	ND	14	
64-17-5	Ethanol	ND	370	ND	190	
75-05-8	Acetonitrile	ND	37	ND	22	
107-02-8	Acrolein	ND	150	ND	64	
67-64-1	Acetone	ND	370	ND	150	
75-69-4	Trichlorofluoromethane	ND	37	ND	6.5	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	370	ND	150	
107-13-1	Acrylonitrile	ND	37	ND	17	
75-35-4	1,1-Dichloroethene	ND	37	ND	9.2	
75-09-2	Methylene Chloride	ND	37	ND	11	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	37	ND	12	
76-13-1	Trichlorotrifluoroethane	ND	37	ND	4.8	
75-15-0	Carbon Disulfide	ND	370	ND	120	
156-60-5	trans-1,2-Dichloroethene	ND	37	ND	9.2	
75-34-3	1,1-Dichloroethane	ND	37	ND	9.0	
1634-04-4	Methyl tert-Butyl Ether	ND	37	ND	10	
108-05-4	Vinyl Acetate	ND	370	ND	100	
78-93-3	2-Butanone (MEK)	ND	370	ND	120	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-38-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-005

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.020 Liter(s)

Test Notes:

Container ID: SSC00127

Initial Pressure (psig): -2.22      Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	37	ND	9.2	
141-78-6	Ethyl Acetate	ND	73	ND	20	
110-54-3	n-Hexane	830	37	240	10	
67-66-3	Chloroform	ND	37	ND	7.5	
109-99-9	Tetrahydrofuran (THF)	ND	37	ND	12	
107-06-2	1,2-Dichloroethane	ND	37	ND	9.0	
71-55-6	1,1,1-Trichloroethane	ND	37	ND	6.7	
71-43-2	Benzene	78	37	25	11	
56-23-5	Carbon Tetrachloride	ND	37	ND	5.8	
110-82-7	Cyclohexane	1,800	73	530	21	
78-87-5	1,2-Dichloropropane	ND	37	ND	7.9	
75-27-4	Bromodichloromethane	ND	37	ND	5.5	
79-01-6	Trichloroethene	ND	37	ND	6.8	
123-91-1	1,4-Dioxane	ND	37	ND	10	
80-62-6	Methyl Methacrylate	ND	73	ND	18	
142-82-5	n-Heptane	2,200	37	540	8.9	
10061-01-5	cis-1,3-Dichloropropene	ND	37	ND	8.0	
108-10-1	4-Methyl-2-pentanone	ND	37	ND	8.9	
10061-02-6	trans-1,3-Dichloropropene	ND	37	ND	8.0	
79-00-5	1,1,2-Trichloroethane	ND	37	ND	6.7	
108-88-3	Toluene	110	37	30	9.7	
591-78-6	2-Hexanone	ND	37	ND	8.9	
124-48-1	Dibromochloromethane	ND	37	ND	4.3	
106-93-4	1,2-Dibromoethane	ND	37	ND	4.8	
123-86-4	n-Butyl Acetate	ND	37	ND	7.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 3 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-38-11162016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P1605444-005

Test Code: EPA TO-15 Modified

Date Collected: 11/16/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 11/21/16

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.020 Liter(s)

Test Notes:

Container ID: SSC00127

Initial Pressure (psig): -2.22      Final Pressure (psig): 3.48

Canister Dilution Factor: 1.46

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	490	37	100	7.8	
127-18-4	Tetrachloroethene	ND	37	ND	5.4	
108-90-7	Chlorobenzene	ND	37	ND	7.9	
100-41-4	Ethylbenzene	38	37	8.8	8.4	
179601-23-1	m,p-Xylenes	1,200	73	280	17	
75-25-2	Bromoform	ND	37	ND	3.5	
100-42-5	Styrene	ND	37	ND	8.6	
95-47-6	o-Xylene	430	37	98	8.4	
111-84-2	n-Nonane	140	37	26	7.0	
79-34-5	1,1,2,2-Tetrachloroethane	ND	37	ND	5.3	
98-82-8	Cumene	ND	37	ND	7.4	
80-56-8	alpha-Pinene	110	37	21	6.6	
103-65-1	n-Propylbenzene	ND	37	ND	7.4	
622-96-8	4-Ethyltoluene	51	37	10	7.4	
108-67-8	1,3,5-Trimethylbenzene	220	37	46	7.4	
95-63-6	1,2,4-Trimethylbenzene	260	37	53	7.4	
100-44-7	Benzyl Chloride	ND	37	ND	7.1	
541-73-1	1,3-Dichlorobenzene	ND	37	ND	6.1	
106-46-7	1,4-Dichlorobenzene	61	37	10	6.1	
95-50-1	1,2-Dichlorobenzene	ND	37	ND	6.1	
5989-27-5	d-Limonene	ND	37	ND	6.6	
96-12-8	1,2-Dibromo-3-chloropropane	ND	37	ND	3.8	
120-82-1	1,2,4-Trichlorobenzene	ND	37	ND	4.9	
91-20-3	Naphthalene	ND	37	ND	7.0	
87-68-3	Hexachlorobutadiene	ND	37	ND	3.4	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Method Blank

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P161130-MB

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Lusine Hakobyan

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 11/30/16

Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	ND	0.50	ND	0.29	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.50	ND	0.10	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.50	ND	0.072	
75-01-4	Vinyl Chloride	ND	0.50	ND	0.20	
106-99-0	1,3-Butadiene	ND	0.50	ND	0.23	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.50	ND	0.19	
64-17-5	Ethanol	ND	5.0	ND	2.7	
75-05-8	Acetonitrile	ND	0.50	ND	0.30	
107-02-8	Acrolein	ND	2.0	ND	0.87	
67-64-1	Acetone	ND	5.0	ND	2.1	
75-69-4	Trichlorofluoromethane	ND	0.50	ND	0.089	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	5.0	ND	2.0	
107-13-1	Acrylonitrile	ND	0.50	ND	0.23	
75-35-4	1,1-Dichloroethene	ND	0.50	ND	0.13	
75-09-2	Methylene Chloride	ND	0.50	ND	0.14	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.50	ND	0.16	
76-13-1	Trichlorotrifluoroethane	ND	0.50	ND	0.065	
75-15-0	Carbon Disulfide	ND	5.0	ND	1.6	
156-60-5	trans-1,2-Dichloroethene	ND	0.50	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.50	ND	0.12	
1634-04-4	Methyl tert-Butyl Ether	ND	0.50	ND	0.14	
108-05-4	Vinyl Acetate	ND	5.0	ND	1.4	
78-93-3	2-Butanone (MEK)	ND	5.0	ND	1.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Method Blank

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P161130-MB

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Lusine Hakobyan

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 11/30/16

Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	0.50	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.0	ND	0.28	
110-54-3	n-Hexane	ND	0.50	ND	0.14	
67-66-3	Chloroform	ND	0.50	ND	0.10	
109-99-9	Tetrahydrofuran (THF)	ND	0.50	ND	0.17	
107-06-2	1,2-Dichloroethane	ND	0.50	ND	0.12	
71-55-6	1,1,1-Trichloroethane	ND	0.50	ND	0.092	
71-43-2	Benzene	ND	0.50	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.50	ND	0.080	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.50	ND	0.11	
75-27-4	Bromodichloromethane	ND	0.50	ND	0.075	
79-01-6	Trichloroethene	ND	0.50	ND	0.093	
123-91-1	1,4-Dioxane	ND	0.50	ND	0.14	
80-62-6	Methyl Methacrylate	ND	1.0	ND	0.24	
142-82-5	n-Heptane	ND	0.50	ND	0.12	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ND	0.11	
108-10-1	4-Methyl-2-pentanone	ND	0.50	ND	0.12	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ND	0.11	
79-00-5	1,1,2-Trichloroethane	ND	0.50	ND	0.092	
108-88-3	Toluene	ND	0.50	ND	0.13	
591-78-6	2-Hexanone	ND	0.50	ND	0.12	
124-48-1	Dibromochloromethane	ND	0.50	ND	0.059	
106-93-4	1,2-Dibromoethane	ND	0.50	ND	0.065	
123-86-4	n-Butyl Acetate	ND	0.50	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 3 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P161130-MB

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 11/30/16  
 Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.50	ND	0.11	
127-18-4	Tetrachloroethene	ND	0.50	ND	0.074	
108-90-7	Chlorobenzene	ND	0.50	ND	0.11	
100-41-4	Ethylbenzene	ND	0.50	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.0	ND	0.23	
75-25-2	Bromoform	ND	0.50	ND	0.048	
100-42-5	Styrene	ND	0.50	ND	0.12	
95-47-6	o-Xylene	ND	0.50	ND	0.12	
111-84-2	n-Nonane	ND	0.50	ND	0.095	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	ND	0.073	
98-82-8	Cumene	ND	0.50	ND	0.10	
80-56-8	alpha-Pinene	ND	0.50	ND	0.090	
103-65-1	n-Propylbenzene	ND	0.50	ND	0.10	
622-96-8	4-Ethyltoluene	ND	0.50	ND	0.10	
108-67-8	1,3,5-Trimethylbenzene	ND	0.50	ND	0.10	
95-63-6	1,2,4-Trimethylbenzene	ND	0.50	ND	0.10	
100-44-7	Benzyl Chloride	ND	0.50	ND	0.097	
541-73-1	1,3-Dichlorobenzene	ND	0.50	ND	0.083	
106-46-7	1,4-Dichlorobenzene	ND	0.50	ND	0.083	
95-50-1	1,2-Dichlorobenzene	ND	0.50	ND	0.083	
5989-27-5	d-Limonene	ND	0.50	ND	0.090	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.50	ND	0.052	
120-82-1	1,2,4-Trichlorobenzene	ND	0.50	ND	0.067	
91-20-3	Naphthalene	ND	0.50	ND	0.095	
87-68-3	Hexachlorobutadiene	ND	0.50	ND	0.047	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Method Blank

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P161205-MB

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Lusine Hakobyan

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 12/5/16

Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	ND	0.50	ND	0.29	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.50	ND	0.10	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.50	ND	0.072	
75-01-4	Vinyl Chloride	ND	0.50	ND	0.20	
106-99-0	1,3-Butadiene	ND	0.50	ND	0.23	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.50	ND	0.19	
64-17-5	Ethanol	ND	5.0	ND	2.7	
75-05-8	Acetonitrile	ND	0.50	ND	0.30	
107-02-8	Acrolein	ND	2.0	ND	0.87	
67-64-1	Acetone	ND	5.0	ND	2.1	
75-69-4	Trichlorofluoromethane	ND	0.50	ND	0.089	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	5.0	ND	2.0	
107-13-1	Acrylonitrile	ND	0.50	ND	0.23	
75-35-4	1,1-Dichloroethene	ND	0.50	ND	0.13	
75-09-2	Methylene Chloride	ND	0.50	ND	0.14	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.50	ND	0.16	
76-13-1	Trichlorotrifluoroethane	ND	0.50	ND	0.065	
75-15-0	Carbon Disulfide	ND	5.0	ND	1.6	
156-60-5	trans-1,2-Dichloroethene	ND	0.50	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.50	ND	0.12	
1634-04-4	Methyl tert-Butyl Ether	ND	0.50	ND	0.14	
108-05-4	Vinyl Acetate	ND	5.0	ND	1.4	
78-93-3	2-Butanone (MEK)	ND	5.0	ND	1.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Method Blank

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P161205-MB

Test Code: EPA TO-15 Modified

Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: NA

Analyst: Lusine Hakobyan

Date Analyzed: 12/5/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 1.00 Liter(s)

Test Notes:

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	0.50	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.0	ND	0.28	
110-54-3	n-Hexane	ND	0.50	ND	0.14	
67-66-3	Chloroform	ND	0.50	ND	0.10	
109-99-9	Tetrahydrofuran (THF)	ND	0.50	ND	0.17	
107-06-2	1,2-Dichloroethane	ND	0.50	ND	0.12	
71-55-6	1,1,1-Trichloroethane	ND	0.50	ND	0.092	
71-43-2	Benzene	ND	0.50	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.50	ND	0.080	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.50	ND	0.11	
75-27-4	Bromodichloromethane	ND	0.50	ND	0.075	
79-01-6	Trichloroethene	ND	0.50	ND	0.093	
123-91-1	1,4-Dioxane	ND	0.50	ND	0.14	
80-62-6	Methyl Methacrylate	ND	1.0	ND	0.24	
142-82-5	n-Heptane	ND	0.50	ND	0.12	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ND	0.11	
108-10-1	4-Methyl-2-pentanone	ND	0.50	ND	0.12	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ND	0.11	
79-00-5	1,1,2-Trichloroethane	ND	0.50	ND	0.092	
108-88-3	Toluene	ND	0.50	ND	0.13	
591-78-6	2-Hexanone	ND	0.50	ND	0.12	
124-48-1	Dibromochloromethane	ND	0.50	ND	0.059	
106-93-4	1,2-Dibromoethane	ND	0.50	ND	0.065	
123-86-4	n-Butyl Acetate	ND	0.50	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 3 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P161205-MB

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 12/5/16  
 Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.50	ND	0.11	
127-18-4	Tetrachloroethene	ND	0.50	ND	0.074	
108-90-7	Chlorobenzene	ND	0.50	ND	0.11	
100-41-4	Ethylbenzene	ND	0.50	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.0	ND	0.23	
75-25-2	Bromoform	ND	0.50	ND	0.048	
100-42-5	Styrene	ND	0.50	ND	0.12	
95-47-6	o-Xylene	ND	0.50	ND	0.12	
111-84-2	n-Nonane	ND	0.50	ND	0.095	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	ND	0.073	
98-82-8	Cumene	ND	0.50	ND	0.10	
80-56-8	alpha-Pinene	ND	0.50	ND	0.090	
103-65-1	n-Propylbenzene	ND	0.50	ND	0.10	
622-96-8	4-Ethyltoluene	ND	0.50	ND	0.10	
108-67-8	1,3,5-Trimethylbenzene	ND	0.50	ND	0.10	
95-63-6	1,2,4-Trimethylbenzene	ND	0.50	ND	0.10	
100-44-7	Benzyl Chloride	ND	0.50	ND	0.097	
541-73-1	1,3-Dichlorobenzene	ND	0.50	ND	0.083	
106-46-7	1,4-Dichlorobenzene	ND	0.50	ND	0.083	
95-50-1	1,2-Dichlorobenzene	ND	0.50	ND	0.083	
5989-27-5	d-Limonene	ND	0.50	ND	0.090	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.50	ND	0.052	
120-82-1	1,2,4-Trichlorobenzene	ND	0.50	ND	0.067	
91-20-3	Naphthalene	ND	0.50	ND	0.095	
87-68-3	Hexachlorobutadiene	ND	0.50	ND	0.047	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



**ALS ENVIRONMENTAL**

SURROGATE SPIKE RECOVERY RESULTS

Page 1 of 1

**Client:** Landau Associates, Inc.  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister(s)  
 Test Notes:

Date(s) Collected: 11/16/16  
 Date(s) Received: 11/21/16  
 Date(s) Analyzed: 11/30 - 12/5/16

Client Sample ID	ALS Sample ID	1,2-Dichloroethane-d4	Toluene-d8	Bromofluorobenzene	Acceptance Limits	Data Qualifier
		Percent Recovered	Percent Recovered	Percent Recovered		
Method Blank	P161130-MB	97	103	102	70-130	
Method Blank	P161205-MB	91	104	108	70-130	
Lab Control Sample	P161130-LCS	93	100	107	70-130	
Lab Control Sample	P161205-LCS	89	102	112	70-130	
GP-43-11162016	P1605444-001	94	98	108	70-130	
GP-41-11162016	P1605444-002	94	97	106	70-130	
Ambient-11162016	P1605444-003	92	102	111	70-130	
GP-39-11162016	P1605444-004	94	98	107	70-130	
GP-38-11162016	P1605444-005	93	96	104	70-130	

Surrogate percent recovery is verified and accepted based on the on-column result.

Reported results are shown in concentration units and as a result of the calculation, may vary slightly from the on-column percent recovery.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Lab Control Sample  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P161130-LCS

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 11/30/16  
 Volume(s) Analyzed: 0.125 Liter(s)

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
115-07-1	Propene	210	191	91	52-127	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	197	94	68-109	
74-87-3	Chloromethane	210	195	93	51-130	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	188	89	66-114	
75-01-4	Vinyl Chloride	210	200	95	61-125	
106-99-0	1,3-Butadiene	210	223	106	62-144	
74-83-9	Bromomethane	210	204	97	73-123	
75-00-3	Chloroethane	210	210	100	69-122	
64-17-5	Ethanol	1,060	996	94	62-124	
75-05-8	Acetonitrile	213	206	97	57-114	
107-02-8	Acrolein	212	172	81	62-116	
67-64-1	Acetone	1,060	967	91	57-117	
75-69-4	Trichlorofluoromethane	210	191	91	63-98	
67-63-0	2-Propanol (Isopropyl Alcohol)	424	406	96	66-121	
107-13-1	Acrylonitrile	213	210	99	68-123	
75-35-4	1,1-Dichloroethene	213	217	102	76-118	
75-09-2	Methylene Chloride	212	193	91	60-118	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	212	203	96	65-126	
76-13-1	Trichlorotrifluoroethane	212	204	96	73-114	
75-15-0	Carbon Disulfide	213	212	100	57-102	
156-60-5	trans-1,2-Dichloroethene	213	207	97	74-123	
75-34-3	1,1-Dichloroethane	212	199	94	69-111	
1634-04-4	Methyl tert-Butyl Ether	213	195	92	69-113	
108-05-4	Vinyl Acetate	1,060	1060	100	76-128	
78-93-3	2-Butanone (MEK)	212	198	93	63-127	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 2 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Lab Control Sample  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P161130-LCS

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 11/30/16  
 Volume(s) Analyzed: 0.125 Liter(s)

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
156-59-2	cis-1,2-Dichloroethene	212	200	94	72-117	
141-78-6	Ethyl Acetate	426	417	98	68-127	
110-54-3	n-Hexane	213	190	89	55-116	
67-66-3	Chloroform	212	193	91	70-109	
109-99-9	Tetrahydrofuran (THF)	213	192	90	72-113	
107-06-2	1,2-Dichloroethane	212	188	89	69-113	
71-55-6	1,1,1-Trichloroethane	212	200	94	72-115	
71-43-2	Benzene	212	180	85	65-107	
56-23-5	Carbon Tetrachloride	213	208	98	71-113	
110-82-7	Cyclohexane	425	400	94	71-115	
78-87-5	1,2-Dichloropropane	212	198	93	71-115	
75-27-4	Bromodichloromethane	214	214	100	75-118	
79-01-6	Trichloroethene	212	205	97	68-114	
123-91-1	1,4-Dioxane	213	200	94	81-131	
80-62-6	Methyl Methacrylate	424	425	100	72-130	
142-82-5	n-Heptane	213	194	91	68-116	
10061-01-5	cis-1,3-Dichloropropene	210	216	103	77-126	
108-10-1	4-Methyl-2-pentanone	213	212	100	69-126	
10061-02-6	trans-1,3-Dichloropropene	213	224	105	79-125	
79-00-5	1,1,2-Trichloroethane	212	207	98	75-119	
108-88-3	Toluene	212	203	96	59-118	
591-78-6	2-Hexanone	213	201	94	69-129	
124-48-1	Dibromochloromethane	213	227	107	74-136	
106-93-4	1,2-Dibromoethane	212	212	100	73-131	
123-86-4	n-Butyl Acetate	216	198	92	69-130	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 3 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P161130-LCS

Test Code: EPA TO-15 Modified

Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: NA

Analyst: Lusine Hakobyan

Date Analyzed: 11/30/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.125 Liter(s)

Test Notes:

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
111-65-9	n-Octane	212	<b>198</b>	<b>93</b>	66-120	
127-18-4	Tetrachloroethene	213	<b>208</b>	<b>98</b>	65-130	
108-90-7	Chlorobenzene	212	<b>201</b>	<b>95</b>	68-120	
100-41-4	Ethylbenzene	212	<b>197</b>	<b>93</b>	68-122	
179601-23-1	m,p-Xylenes	424	<b>393</b>	<b>93</b>	68-123	
75-25-2	Bromoform	212	<b>250</b>	<b>118</b>	69-130	
100-42-5	Styrene	212	<b>207</b>	<b>98</b>	71-133	
95-47-6	o-Xylene	212	<b>199</b>	<b>94</b>	68-122	
111-84-2	n-Nonane	212	<b>192</b>	<b>91</b>	65-120	
79-34-5	1,1,2,2-Tetrachloroethane	212	<b>218</b>	<b>103</b>	69-130	
98-82-8	Cumene	212	<b>211</b>	<b>100</b>	70-123	
80-56-8	alpha-Pinene	213	<b>204</b>	<b>96</b>	70-128	
103-65-1	n-Propylbenzene	214	<b>206</b>	<b>96</b>	69-125	
622-96-8	4-Ethyltoluene	212	<b>206</b>	<b>97</b>	67-130	
108-67-8	1,3,5-Trimethylbenzene	212	<b>196</b>	<b>92</b>	67-124	
95-63-6	1,2,4-Trimethylbenzene	212	<b>201</b>	<b>95</b>	67-129	
100-44-7	Benzyl Chloride	212	<b>244</b>	<b>115</b>	79-138	
541-73-1	1,3-Dichlorobenzene	212	<b>227</b>	<b>107</b>	65-136	
106-46-7	1,4-Dichlorobenzene	213	<b>200</b>	<b>94</b>	66-141	
95-50-1	1,2-Dichlorobenzene	212	<b>214</b>	<b>101</b>	67-136	
5989-27-5	d-Limonene	212	<b>208</b>	<b>98</b>	71-134	
96-12-8	1,2-Dibromo-3-chloropropane	212	<b>259</b>	<b>122</b>	73-136	
120-82-1	1,2,4-Trichlorobenzene	212	<b>258</b>	<b>122</b>	64-134	
91-20-3	Naphthalene	214	<b>266</b>	<b>124</b>	62-136	
87-68-3	Hexachlorobutadiene	213	<b>247</b>	<b>116</b>	60-133	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Lab Control Sample  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444  
 ALS Sample ID: P161205-LCS

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 12/5/16  
 Volume(s) Analyzed: 0.125 Liter(s)

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
115-07-1	Propene	210	179	85	52-127	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	185	88	68-109	
74-87-3	Chloromethane	210	173	82	51-130	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	184	87	66-114	
75-01-4	Vinyl Chloride	210	184	88	61-125	
106-99-0	1,3-Butadiene	210	221	105	62-144	
74-83-9	Bromomethane	210	203	97	73-123	
75-00-3	Chloroethane	210	203	97	69-122	
64-17-5	Ethanol	1,060	930	88	62-124	
75-05-8	Acetonitrile	213	193	91	57-114	
107-02-8	Acrolein	212	164	77	62-116	
67-64-1	Acetone	1,060	908	86	57-117	
75-69-4	Trichlorofluoromethane	210	181	86	63-98	
67-63-0	2-Propanol (Isopropyl Alcohol)	424	369	87	66-121	
107-13-1	Acrylonitrile	213	199	93	68-123	
75-35-4	1,1-Dichloroethene	213	210	99	76-118	
75-09-2	Methylene Chloride	212	186	88	60-118	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	212	188	89	65-126	
76-13-1	Trichlorotrifluoroethane	212	199	94	73-114	
75-15-0	Carbon Disulfide	213	205	96	57-102	
156-60-5	trans-1,2-Dichloroethene	213	196	92	74-123	
75-34-3	1,1-Dichloroethane	212	189	89	69-111	
1634-04-4	Methyl tert-Butyl Ether	213	187	88	69-113	
108-05-4	Vinyl Acetate	1,060	1000	94	76-128	
78-93-3	2-Butanone (MEK)	212	190	90	63-127	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P161205-LCS

Test Code: EPA TO-15 Modified

Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: NA

Analyst: Lusine Hakobyan

Date Analyzed: 12/5/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.125 Liter(s)

Test Notes:

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
156-59-2	cis-1,2-Dichloroethene	212	189	89	72-117	
141-78-6	Ethyl Acetate	426	389	91	68-127	
110-54-3	n-Hexane	213	176	83	55-116	
67-66-3	Chloroform	212	184	87	70-109	
109-99-9	Tetrahydrofuran (THF)	213	184	86	72-113	
107-06-2	1,2-Dichloroethane	212	175	83	69-113	
71-55-6	1,1,1-Trichloroethane	212	189	89	72-115	
71-43-2	Benzene	212	172	81	65-107	
56-23-5	Carbon Tetrachloride	213	198	93	71-113	
110-82-7	Cyclohexane	425	385	91	71-115	
78-87-5	1,2-Dichloropropane	212	189	89	71-115	
75-27-4	Bromodichloromethane	214	200	93	75-118	
79-01-6	Trichloroethene	212	201	95	68-114	
123-91-1	1,4-Dioxane	213	192	90	81-131	
80-62-6	Methyl Methacrylate	424	408	96	72-130	
142-82-5	n-Heptane	213	187	88	68-116	
10061-01-5	cis-1,3-Dichloropropene	210	204	97	77-126	
108-10-1	4-Methyl-2-pentanone	213	199	93	69-126	
10061-02-6	trans-1,3-Dichloropropene	213	211	99	79-125	
79-00-5	1,1,2-Trichloroethane	212	199	94	75-119	
108-88-3	Toluene	212	198	93	59-118	
591-78-6	2-Hexanone	213	186	87	69-129	
124-48-1	Dibromochloromethane	213	224	105	74-136	
106-93-4	1,2-Dibromoethane	212	208	98	73-131	
123-86-4	n-Butyl Acetate	216	185	86	69-130	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 3 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1605444

ALS Sample ID: P161205-LCS

Test Code: EPA TO-15 Modified

Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: NA

Analyst: Lusine Hakobyan

Date Analyzed: 12/5/16

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.125 Liter(s)

Test Notes:

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
111-65-9	n-Octane	212	190	90	66-120	
127-18-4	Tetrachloroethene	213	207	97	65-130	
108-90-7	Chlorobenzene	212	198	93	68-120	
100-41-4	Ethylbenzene	212	192	91	68-122	
179601-23-1	m,p-Xylenes	424	378	89	68-123	
75-25-2	Bromoform	212	248	117	69-130	
100-42-5	Styrene	212	203	96	71-133	
95-47-6	o-Xylene	212	193	91	68-122	
111-84-2	n-Nonane	212	179	84	65-120	
79-34-5	1,1,2,2-Tetrachloroethane	212	210	99	69-130	
98-82-8	Cumene	212	206	97	70-123	
80-56-8	alpha-Pinene	213	197	92	70-128	
103-65-1	n-Propylbenzene	214	198	93	69-125	
622-96-8	4-Ethyltoluene	212	194	92	67-130	
108-67-8	1,3,5-Trimethylbenzene	212	187	88	67-124	
95-63-6	1,2,4-Trimethylbenzene	212	186	88	67-129	
100-44-7	Benzyl Chloride	212	225	106	79-138	
541-73-1	1,3-Dichlorobenzene	212	219	103	65-136	
106-46-7	1,4-Dichlorobenzene	213	195	92	66-141	
95-50-1	1,2-Dichlorobenzene	212	206	97	67-136	
5989-27-5	d-Limonene	212	181	85	71-134	
96-12-8	1,2-Dibromo-3-chloropropane	212	257	121	73-136	
120-82-1	1,2,4-Trichlorobenzene	212	256	121	64-134	
91-20-3	Naphthalene	214	258	121	62-136	
87-68-3	Hexachlorobutadiene	213	248	116	60-133	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.



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[www.alsglobal.com](http://www.alsglobal.com)

## LABORATORY REPORT

January 17, 2017

Piper Roelen  
Landau Associates, Inc.  
130 2nd Ave. South  
Edmonds, WA 98020

**RE: Transportation Corridor Investigation / 1148009.010.014**

Dear Piper:

Enclosed are the results of the samples submitted to our laboratory on January 3, 2017. For your reference, these analyses have been assigned our service request number P1700001.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at [www.alsglobal.com](http://www.alsglobal.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**ALS | Environmental**

By Kate Kaneko at 7:43 am, 01/17/17

Kate Kaneko  
Project Manager





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[www.alsglobal.com](http://www.alsglobal.com)

Client: Landau Associates, Inc. Service Request No: P1700001  
Project: Transportation Corridor Investigation / 1148009.010.014

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## CASE NARRATIVE

The samples were received intact under chain of custody on January 3, 2017 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

### Fixed Gases Analysis

The samples were analyzed for fixed gases (oxygen, nitrogen, carbon monoxide, methane and carbon dioxide) according to modified EPA Method 3C (single injection) using a gas chromatograph equipped with a thermal conductivity detector (TCD). This procedure is described in laboratory SOP VOA-EPA3C. This method is included on the laboratory's DoD-ELAP scope of accreditation, however it is not part of the NELAP accreditation.

### Sulfur Analysis

The samples were also analyzed for twenty sulfur compounds per ASTM D 5504-12 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan. This method is included on the laboratory's NELAP scope of accreditation, however it is not part of the DoD-ELAP accreditation.

### Total Gaseous Non-Methane Organics as Methane Analysis

The samples were also analyzed for total gaseous non-methane organics as methane according to modified EPA Method 25C. The analyses included a single sample injection (method modification) analyzed by gas chromatography using flame ionization detection/total combustion analysis. This method is not included on the laboratory's NELAP or DoD-ELAP scope of accreditation.

### Volatile Organic Compound Analysis

The samples were also analyzed for volatile organic compounds in accordance with EPA Method TO-15 from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition (EPA/625/R-96/010b), January, 1999. This procedure is described in laboratory SOP VOA-TO15. The analytical system was comprised of a gas chromatograph / mass spectrometer (GC/MS) interfaced to a whole-air preconcentrator. The method was modified to include the use of helium as a diluent gas in place of zero-grade air for container pressurization. When necessary, analytical sample volumes were adjusted by a correction factor



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Client: Landau Associates, Inc. Service Request No: P1700001  
Project: Transportation Corridor Investigation / 1148009.010.014

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### CASE NARRATIVE

for containers pressurized with helium. A summary sheet has been included listing the affected samples. This method is included on the laboratory's NELAP and DoD-ELAP scope of accreditation. Any analytes flagged with an X are not included on the NELAP or DoD-ELAP accreditation.

The containers were cleaned, prior to sampling, down to the method reporting limit (MRL) reported for this project. Please note, projects which require reporting below the MRL could have results between the MRL and method detection limit (MDL) that are biased high.

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*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.*

*Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.*



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ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
Arizona DHS	<a href="http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home">http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home</a>	AZ0694
Florida DOH (NELAP)	<a href="http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm">http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm</a>	E871020
Louisiana DEQ (NELAP)	<a href="http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx">http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx</a>	05071
Maine DHHS	<a href="http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm">http://www.maine.gov/dhhs/mecdc/environmental-health/water/dwp-services/labcert/labcert.htm</a>	2016036
Minnesota DOH (NELAP)	<a href="http://www.health.state.mn.us/accreditation">http://www.health.state.mn.us/accreditation</a>	1177034
New Jersey DEP (NELAP)	<a href="http://www.nj.gov/dep/oqa/">http://www.nj.gov/dep/oqa/</a>	CA009
New York DOH (NELAP)	<a href="http://www.wadsworth.org/labcert/elap/elap.html">http://www.wadsworth.org/labcert/elap/elap.html</a>	11221
Oregon PHD (NELAP)	<a href="http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx">http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx</a>	4068-003
Pennsylvania DEP	<a href="http://www.depweb.state.pa.us/labs">http://www.depweb.state.pa.us/labs</a>	68-03307 (Registration)
PJLA (DoD ELAP)	<a href="http://www.pjlabs.com/search-accredited-labs">http://www.pjlabs.com/search-accredited-labs</a>	65818 (Testing)
Texas CEQ (NELAP)	<a href="http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html">http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html</a>	T104704413-16-7
Utah DOH (NELAP)	<a href="http://health.utah.gov/lab/environmental-lab-certification/">http://health.utah.gov/lab/environmental-lab-certification/</a>	CA01627201 6-6
Washington DOE	<a href="http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html">http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html</a>	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at [www.alsglobal.com](http://www.alsglobal.com), or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

# ALS ENVIRONMENTAL

## DETAIL SUMMARY REPORT

Client: Landau Associates, Inc.  
 Project ID: Transportation Corridor Investigation / 1148009.010.014

Service Request: P1700001

Date Received: 1/3/2017  
 Time Received: 09:15

ASTM D1946-90(2006) - Fxd Gases Can	ASTM D 5504-12 - Sulfur Can	25C Modified - TGNMO+ 1X Can	TO-15 Modified - VOC Cans
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Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)				
Ambient-12292016	P1700001-001	Air	12/29/2016	13:07	SSC00151	0.05	3.91	X	X	X	X
GP-38-12292016	P1700001-002	Air	12/29/2016	13:30	SSC00258	0.22	3.92	X	X	X	X
GP-39-12292016	P1700001-003	Air	12/29/2016	14:15	SSC00120	0.04	3.81	X	X	X	X
GP-43-12292016	P1700001-004	Air	12/29/2016	14:30	SSC00277	0.11	4.07	X	X	X	X
GP-41-12292016	P1700001-005	Air	12/29/2016	14:45	SSC00402	-0.33	3.74	X	X	X	X



# Air - Chain of Custody Record & Analytical Service Request

2655 Park Center Drive, Suite A  
 Simi Valley, California 93065  
 Phone (805) 526-7161  
 Fax (805) 526-7270

**Requested Turnaround Time in Business Days (Surcharges) please circle**  
 1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10-Day-Standard

ALS Project No. A60070000

Company Name & Address (Reporting Information) <i>Landaw Associates 130 2nd Ave. South Edmonds, WA 98026</i>				Project Name <i>Transportation Corridor Investigation</i>					ALS Contact:				Comments e.g. Actual Preservative or specific instructions
									Analysis Method				
Project Manager <i>Piper Roelen</i>				Project Number <i>1148009.010.014</i>					<i>Total Reduced Sulfur ASTM D-5504</i> <i>Fixed Gases &amp; ASTM D-1945</i> <i>NMOC's (EPA 25C)</i> <i>VOC's (TO-15)</i>				
Phone <i>(425) 778-0907</i>		Fax <i>—</i>		P.O. # / Billing Information <i>1148009.010.014 closed City of Yakima Landfill Site Project</i>									
Email Address for Result Reporting <i>proelen@landawinc.com, cjohnson@landawinc.com, jdavis@landawinc.com</i>				Sampler (Print & Sign) <i>Stephanie Renando</i>					<i>methane, CO2, CO, O2, Nitrogen</i>				
Client Sample ID				Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code # - FC #)					Canister Start Pressure "Hg
<i>Ambient-12292016</i>	<i>①</i>	<i>12/29/16</i>	<i>1307</i>	<i>SSC00151</i>	<i>SFCM105</i>	<i>-17.49</i>	<i>-4</i>	<i>6L</i>	<i>X</i>	<i>X</i>	<i>X</i>	<i>X</i>	
<i>GP-38-12292016</i>	<i>②</i>	<i>12/29/16</i>	<i>1330</i>	<i>SSC00258</i>	<i>SFCM095</i>	<i>-17.58</i>	<i>-0.09</i>	<i>6L</i>	<i>+</i>	<i>+</i>	<i>+</i>	<i>+</i>	
<i>GP-39-12292016</i>	<i>③</i>	<i>12/29/16</i>	<i>1415</i>	<i>SSC00120</i>	<i>SFC00144</i>	<i>-17.64</i>	<i>-7</i>	<i>6L</i>	<i>+</i>	<i>+</i>	<i>+</i>	<i>+</i>	
<i>GP-43-12292016</i>	<i>④</i>	<i>12/29/16</i>	<i>1430</i>	<i>SSC00277</i>	<i>SFC00113</i>	<i>-17.64</i>	<i>-0.70</i>	<i>6L</i>	<i>+</i>	<i>X</i>	<i>X</i>	<i>X</i>	
<i>GP-41-12292016</i>	<i>⑤</i>	<i>12/29/16</i>	<i>1445</i>	<i>SSC00402</i>	<i>SFC00161</i>	<i>-17.67</i>	<i>-4</i>	<i>6L</i>	<i>+</i>	<i>+</i>	<i>X</i>	<i>X</i>	
Report Tier Levels - please select													
Tier I - Results (Default in not specified) _____				Tier III (Results + QC & Calibration Summaries) _____				EDD required YES / No		Chain of Custody Seal: (Circle)			Project Requirements (MRLs, QAPP)
Tier II (Results + QC Summaries) _____				Tier IV (Date Validation Package) 10% Surcharge _____				Type: _____ Units: _____		INTACT <input type="checkbox"/> BROKEN <input type="checkbox"/> ABSENT <input checked="" type="checkbox"/>			
Relinquished by: (Signature) <i>SAR</i>			Date: <i>12/29/16</i>	Time: <i>1600</i>		Received by: (Signature) _____			Date: _____	Time: _____		Cooler / Blank Temperature _____ °C	
Relinquished by: (Signature) <i>#26X G</i>			Date: _____	Time: _____		Received by: (Signature) <i>[Signature]</i>			Date: <i>1/3/17</i>	Time: <i>0915</i>			

## ALS Environmental Sample Acceptance Check Form

Client: Landau Associates, Inc. Work order: P1700001  
 Project: Transportation Corridor Investigation / 1148009.010.014  
 Sample(s) received on: 1/3/17 Date opened: 1/3/17 by: ADAVID

**Note:** This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

- |   | <u>Yes</u>                          | <u>No</u>                           | <u>N/A</u>                          |
|---|-------------------------------------|-------------------------------------|-------------------------------------|
| 1 Were <b>sample containers</b> properly marked with client sample ID?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 2 Did <b>sample containers</b> arrive in good condition?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 3 Were <b>chain-of-custody</b> papers used and filled out?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 4 Did <b>sample container labels</b> and/or tags agree with custody papers?                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 5 Was <b>sample volume</b> received adequate for analysis?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 6 Are samples within specified holding times?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 7 Was proper <b>temperature</b> (thermal preservation) of cooler at receipt adhered to?                         | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 8 Were <b>custody seals</b> on outside of cooler/Box/Container?   | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Location of seal(s)? _____ Sealing Lid?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were signature and date included?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were seals intact?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 9 Do containers have appropriate <b>preservation</b> , according to method/SOP or Client specified information? | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Is there a client indication that the submitted samples are <b>pH</b> preserved?                                | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were <b>VOA vials</b> checked for presence/absence of air bubbles?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?       | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 10 <b>Tubes:</b> Are the tubes capped and intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 11 <b>Badges:</b> Are the badges properly capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Are dual bed badges separated and individually capped and intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1700001-001.01	6.0 L Silonite Can					
P1700001-002.01	6.0 L Silonite Can					
P1700001-003.01	6.0 L Silonite Can					
P1700001-004.01	6.0 L Silonite Can					
P1700001-005.01	6.0 L Silonite Can					

Explain any discrepancies: (include lab sample ID numbers): \_\_\_\_\_

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Ambient-12292016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P1700001-001

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00151

Date Collected: 12/29/16  
 Date Received: 1/3/17  
 Date Analyzed: 1/3/17  
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 2.20

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	22.2	0.22	
7727-37-9	Nitrogen	77.8	0.22	
630-08-0	Carbon Monoxide	ND	0.22	
74-82-8	Methane	ND	0.22	
124-38-9	Carbon Dioxide	ND	0.22	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-38-12292016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P1700001-002

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00258

Date Collected: 12/29/16  
 Date Received: 1/3/17  
 Date Analyzed: 1/3/17  
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 2.16

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	<b>0.286</b>	0.22	
7727-37-9	Nitrogen	<b>5.76</b>	0.22	
630-08-0	Carbon Monoxide	ND	0.22	
74-82-8	Methane	<b>57.9</b>	0.22	
124-38-9	Carbon Dioxide	<b>36.0</b>	0.22	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.



**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-39-12292016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P1700001-003

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00120

Date Collected: 12/29/16  
 Date Received: 1/3/17  
 Date Analyzed: 1/3/17  
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 2.19

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.22	
7727-37-9	<b>Nitrogen</b>	<b>1.18</b>	0.22	
630-08-0	Carbon Monoxide	ND	0.22	
74-82-8	<b>Methane</b>	<b>66.0</b>	0.22	
124-38-9	<b>Carbon Dioxide</b>	<b>32.6</b>	0.22	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-43-12292016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P1700001-004

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00277

Date Collected: 12/29/16  
 Date Received: 1/3/17  
 Date Analyzed: 1/4/17  
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 2.21

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	<b>Oxygen*</b>	<b>0.380</b>	0.22	
7727-37-9	<b>Nitrogen</b>	<b>2.82</b>	0.22	
630-08-0	Carbon Monoxide	ND	0.22	
74-82-8	<b>Methane</b>	<b>65.9</b>	0.22	
124-38-9	<b>Carbon Dioxide</b>	<b>30.8</b>	0.22	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-41-12292016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P1700001-005

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00402

Date Collected: 12/29/16  
 Date Received: 1/3/17  
 Date Analyzed: 1/4/17  
 Volume(s) Analyzed: 0.10 ml(s)

Canister Dilution Factor: 2.29

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	0.376	0.23	
7727-37-9	Nitrogen	4.02	0.23	
630-08-0	Carbon Monoxide	ND	0.23	
74-82-8	Methane	70.5	0.23	
124-38-9	Carbon Dioxide	25.1	0.23	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P170103-MB

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 1/03/17  
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P170104-MB

Test Code: ASTM D1946  
 Instrument ID: HP5890 II/GC1/TCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 1/04/17  
 Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result %, v/v	MRL %, v/v	Data Qualifier
7782-44-7	Oxygen*	ND	0.10	
7727-37-9	Nitrogen	ND	0.10	
630-08-0	Carbon Monoxide	ND	0.10	
74-82-8	Methane	ND	0.10	
124-38-9	Carbon Dioxide	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

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**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170103-LCS

Test Code: ASTM D1946

Instrument ID: HP5890 II/GC1/TCD

Analyst: Mike Conejo

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 1/03/17

Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppmV	Result ppmV	% Recovery	ALS Acceptance Limits	Data Qualifier
7782-44-7	Oxygen*	50,000	53,000	106	97-108	
7727-37-9	Nitrogen	50,000	52,900	106	89-113	
630-08-0	Carbon Monoxide	50,000	52,200	104	98-108	
74-82-8	Methane	50,000	50,300	101	94-111	
124-38-9	Carbon Dioxide	50,000	50,200	100	94-104	

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170104-LCS

Test Code: ASTM D1946

Instrument ID: HP5890 II/GC1/TCD

Analyst: Mike Conejo

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 1/04/17

Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppmV	Result ppmV	% Recovery	ALS Acceptance Limits	Data Qualifier
7782-44-7	Oxygen*	50,000	53,000	106	97-108	
7727-37-9	Nitrogen	50,000	53,800	108	89-113	
630-08-0	Carbon Monoxide	50,000	51,800	104	98-108	
74-82-8	Methane	50,000	50,000	100	94-111	
124-38-9	Carbon Dioxide	50,000	49,800	100	94-104	

\* = The oxygen result may include argon due to coelution. Ambient air includes 0.93% argon.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** Ambient-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-001

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00151

Date Collected: 12/29/16  
 Time Collected: 13:07  
 Date Received: 1/3/17  
 Date Analyzed: 1/3/17  
 Time Analyzed: 15:18  
 Volume(s) Analyzed: 1.0 ml(s)

Canister Dilution Factor: 2.20

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	15	ND	11	
463-58-1	Carbonyl Sulfide	ND	27	ND	11	
74-93-1	Methyl Mercaptan	ND	22	ND	11	
75-08-1	Ethyl Mercaptan	ND	28	ND	11	
75-18-3	Dimethyl Sulfide	ND	28	ND	11	
75-15-0	Carbon Disulfide	ND	17	ND	5.5	
75-33-2	Isopropyl Mercaptan	ND	34	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	41	ND	11	
107-03-9	n-Propyl Mercaptan	ND	34	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	34	ND	11	
110-02-1	Thiophene	ND	38	ND	11	
513-44-0	Isobutyl Mercaptan	ND	41	ND	11	
352-93-2	Diethyl Sulfide	ND	41	ND	11	
109-79-5	n-Butyl Mercaptan	ND	41	ND	11	
624-92-0	Dimethyl Disulfide	ND	21	ND	5.5	
616-44-4	3-Methylthiophene	ND	44	ND	11	
110-01-0	Tetrahydrothiophene	ND	40	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	50	ND	11	
872-55-9	2-Ethylthiophene	ND	50	ND	11	
110-81-6	Diethyl Disulfide	ND	27	ND	5.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-38-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-002

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00258

Date Collected: 12/29/16  
 Time Collected: 13:30  
 Date Received: 1/3/17  
 Date Analyzed: 1/3/17  
 Time Analyzed: 15:42  
 Volume(s) Analyzed: 1.0 ml(s)

Canister Dilution Factor: 2.16

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	<b>3,400</b>	15	<b>2,400</b>	11	
463-58-1	Carbonyl Sulfide	ND	27	ND	11	
74-93-1	Methyl Mercaptan	<b>38</b>	21	<b>19</b>	11	
75-08-1	Ethyl Mercaptan	ND	27	ND	11	
75-18-3	Dimethyl Sulfide	ND	27	ND	11	
75-15-0	Carbon Disulfide	ND	17	ND	5.4	
75-33-2	Isopropyl Mercaptan	ND	34	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	40	ND	11	
107-03-9	n-Propyl Mercaptan	ND	34	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	34	ND	11	
110-02-1	Thiophene	ND	37	ND	11	
513-44-0	Isobutyl Mercaptan	ND	40	ND	11	
352-93-2	Diethyl Sulfide	ND	40	ND	11	
109-79-5	n-Butyl Mercaptan	ND	40	ND	11	
624-92-0	Dimethyl Disulfide	ND	21	ND	5.4	
616-44-4	3-Methylthiophene	ND	43	ND	11	
110-01-0	Tetrahydrothiophene	ND	39	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	50	ND	11	
872-55-9	2-Ethylthiophene	ND	50	ND	11	
110-81-6	Diethyl Disulfide	ND	27	ND	5.4	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-39-12292016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P1700001-003

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00120

Date Collected: 12/29/16  
 Time Collected: 14:15  
 Date Received: 1/3/17  
 Date Analyzed: 1/3/17  
 Time Analyzed: 16:00  
 Volume(s) Analyzed: 1.0 ml(s)

Canister Dilution Factor: 2.19

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	12,000	15	8,800	11	
463-58-1	Carbonyl Sulfide	ND	27	ND	11	
74-93-1	Methyl Mercaptan	ND	22	ND	11	
75-08-1	Ethyl Mercaptan	28	28	11	11	
75-18-3	Dimethyl Sulfide	ND	28	ND	11	
75-15-0	Carbon Disulfide	ND	17	ND	5.5	
75-33-2	Isopropyl Mercaptan	ND	34	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	40	ND	11	
107-03-9	n-Propyl Mercaptan	ND	34	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	34	ND	11	
110-02-1	Thiophene	ND	38	ND	11	
513-44-0	Isobutyl Mercaptan	ND	40	ND	11	
352-93-2	Diethyl Sulfide	ND	40	ND	11	
109-79-5	n-Butyl Mercaptan	ND	40	ND	11	
624-92-0	Dimethyl Disulfide	ND	21	ND	5.5	
616-44-4	3-Methylthiophene	ND	44	ND	11	
110-01-0	Tetrahydrothiophene	ND	39	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	50	ND	11	
872-55-9	2-Ethylthiophene	ND	50	ND	11	
110-81-6	Diethyl Disulfide	ND	27	ND	5.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-43-12292016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P1700001-004

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00277

Date Collected: 12/29/16  
 Time Collected: 14:30  
 Date Received: 1/3/17  
 Date Analyzed: 1/3/17  
 Time Analyzed: 16:18  
 Volume(s) Analyzed: 1.0 ml(s)

Canister Dilution Factor: 2.21

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	<b>5,100</b>	15	<b>3,600</b>	11	
463-58-1	Carbonyl Sulfide	ND	27	ND	11	
74-93-1	Methyl Mercaptan	<b>30</b>	22	<b>15</b>	11	
75-08-1	Ethyl Mercaptan	ND	28	ND	11	
75-18-3	Dimethyl Sulfide	<b>110</b>	28	<b>42</b>	11	
75-15-0	Carbon Disulfide	ND	17	ND	5.5	
75-33-2	Isopropyl Mercaptan	ND	34	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	41	ND	11	
107-03-9	n-Propyl Mercaptan	ND	34	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	34	ND	11	
110-02-1	Thiophene	ND	38	ND	11	
513-44-0	Isobutyl Mercaptan	ND	41	ND	11	
352-93-2	Diethyl Sulfide	ND	41	ND	11	
109-79-5	n-Butyl Mercaptan	ND	41	ND	11	
624-92-0	Dimethyl Disulfide	ND	21	ND	5.5	
616-44-4	3-Methylthiophene	ND	44	ND	11	
110-01-0	Tetrahydrothiophene	ND	40	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	51	ND	11	
872-55-9	2-Ethylthiophene	ND	51	ND	11	
110-81-6	Diethyl Disulfide	ND	28	ND	5.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-41-12292016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P1700001-005

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00402

Date Collected: 12/29/16  
 Time Collected: 14:45  
 Date Received: 1/3/17  
 Date Analyzed: 1/3/17  
 Time Analyzed: 16:36  
 Volume(s) Analyzed: 1.0 ml(s)

Canister Dilution Factor: 2.29

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	<b>640</b>	16	<b>460</b>	11	
463-58-1	Carbonyl Sulfide	ND	28	ND	11	
74-93-1	Methyl Mercaptan	ND	23	ND	11	
75-08-1	Ethyl Mercaptan	ND	29	ND	11	
75-18-3	Dimethyl Sulfide	ND	29	ND	11	
75-15-0	Carbon Disulfide	<b>110</b>	18	<b>34</b>	5.7	
75-33-2	Isopropyl Mercaptan	ND	36	ND	11	
75-66-1	tert-Butyl Mercaptan	ND	42	ND	11	
107-03-9	n-Propyl Mercaptan	ND	36	ND	11	
624-89-5	Ethyl Methyl Sulfide	ND	36	ND	11	
110-02-1	Thiophene	ND	39	ND	11	
513-44-0	Isobutyl Mercaptan	ND	42	ND	11	
352-93-2	Diethyl Sulfide	ND	42	ND	11	
109-79-5	n-Butyl Mercaptan	ND	42	ND	11	
624-92-0	Dimethyl Disulfide	ND	22	ND	5.7	
616-44-4	3-Methylthiophene	ND	46	ND	11	
110-01-0	Tetrahydrothiophene	ND	41	ND	11	
638-02-8	2,5-Dimethylthiophene	ND	53	ND	11	
872-55-9	2-Ethylthiophene	ND	53	ND	11	
110-81-6	Diethyl Disulfide	ND	29	ND	5.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P170103-MB

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Time Collected: NA  
 Date Received: NA  
 Date Analyzed: 1/03/17  
 Time Analyzed: 08:21  
 Volume(s) Analyzed: 1.0 ml(s)

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	
463-58-1	Carbonyl Sulfide	ND	12	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-08-1	Ethyl Mercaptan	ND	13	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
75-15-0	Carbon Disulfide	ND	7.8	ND	2.5	
75-33-2	Isopropyl Mercaptan	ND	16	ND	5.0	
75-66-1	tert-Butyl Mercaptan	ND	18	ND	5.0	
107-03-9	n-Propyl Mercaptan	ND	16	ND	5.0	
624-89-5	Ethyl Methyl Sulfide	ND	16	ND	5.0	
110-02-1	Thiophene	ND	17	ND	5.0	
513-44-0	Isobutyl Mercaptan	ND	18	ND	5.0	
352-93-2	Diethyl Sulfide	ND	18	ND	5.0	
109-79-5	n-Butyl Mercaptan	ND	18	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	
616-44-4	3-Methylthiophene	ND	20	ND	5.0	
110-01-0	Tetrahydrothiophene	ND	18	ND	5.0	
638-02-8	2,5-Dimethylthiophene	ND	23	ND	5.0	
872-55-9	2-Ethylthiophene	ND	23	ND	5.0	
110-81-6	Diethyl Disulfide	ND	12	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Lab Control Sample  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P170103-LCS

Test Code: ASTM D 5504-12  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Mike Conejo  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 1/03/17  
 Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppbV	Result ppbV	% Recovery	ALS	
					Acceptance Limits	Data Qualifier
7783-06-4	Hydrogen Sulfide	1,000	<b>1,040</b>	<b>104</b>	75-148	
463-58-1	Carbonyl Sulfide	1,000	<b>1,060</b>	<b>106</b>	70-137	
74-93-1	Methyl Mercaptan	1,000	<b>1,050</b>	<b>105</b>	72-139	

**ALS ENVIRONMENTAL**

RESULTS OF ANALYSIS

Page 1 of 1

**Client:** Landau Associates, Inc.

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

**Total Gaseous Nonmethane Organics (TGNMO) as Methane**

Test Code: EPA Method 25C Modified  
 Instrument ID: HP5890 II/GC1/FID/TCA  
 Analyst: Mike Conejo  
 Sampling Media: 6.0 L Silonite Canister(s)  
 Test Notes:

Date(s) Collected: 12/29/16  
 Date Received: 1/3/17  
 Date Analyzed: 1/5/17

Client Sample ID	ALS Sample ID	Canister Dilution Factor	Injection Volume ml(s)	Result ppmV	MRL ppmV	Data Qualifier
Ambient-12292016	P1700001-001	2.20	0.50	ND	2.2	
GP-38-12292016	P1700001-002	2.16	0.50	<b>250</b>	2.2	
GP-39-12292016	P1700001-003	2.19	0.50	<b>600</b>	2.2	
GP-43-12292016	P1700001-004	2.21	0.50	<b>230</b>	2.2	
GP-41-12292016	P1700001-005	2.29	0.50	<b>310</b>	2.3	
Method Blank	P170105-MB	1.00	0.50	ND	1.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 1

**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170105-LCS

Test Code: EPA Method 25C Modified

Instrument ID: HP5890 II/GC1/FID/TCA

Analyst: Mike Conejo

Sampling Media: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 1/05/17

Volume(s) Analyzed: NA ml(s)

Compound	Spike Amount ppmV	Result ppmV	% Recovery	ALS	Data Qualifier
				Acceptance Limits	
Total Gaseous Nonmethane Organics (TGNMO) as Methane	1,000	902	90	85-121	



# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Ambient-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-001

Test Code: EPA TO-15 Modified

Date Collected: 12/29/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 1/3/17

Analyst: Lusine Hakobyan

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 1.00 Liter(s)

Test Notes:

Container ID: SSC00151

Canister Dilution Factor: 2.20

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	3.4	1.1	2.0	0.64	
75-71-8	Dichlorodifluoromethane (CFC 12)	2.1	1.1	0.42	0.22	
74-87-3	Chloromethane	ND	1.1	ND	0.53	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	1.1	ND	0.16	
75-01-4	Vinyl Chloride	ND	1.1	ND	0.43	
106-99-0	1,3-Butadiene	ND	1.1	ND	0.50	
74-83-9	Bromomethane	ND	1.1	ND	0.28	
75-00-3	Chloroethane	ND	1.1	ND	0.42	
64-17-5	Ethanol	ND	11	ND	5.8	
75-05-8	Acetonitrile	ND	1.1	ND	0.66	
107-02-8	Acrolein	ND	4.4	ND	1.9	
67-64-1	Acetone	ND	11	ND	4.6	
75-69-4	Trichlorofluoromethane	ND	1.1	ND	0.20	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	11	ND	4.5	
107-13-1	Acrylonitrile	ND	1.1	ND	0.51	
75-35-4	1,1-Dichloroethene	ND	1.1	ND	0.28	
75-09-2	Methylene Chloride	ND	1.1	ND	0.32	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	1.1	ND	0.35	
76-13-1	Trichlorotrifluoroethane	ND	1.1	ND	0.14	
75-15-0	Carbon Disulfide	ND	11	ND	3.5	
156-60-5	trans-1,2-Dichloroethene	ND	1.1	ND	0.28	
75-34-3	1,1-Dichloroethane	ND	1.1	ND	0.27	
1634-04-4	Methyl tert-Butyl Ether	ND	1.1	ND	0.31	
108-05-4	Vinyl Acetate	ND	11	ND	3.1	
78-93-3	2-Butanone (MEK)	ND	11	ND	3.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Ambient-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-001

Test Code: EPA TO-15 Modified

Date Collected: 12/29/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 1/3/17

Analyst: Lusine Hakobyan

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 1.00 Liter(s)

Test Notes:

Container ID: SSC00151

Canister Dilution Factor: 2.20

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	1.1	ND	0.28	
141-78-6	Ethyl Acetate	<b>3.3</b>	2.2	<b>0.92</b>	0.61	
110-54-3	n-Hexane	ND	1.1	ND	0.31	
67-66-3	Chloroform	ND	1.1	ND	0.23	
109-99-9	Tetrahydrofuran (THF)	ND	1.1	ND	0.37	
107-06-2	1,2-Dichloroethane	ND	1.1	ND	0.27	
71-55-6	1,1,1-Trichloroethane	ND	1.1	ND	0.20	
71-43-2	Benzene	ND	1.1	ND	0.34	
56-23-5	Carbon Tetrachloride	ND	1.1	ND	0.17	
110-82-7	Cyclohexane	ND	2.2	ND	0.64	
78-87-5	1,2-Dichloropropane	ND	1.1	ND	0.24	
75-27-4	Bromodichloromethane	ND	1.1	ND	0.16	
79-01-6	Trichloroethene	ND	1.1	ND	0.20	
123-91-1	1,4-Dioxane	ND	1.1	ND	0.31	
80-62-6	Methyl Methacrylate	ND	2.2	ND	0.54	
142-82-5	n-Heptane	ND	1.1	ND	0.27	
10061-01-5	cis-1,3-Dichloropropene	ND	1.1	ND	0.24	
108-10-1	4-Methyl-2-pentanone	ND	1.1	ND	0.27	
10061-02-6	trans-1,3-Dichloropropene	ND	1.1	ND	0.24	
79-00-5	1,1,2-Trichloroethane	ND	1.1	ND	0.20	
108-88-3	Toluene	ND	1.1	ND	0.29	
591-78-6	2-Hexanone	ND	1.1	ND	0.27	
124-48-1	Dibromochloromethane	ND	1.1	ND	0.13	
106-93-4	1,2-Dibromoethane	ND	1.1	ND	0.14	
123-86-4	n-Butyl Acetate	ND	1.1	ND	0.23	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 3 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Ambient-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-001

Test Code: EPA TO-15 Modified

Date Collected: 12/29/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 1/3/17

Analyst: Lusine Hakobyan

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 1.00 Liter(s)

Test Notes:

Container ID: SSC00151

Canister Dilution Factor: 2.20

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	1.1	ND	0.24	
127-18-4	Tetrachloroethene	ND	1.1	ND	0.16	
108-90-7	Chlorobenzene	ND	1.1	ND	0.24	
100-41-4	Ethylbenzene	ND	1.1	ND	0.25	
179601-23-1	m,p-Xylenes	ND	2.2	ND	0.51	
75-25-2	Bromoform	ND	1.1	ND	0.11	
100-42-5	Styrene	ND	1.1	ND	0.26	
95-47-6	o-Xylene	ND	1.1	ND	0.25	
111-84-2	n-Nonane	ND	1.1	ND	0.21	
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.1	ND	0.16	
98-82-8	Cumene	ND	1.1	ND	0.22	
80-56-8	alpha-Pinene	ND	1.1	ND	0.20	
103-65-1	n-Propylbenzene	ND	1.1	ND	0.22	
622-96-8	4-Ethyltoluene	ND	1.1	ND	0.22	
108-67-8	1,3,5-Trimethylbenzene	ND	1.1	ND	0.22	
95-63-6	1,2,4-Trimethylbenzene	ND	1.1	ND	0.22	
100-44-7	Benzyl Chloride	ND	1.1	ND	0.21	
541-73-1	1,3-Dichlorobenzene	ND	1.1	ND	0.18	
106-46-7	1,4-Dichlorobenzene	ND	1.1	ND	0.18	
95-50-1	1,2-Dichlorobenzene	ND	1.1	ND	0.18	
5989-27-5	d-Limonene	ND	1.1	ND	0.20	
96-12-8	1,2-Dibromo-3-chloropropane	ND	1.1	ND	0.11	
120-82-1	1,2,4-Trichlorobenzene	ND	1.1	ND	0.15	
91-20-3	Naphthalene	ND	1.1	ND	0.21	
87-68-3	Hexachlorobutadiene	ND	1.1	ND	0.10	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-38-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-002

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Lusine Hakobyan

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00258

Date Collected: 12/29/16

Date Received: 1/3/17

Date Analyzed: 1/4 - 1/5/17

Volume(s) Analyzed: 0.10 Liter(s)

0.020 Liter(s)

Canister Dilution Factor: 2.16

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	<b>870</b>	11	<b>500</b>	6.3	
75-71-8	Dichlorodifluoromethane (CFC 12)	<b>53</b>	11	<b>11</b>	2.2	
74-87-3	Chloromethane	ND	11	ND	5.2	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	<b>1,100</b>	11	<b>150</b>	1.5	
75-01-4	Vinyl Chloride	<b>78</b>	11	<b>30</b>	4.2	
106-99-0	1,3-Butadiene	ND	11	ND	4.9	
74-83-9	Bromomethane	ND	11	ND	2.8	
75-00-3	Chloroethane	<b>26</b>	11	<b>9.9</b>	4.1	
64-17-5	Ethanol	ND	110	ND	57	
75-05-8	Acetonitrile	ND	11	ND	6.4	
107-02-8	Acrolein	ND	43	ND	19	
67-64-1	Acetone	ND	110	ND	45	
75-69-4	Trichlorofluoromethane	ND	11	ND	1.9	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	110	ND	44	
107-13-1	Acrylonitrile	ND	11	ND	5.0	
75-35-4	1,1-Dichloroethene	<b>11</b>	11	<b>2.9</b>	2.7	
75-09-2	Methylene Chloride	ND	11	ND	3.1	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	11	ND	3.5	
76-13-1	Trichlorotrifluoroethane	ND	11	ND	1.4	
75-15-0	Carbon Disulfide	ND	110	ND	35	
156-60-5	trans-1,2-Dichloroethene	ND	11	ND	2.7	
75-34-3	1,1-Dichloroethane	ND	11	ND	2.7	
1634-04-4	Methyl tert-Butyl Ether	ND	11	ND	3.0	
108-05-4	Vinyl Acetate	ND	110	ND	31	
78-93-3	2-Butanone (MEK)	ND	110	ND	37	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-38-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-002

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Lusine Hakobyan

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00258

Date Collected: 12/29/16

Date Received: 1/3/17

Date Analyzed: 1/4 - 1/5/17

Volume(s) Analyzed: 0.10 Liter(s)

0.020 Liter(s)

Canister Dilution Factor: 2.16

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	21	11	5.4	2.7	
141-78-6	Ethyl Acetate	ND	22	ND	6.0	
110-54-3	n-Hexane	920	11	260	3.1	
67-66-3	Chloroform	ND	11	ND	2.2	
109-99-9	Tetrahydrofuran (THF)	ND	11	ND	3.7	
107-06-2	1,2-Dichloroethane	ND	11	ND	2.7	
71-55-6	1,1,1-Trichloroethane	ND	11	ND	2.0	
71-43-2	Benzene	70	11	22	3.4	
56-23-5	Carbon Tetrachloride	ND	11	ND	1.7	
110-82-7	Cyclohexane	2,200	22	640	6.3	
78-87-5	1,2-Dichloropropane	ND	11	ND	2.3	
75-27-4	Bromodichloromethane	ND	11	ND	1.6	
79-01-6	Trichloroethene	19	11	3.4	2.0	
123-91-1	1,4-Dioxane	ND	11	ND	3.0	
80-62-6	Methyl Methacrylate	ND	22	ND	5.3	
142-82-5	n-Heptane	3,100	54	760	13	D
10061-01-5	cis-1,3-Dichloropropene	ND	11	ND	2.4	
108-10-1	4-Methyl-2-pentanone	ND	11	ND	2.6	
10061-02-6	trans-1,3-Dichloropropene	ND	11	ND	2.4	
79-00-5	1,1,2-Trichloroethane	ND	11	ND	2.0	
108-88-3	Toluene	54	11	14	2.9	
591-78-6	2-Hexanone	ND	11	ND	2.6	
124-48-1	Dibromochloromethane	ND	11	ND	1.3	
106-93-4	1,2-Dibromoethane	ND	11	ND	1.4	
123-86-4	n-Butyl Acetate	ND	11	ND	2.3	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

D = The reported result is from a dilution.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 3 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-38-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-002

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Lusine Hakobyan

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00258

Date Collected: 12/29/16

Date Received: 1/3/17

Date Analyzed: 1/4 - 1/5/17

Volume(s) Analyzed: 0.10 Liter(s)

0.020 Liter(s)

Canister Dilution Factor: 2.16

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	260	11	56	2.3	
127-18-4	Tetrachloroethene	ND	11	ND	1.6	
108-90-7	Chlorobenzene	190	11	42	2.3	
100-41-4	Ethylbenzene	62	11	14	2.5	
179601-23-1	m,p-Xylenes	440	22	100	5.0	
75-25-2	Bromoform	ND	11	ND	1.0	
100-42-5	Styrene	ND	11	ND	2.5	
95-47-6	o-Xylene	130	11	29	2.5	
111-84-2	n-Nonane	200	11	38	2.1	
79-34-5	1,1,2,2-Tetrachloroethane	ND	11	ND	1.6	
98-82-8	Cumene	300	11	62	2.2	
80-56-8	alpha-Pinene	65	11	12	1.9	
103-65-1	n-Propylbenzene	170	11	35	2.2	
622-96-8	4-Ethyltoluene	28	11	5.7	2.2	
108-67-8	1,3,5-Trimethylbenzene	110	11	23	2.2	
95-63-6	1,2,4-Trimethylbenzene	270	11	56	2.2	
100-44-7	Benzyl Chloride	ND	11	ND	2.1	
541-73-1	1,3-Dichlorobenzene	ND	11	ND	1.8	
106-46-7	1,4-Dichlorobenzene	100	11	17	1.8	
95-50-1	1,2-Dichlorobenzene	22	11	3.6	1.8	
5989-27-5	d-Limonene	ND	11	ND	1.9	
96-12-8	1,2-Dibromo-3-chloropropane	ND	11	ND	1.1	
120-82-1	1,2,4-Trichlorobenzene	ND	11	ND	1.5	
91-20-3	Naphthalene	ND	11	ND	2.1	
87-68-3	Hexachlorobutadiene	ND	11	ND	1.0	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-39-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-003

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Lusine Hakobyan

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00120

Date Collected: 12/29/16

Date Received: 1/3/17

Date Analyzed: 1/5/17

Volume(s) Analyzed: 0.020 Liter(s)

0.010 Liter(s)

Canister Dilution Factor: 2.19

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	1,200	55	700	32	
75-71-8	Dichlorodifluoromethane (CFC 12)	1,100	55	210	11	
74-87-3	Chloromethane	ND	55	ND	27	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	1,300	55	190	7.8	
75-01-4	Vinyl Chloride	11,000	55	4,200	21	
106-99-0	1,3-Butadiene	ND	55	ND	25	
74-83-9	Bromomethane	ND	55	ND	14	
75-00-3	Chloroethane	83	55	32	21	
64-17-5	Ethanol	ND	550	ND	290	
75-05-8	Acetonitrile	ND	55	ND	33	
107-02-8	Acrolein	ND	220	ND	96	
67-64-1	Acetone	ND	550	ND	230	
75-69-4	Trichlorofluoromethane	ND	55	ND	9.7	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	550	ND	220	
107-13-1	Acrylonitrile	ND	55	ND	25	
75-35-4	1,1-Dichloroethene	ND	55	ND	14	
75-09-2	Methylene Chloride	ND	55	ND	16	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	55	ND	17	
76-13-1	Trichlorotrifluoroethane	ND	55	ND	7.1	
75-15-0	Carbon Disulfide	ND	550	ND	180	
156-60-5	trans-1,2-Dichloroethene	ND	55	ND	14	
75-34-3	1,1-Dichloroethane	ND	55	ND	14	
1634-04-4	Methyl tert-Butyl Ether	ND	55	ND	15	
108-05-4	Vinyl Acetate	ND	550	ND	160	
78-93-3	2-Butanone (MEK)	ND	550	ND	190	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-39-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-003

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Lusine Hakobyan

Sample Type: 6.0 L Silonite Canister

Test Notes:

Container ID: SSC00120

Date Collected: 12/29/16

Date Received: 1/3/17

Date Analyzed: 1/5/17

Volume(s) Analyzed: 0.020 Liter(s)

0.010 Liter(s)

Canister Dilution Factor: 2.19

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	380	55	95	14	
141-78-6	Ethyl Acetate	ND	110	ND	30	
110-54-3	n-Hexane	840	55	240	16	
67-66-3	Chloroform	ND	55	ND	11	
109-99-9	Tetrahydrofuran (THF)	ND	55	ND	19	
107-06-2	1,2-Dichloroethane	ND	55	ND	14	
71-55-6	1,1,1-Trichloroethane	ND	55	ND	10	
71-43-2	Benzene	450	55	140	17	
56-23-5	Carbon Tetrachloride	ND	55	ND	8.7	
110-82-7	Cyclohexane	3,000	110	880	32	
78-87-5	1,2-Dichloropropane	ND	55	ND	12	
75-27-4	Bromodichloromethane	ND	55	ND	8.2	
79-01-6	Trichloroethene	77	55	14	10	
123-91-1	1,4-Dioxane	ND	55	ND	15	
80-62-6	Methyl Methacrylate	ND	110	ND	27	
142-82-5	n-Heptane	2,400	55	580	13	
10061-01-5	cis-1,3-Dichloropropene	ND	55	ND	12	
108-10-1	4-Methyl-2-pentanone	78	55	19	13	
10061-02-6	trans-1,3-Dichloropropene	ND	55	ND	12	
79-00-5	1,1,2-Trichloroethane	ND	55	ND	10	
108-88-3	Toluene	1,400	55	380	15	
591-78-6	2-Hexanone	ND	55	ND	13	
124-48-1	Dibromochloromethane	ND	55	ND	6.4	
106-93-4	1,2-Dibromoethane	ND	55	ND	7.1	
123-86-4	n-Butyl Acetate	ND	55	ND	12	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-39-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-003

Test Code: EPA TO-15 Modified

Date Collected: 12/29/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 1/3/17

Analyst: Lusine Hakobyan

Date Analyzed: 1/5/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.020 Liter(s)

Test Notes:

0.010 Liter(s)

Container ID: SSC00120

Canister Dilution Factor: 2.19

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	1,900	55	400	12	
127-18-4	Tetrachloroethene	67	55	9.9	8.1	
108-90-7	Chlorobenzene	ND	55	ND	12	
100-41-4	Ethylbenzene	4,200	55	960	13	
179601-23-1	m,p-Xylenes	8,600	110	2,000	25	
75-25-2	Bromoform	ND	55	ND	5.3	
100-42-5	Styrene	ND	55	ND	13	
95-47-6	o-Xylene	3,200	55	730	13	
111-84-2	n-Nonane	15,000	110	2,900	21	<b>D</b>
79-34-5	1,1,2,2-Tetrachloroethane	ND	55	ND	8.0	
98-82-8	Cumene	780	55	160	11	
80-56-8	alpha-Pinene	1,300	55	230	9.8	
103-65-1	n-Propylbenzene	1,300	55	260	11	
622-96-8	4-Ethyltoluene	570	55	120	11	
108-67-8	1,3,5-Trimethylbenzene	1,800	55	360	11	
95-63-6	1,2,4-Trimethylbenzene	3,800	55	780	11	
100-44-7	Benzyl Chloride	ND	55	ND	11	
541-73-1	1,3-Dichlorobenzene	ND	55	ND	9.1	
106-46-7	1,4-Dichlorobenzene	69	55	11	9.1	
95-50-1	1,2-Dichlorobenzene	79	55	13	9.1	
5989-27-5	d-Limonene	620	55	110	9.8	
96-12-8	1,2-Dibromo-3-chloropropane	ND	55	ND	5.7	
120-82-1	1,2,4-Trichlorobenzene	ND	55	ND	7.4	
91-20-3	Naphthalene	ND	55	ND	10	
87-68-3	Hexachlorobutadiene	ND	55	ND	5.1	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

D = The reported result is from a dilution.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-43-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-004

Test Code: EPA TO-15 Modified

Date Collected: 12/29/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 1/3/17

Analyst: Lusine Hakobyan

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.030 Liter(s)

Test Notes:

Container ID: SSC00277

Canister Dilution Factor: 2.21

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	1,200	37	670	21	
75-71-8	Dichlorodifluoromethane (CFC 12)	1,500	37	290	7.5	
74-87-3	Chloromethane	ND	37	ND	18	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	1,200	37	170	5.3	
75-01-4	Vinyl Chloride	5,400	37	2,100	14	
106-99-0	1,3-Butadiene	ND	37	ND	17	
74-83-9	Bromomethane	ND	37	ND	9.5	
75-00-3	Chloroethane	ND	37	ND	14	
64-17-5	Ethanol	ND	370	ND	200	
75-05-8	Acetonitrile	ND	37	ND	22	
107-02-8	Acrolein	ND	150	ND	64	
67-64-1	Acetone	970	370	410	160	
75-69-4	Trichlorofluoromethane	430	37	77	6.6	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	370	ND	150	
107-13-1	Acrylonitrile	ND	37	ND	17	
75-35-4	1,1-Dichloroethene	81	37	21	9.3	
75-09-2	Methylene Chloride	85	37	24	11	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	37	ND	12	
76-13-1	Trichlorotrifluoroethane	ND	37	ND	4.8	
75-15-0	Carbon Disulfide	ND	370	ND	120	
156-60-5	trans-1,2-Dichloroethene	120	37	31	9.3	
75-34-3	1,1-Dichloroethane	ND	37	ND	9.1	
1634-04-4	Methyl tert-Butyl Ether	ND	37	ND	10	
108-05-4	Vinyl Acetate	ND	370	ND	100	
78-93-3	2-Butanone (MEK)	1,500	370	510	120	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-43-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-004

Test Code: EPA TO-15 Modified

Date Collected: 12/29/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 1/3/17

Analyst: Lusine Hakobyan

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.030 Liter(s)

Test Notes:

Container ID: SSC00277

Canister Dilution Factor: 2.21

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	2,800	37	710	9.3	
141-78-6	Ethyl Acetate	ND	74	ND	20	
110-54-3	n-Hexane	580	37	170	10	
67-66-3	Chloroform	ND	37	ND	7.5	
109-99-9	Tetrahydrofuran (THF)	910	37	310	12	
107-06-2	1,2-Dichloroethane	ND	37	ND	9.1	
71-55-6	1,1,1-Trichloroethane	ND	37	ND	6.8	
71-43-2	Benzene	340	37	110	12	
56-23-5	Carbon Tetrachloride	ND	37	ND	5.9	
110-82-7	Cyclohexane	500	74	140	21	
78-87-5	1,2-Dichloropropane	ND	37	ND	8.0	
75-27-4	Bromodichloromethane	ND	37	ND	5.5	
79-01-6	Trichloroethene	450	37	83	6.9	
123-91-1	1,4-Dioxane	ND	37	ND	10	
80-62-6	Methyl Methacrylate	ND	74	ND	18	
142-82-5	n-Heptane	1,900	37	470	9.0	
10061-01-5	cis-1,3-Dichloropropene	ND	37	ND	8.1	
108-10-1	4-Methyl-2-pentanone	630	37	150	9.0	
10061-02-6	trans-1,3-Dichloropropene	ND	37	ND	8.1	
79-00-5	1,1,2-Trichloroethane	ND	37	ND	6.8	
108-88-3	Toluene	6,300	37	1,700	9.8	
591-78-6	2-Hexanone	ND	37	ND	9.0	
124-48-1	Dibromochloromethane	ND	37	ND	4.3	
106-93-4	1,2-Dibromoethane	ND	37	ND	4.8	
123-86-4	n-Butyl Acetate	ND	37	ND	7.8	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-43-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-004

Test Code: EPA TO-15 Modified

Date Collected: 12/29/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 1/3/17

Analyst: Lusine Hakobyan

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.030 Liter(s)

Test Notes:

Container ID: SSC00277

Canister Dilution Factor: 2.21

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	1,500	37	310	7.9	
127-18-4	Tetrachloroethene	640	37	94	5.4	
108-90-7	Chlorobenzene	ND	37	ND	8.0	
100-41-4	Ethylbenzene	3,800	37	880	8.5	
179601-23-1	m,p-Xylenes	7,400	74	1,700	17	
75-25-2	Bromoform	ND	37	ND	3.6	
100-42-5	Styrene	96	37	23	8.7	
95-47-6	o-Xylene	1,800	37	420	8.5	
111-84-2	n-Nonane	3,200	37	610	7.0	
79-34-5	1,1,2,2-Tetrachloroethane	ND	37	ND	5.4	
98-82-8	Cumene	550	37	110	7.5	
80-56-8	alpha-Pinene	4,300	37	780	6.6	
103-65-1	n-Propylbenzene	560	37	110	7.5	
622-96-8	4-Ethyltoluene	260	37	53	7.5	
108-67-8	1,3,5-Trimethylbenzene	450	37	92	7.5	
95-63-6	1,2,4-Trimethylbenzene	1,300	37	270	7.5	
100-44-7	Benzyl Chloride	ND	37	ND	7.1	
541-73-1	1,3-Dichlorobenzene	ND	37	ND	6.1	
106-46-7	1,4-Dichlorobenzene	ND	37	ND	6.1	
95-50-1	1,2-Dichlorobenzene	ND	37	ND	6.1	
5989-27-5	d-Limonene	6,900	37	1,200	6.6	
96-12-8	1,2-Dibromo-3-chloropropane	ND	37	ND	3.8	
120-82-1	1,2,4-Trichlorobenzene	ND	37	ND	5.0	
91-20-3	Naphthalene	ND	37	ND	7.0	
87-68-3	Hexachlorobutadiene	ND	37	ND	3.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-41-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-005

Test Code: EPA TO-15 Modified

Date Collected: 12/29/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 1/3/17

Analyst: Lusine Hakobyan

Date Analyzed: 1/5/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.020 Liter(s)

Test Notes:

Container ID: SSC00402

Canister Dilution Factor: 2.29

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	1,500	57	880	33	
75-71-8	Dichlorodifluoromethane (CFC 12)	4,100	57	830	12	
74-87-3	Chloromethane	ND	57	ND	28	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	2,900	57	410	8.2	
75-01-4	Vinyl Chloride	9,400	57	3,700	22	
106-99-0	1,3-Butadiene	ND	57	ND	26	
74-83-9	Bromomethane	ND	57	ND	15	
75-00-3	Chloroethane	ND	57	ND	22	
64-17-5	Ethanol	ND	570	ND	300	
75-05-8	Acetonitrile	ND	57	ND	34	
107-02-8	Acrolein	ND	230	ND	100	
67-64-1	Acetone	ND	570	ND	240	
75-69-4	Trichlorofluoromethane	ND	57	ND	10	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	570	ND	230	
107-13-1	Acrylonitrile	ND	57	ND	26	
75-35-4	1,1-Dichloroethene	ND	57	ND	14	
75-09-2	Methylene Chloride	ND	57	ND	16	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	57	ND	18	
76-13-1	Trichlorotrifluoroethane	ND	57	ND	7.5	
75-15-0	Carbon Disulfide	ND	570	ND	180	
156-60-5	trans-1,2-Dichloroethene	ND	57	ND	14	
75-34-3	1,1-Dichloroethane	ND	57	ND	14	
1634-04-4	Methyl tert-Butyl Ether	ND	57	ND	16	
108-05-4	Vinyl Acetate	ND	570	ND	160	
78-93-3	2-Butanone (MEK)	ND	570	ND	190	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 2 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** GP-41-12292016  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P1700001-005

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:  
 Container ID: SSC00402

Date Collected: 12/29/16  
 Date Received: 1/3/17  
 Date Analyzed: 1/5/17  
 Volume(s) Analyzed: 0.020 Liter(s)

Canister Dilution Factor: 2.29

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	97	57	24	14	
141-78-6	Ethyl Acetate	ND	110	ND	32	
110-54-3	n-Hexane	620	57	180	16	
67-66-3	Chloroform	ND	57	ND	12	
109-99-9	Tetrahydrofuran (THF)	ND	57	ND	19	
107-06-2	1,2-Dichloroethane	ND	57	ND	14	
71-55-6	1,1,1-Trichloroethane	ND	57	ND	10	
71-43-2	Benzene	490	57	150	18	
56-23-5	Carbon Tetrachloride	ND	57	ND	9.1	
110-82-7	Cyclohexane	410	110	120	33	
78-87-5	1,2-Dichloropropane	ND	57	ND	12	
75-27-4	Bromodichloromethane	ND	57	ND	8.5	
79-01-6	Trichloroethene	ND	57	ND	11	
123-91-1	1,4-Dioxane	ND	57	ND	16	
80-62-6	Methyl Methacrylate	ND	110	ND	28	
142-82-5	n-Heptane	920	57	230	14	
10061-01-5	cis-1,3-Dichloropropene	ND	57	ND	13	
108-10-1	4-Methyl-2-pentanone	ND	57	ND	14	
10061-02-6	trans-1,3-Dichloropropene	ND	57	ND	13	
79-00-5	1,1,2-Trichloroethane	ND	57	ND	10	
108-88-3	Toluene	550	57	150	15	
591-78-6	2-Hexanone	ND	57	ND	14	
124-48-1	Dibromochloromethane	ND	57	ND	6.7	
106-93-4	1,2-Dibromoethane	ND	57	ND	7.5	
123-86-4	n-Butyl Acetate	ND	57	ND	12	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

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**Client:** Landau Associates, Inc.

**Client Sample ID:** GP-41-12292016

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P1700001-005

Test Code: EPA TO-15 Modified

Date Collected: 12/29/16

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: 1/3/17

Analyst: Lusine Hakobyan

Date Analyzed: 1/5/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.020 Liter(s)

Test Notes:

Container ID: SSC00402

Canister Dilution Factor: 2.29

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	1,800	57	380	12	
127-18-4	Tetrachloroethene	ND	57	ND	8.4	
108-90-7	Chlorobenzene	ND	57	ND	12	
100-41-4	Ethylbenzene	910	57	210	13	
179601-23-1	m,p-Xylenes	2,200	110	510	26	
75-25-2	Bromoform	ND	57	ND	5.5	
100-42-5	Styrene	ND	57	ND	13	
95-47-6	o-Xylene	910	57	210	13	
111-84-2	n-Nonane	9,800	57	1,900	11	
79-34-5	1,1,2,2-Tetrachloroethane	ND	57	ND	8.3	
98-82-8	Cumene	240	57	48	12	
80-56-8	alpha-Pinene	1,300	57	220	10	
103-65-1	n-Propylbenzene	240	57	48	12	
622-96-8	4-Ethyltoluene	91	57	19	12	
108-67-8	1,3,5-Trimethylbenzene	520	57	110	12	
95-63-6	1,2,4-Trimethylbenzene	920	57	190	12	
100-44-7	Benzyl Chloride	ND	57	ND	11	
541-73-1	1,3-Dichlorobenzene	ND	57	ND	9.5	
106-46-7	1,4-Dichlorobenzene	ND	57	ND	9.5	
95-50-1	1,2-Dichlorobenzene	76	57	13	9.5	
5989-27-5	d-Limonene	90	57	16	10	
96-12-8	1,2-Dibromo-3-chloropropane	ND	57	ND	5.9	
120-82-1	1,2,4-Trichlorobenzene	ND	57	ND	7.7	
91-20-3	Naphthalene	ND	57	ND	11	
87-68-3	Hexachlorobutadiene	ND	57	ND	5.4	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Method Blank

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Cory Lewis

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 1/4/17

Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	ND	0.50	ND	0.29	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.50	ND	0.10	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.50	ND	0.072	
75-01-4	Vinyl Chloride	ND	0.50	ND	0.20	
106-99-0	1,3-Butadiene	ND	0.50	ND	0.23	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.50	ND	0.19	
64-17-5	Ethanol	ND	5.0	ND	2.7	
75-05-8	Acetonitrile	ND	0.50	ND	0.30	
107-02-8	Acrolein	ND	2.0	ND	0.87	
67-64-1	Acetone	ND	5.0	ND	2.1	
75-69-4	Trichlorofluoromethane	ND	0.50	ND	0.089	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	5.0	ND	2.0	
107-13-1	Acrylonitrile	ND	0.50	ND	0.23	
75-35-4	1,1-Dichloroethene	ND	0.50	ND	0.13	
75-09-2	Methylene Chloride	ND	0.50	ND	0.14	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.50	ND	0.16	
76-13-1	Trichlorotrifluoroethane	ND	0.50	ND	0.065	
75-15-0	Carbon Disulfide	ND	5.0	ND	1.6	
156-60-5	trans-1,2-Dichloroethene	ND	0.50	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.50	ND	0.12	
1634-04-4	Methyl tert-Butyl Ether	ND	0.50	ND	0.14	
108-05-4	Vinyl Acetate	ND	5.0	ND	1.4	
78-93-3	2-Butanone (MEK)	ND	5.0	ND	1.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.



# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Method Blank

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Cory Lewis

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 1/4/17

Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	0.50	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.0	ND	0.28	
110-54-3	n-Hexane	ND	0.50	ND	0.14	
67-66-3	Chloroform	ND	0.50	ND	0.10	
109-99-9	Tetrahydrofuran (THF)	ND	0.50	ND	0.17	
107-06-2	1,2-Dichloroethane	ND	0.50	ND	0.12	
71-55-6	1,1,1-Trichloroethane	ND	0.50	ND	0.092	
71-43-2	Benzene	ND	0.50	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.50	ND	0.080	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.50	ND	0.11	
75-27-4	Bromodichloromethane	ND	0.50	ND	0.075	
79-01-6	Trichloroethene	ND	0.50	ND	0.093	
123-91-1	1,4-Dioxane	ND	0.50	ND	0.14	
80-62-6	Methyl Methacrylate	ND	1.0	ND	0.24	
142-82-5	n-Heptane	ND	0.50	ND	0.12	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ND	0.11	
108-10-1	4-Methyl-2-pentanone	ND	0.50	ND	0.12	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ND	0.11	
79-00-5	1,1,2-Trichloroethane	ND	0.50	ND	0.092	
108-88-3	Toluene	ND	0.50	ND	0.13	
591-78-6	2-Hexanone	ND	0.50	ND	0.12	
124-48-1	Dibromochloromethane	ND	0.50	ND	0.059	
106-93-4	1,2-Dibromoethane	ND	0.50	ND	0.065	
123-86-4	n-Butyl Acetate	ND	0.50	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 3 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Cory Lewis  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 1/4/17  
 Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.50	ND	0.11	
127-18-4	Tetrachloroethene	ND	0.50	ND	0.074	
108-90-7	Chlorobenzene	ND	0.50	ND	0.11	
100-41-4	Ethylbenzene	ND	0.50	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.0	ND	0.23	
75-25-2	Bromoform	ND	0.50	ND	0.048	
100-42-5	Styrene	ND	0.50	ND	0.12	
95-47-6	o-Xylene	ND	0.50	ND	0.12	
111-84-2	n-Nonane	ND	0.50	ND	0.095	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	ND	0.073	
98-82-8	Cumene	ND	0.50	ND	0.10	
80-56-8	alpha-Pinene	ND	0.50	ND	0.090	
103-65-1	n-Propylbenzene	ND	0.50	ND	0.10	
622-96-8	4-Ethyltoluene	ND	0.50	ND	0.10	
108-67-8	1,3,5-Trimethylbenzene	ND	0.50	ND	0.10	
95-63-6	1,2,4-Trimethylbenzene	ND	0.50	ND	0.10	
100-44-7	Benzyl Chloride	ND	0.50	ND	0.097	
541-73-1	1,3-Dichlorobenzene	ND	0.50	ND	0.083	
106-46-7	1,4-Dichlorobenzene	ND	0.50	ND	0.083	
95-50-1	1,2-Dichlorobenzene	ND	0.50	ND	0.083	
5989-27-5	d-Limonene	ND	0.50	ND	0.090	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.50	ND	0.052	
120-82-1	1,2,4-Trichlorobenzene	ND	0.50	ND	0.067	
91-20-3	Naphthalene	ND	0.50	ND	0.095	
87-68-3	Hexachlorobutadiene	ND	0.50	ND	0.047	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 1 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 1/4/17  
 Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result	MRL	Result	MRL	Data Qualifier
		µg/m <sup>3</sup>	µg/m <sup>3</sup>	ppbV	ppbV	
115-07-1	Propene	ND	0.50	ND	0.29	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.50	ND	0.10	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.50	ND	0.072	
75-01-4	Vinyl Chloride	ND	0.50	ND	0.20	
106-99-0	1,3-Butadiene	ND	0.50	ND	0.23	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.50	ND	0.19	
64-17-5	Ethanol	ND	5.0	ND	2.7	
75-05-8	Acetonitrile	ND	0.50	ND	0.30	
107-02-8	Acrolein	ND	2.0	ND	0.87	
67-64-1	Acetone	ND	5.0	ND	2.1	
75-69-4	Trichlorofluoromethane	ND	0.50	ND	0.089	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	5.0	ND	2.0	
107-13-1	Acrylonitrile	ND	0.50	ND	0.23	
75-35-4	1,1-Dichloroethene	ND	0.50	ND	0.13	
75-09-2	Methylene Chloride	ND	0.50	ND	0.14	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.50	ND	0.16	
76-13-1	Trichlorotrifluoroethane	ND	0.50	ND	0.065	
75-15-0	Carbon Disulfide	ND	5.0	ND	1.6	
156-60-5	trans-1,2-Dichloroethene	ND	0.50	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.50	ND	0.12	
1634-04-4	Methyl tert-Butyl Ether	ND	0.50	ND	0.14	
108-05-4	Vinyl Acetate	ND	5.0	ND	1.4	
78-93-3	2-Butanone (MEK)	ND	5.0	ND	1.7	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Method Blank

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Lusine Hakobyan

Sample Type: 6.0 L Silonite Canister

Test Notes:

Date Collected: NA

Date Received: NA

Date Analyzed: 1/4/17

Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	0.50	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.0	ND	0.28	
110-54-3	n-Hexane	ND	0.50	ND	0.14	
67-66-3	Chloroform	ND	0.50	ND	0.10	
109-99-9	Tetrahydrofuran (THF)	ND	0.50	ND	0.17	
107-06-2	1,2-Dichloroethane	ND	0.50	ND	0.12	
71-55-6	1,1,1-Trichloroethane	ND	0.50	ND	0.092	
71-43-2	Benzene	ND	0.50	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.50	ND	0.080	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.50	ND	0.11	
75-27-4	Bromodichloromethane	ND	0.50	ND	0.075	
79-01-6	Trichloroethene	ND	0.50	ND	0.093	
123-91-1	1,4-Dioxane	ND	0.50	ND	0.14	
80-62-6	Methyl Methacrylate	ND	1.0	ND	0.24	
142-82-5	n-Heptane	ND	0.50	ND	0.12	
10061-01-5	cis-1,3-Dichloropropene	ND	0.50	ND	0.11	
108-10-1	4-Methyl-2-pentanone	ND	0.50	ND	0.12	
10061-02-6	trans-1,3-Dichloropropene	ND	0.50	ND	0.11	
79-00-5	1,1,2-Trichloroethane	ND	0.50	ND	0.092	
108-88-3	Toluene	ND	0.50	ND	0.13	
591-78-6	2-Hexanone	ND	0.50	ND	0.12	
124-48-1	Dibromochloromethane	ND	0.50	ND	0.059	
106-93-4	1,2-Dibromoethane	ND	0.50	ND	0.065	
123-86-4	n-Butyl Acetate	ND	0.50	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

# ALS ENVIRONMENTAL

## RESULTS OF ANALYSIS

Page 3 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P170104-MB

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 1/4/17  
 Volume(s) Analyzed: 1.00 Liter(s)

Canister Dilution Factor: 1.00

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.50	ND	0.11	
127-18-4	Tetrachloroethene	ND	0.50	ND	0.074	
108-90-7	Chlorobenzene	ND	0.50	ND	0.11	
100-41-4	Ethylbenzene	ND	0.50	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.0	ND	0.23	
75-25-2	Bromoform	ND	0.50	ND	0.048	
100-42-5	Styrene	ND	0.50	ND	0.12	
95-47-6	o-Xylene	ND	0.50	ND	0.12	
111-84-2	n-Nonane	ND	0.50	ND	0.095	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.50	ND	0.073	
98-82-8	Cumene	ND	0.50	ND	0.10	
80-56-8	alpha-Pinene	ND	0.50	ND	0.090	
103-65-1	n-Propylbenzene	ND	0.50	ND	0.10	
622-96-8	4-Ethyltoluene	ND	0.50	ND	0.10	
108-67-8	1,3,5-Trimethylbenzene	ND	0.50	ND	0.10	
95-63-6	1,2,4-Trimethylbenzene	ND	0.50	ND	0.10	
100-44-7	Benzyl Chloride	ND	0.50	ND	0.097	
541-73-1	1,3-Dichlorobenzene	ND	0.50	ND	0.083	
106-46-7	1,4-Dichlorobenzene	ND	0.50	ND	0.083	
95-50-1	1,2-Dichlorobenzene	ND	0.50	ND	0.083	
5989-27-5	d-Limonene	ND	0.50	ND	0.090	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.50	ND	0.052	
120-82-1	1,2,4-Trichlorobenzene	ND	0.50	ND	0.067	
91-20-3	Naphthalene	ND	0.50	ND	0.095	
87-68-3	Hexachlorobutadiene	ND	0.50	ND	0.047	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

**ALS ENVIRONMENTAL**

SURROGATE SPIKE RECOVERY RESULTS

Page 1 of 1

**Client:** Landau Associates, Inc.

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

Test Code: EPA TO-15 Modified

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Analyst: Cory Lewis

Sample Type: 6.0 L Silonite Canister(s)

Test Notes:

Date(s) Collected: 12/29/16

Date(s) Received: 1/3/17

Date(s) Analyzed: 1/4 - 1/5/17

Client Sample ID	ALS Sample ID	1,2-Dichloroethane-d4	Toluene-d8	Bromofluorobenzene	Acceptance Limits	Data Qualifier
		Percent Recovered	Percent Recovered	Percent Recovered		
Method Blank	P170104-MB	105	100	91	70-130	
Method Blank	P170104-MB	106	98	93	70-130	
Lab Control Sample	P170104-LCS	102	97	94	70-130	
Lab Control Sample	P170104-LCS	106	96	95	70-130	
Ambient-12292016	P1700001-001	107	97	91	70-130	
GP-38-12292016	P1700001-002	105	73	84	70-130	
GP-39-12292016	P1700001-003	105	85	94	70-130	
GP-43-12292016	P1700001-004	106	86	91	70-130	
GP-41-12292016	P1700001-005	108	89	96	70-130	

Surrogate percent recovery is verified and accepted based on the on-column result.

Reported results are shown in concentration units and as a result of the calculation, may vary slightly from the on-column percent recovery.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Lab Control Sample  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P170104-LCS

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Cory Lewis  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 1/4/17  
 Volume(s) Analyzed: 0.125 Liter(s)

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
115-07-1	Propene	210	191	91	52-127	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	188	90	68-109	
74-87-3	Chloromethane	210	180	86	51-130	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	177	84	66-114	
75-01-4	Vinyl Chloride	210	215	102	61-125	
106-99-0	1,3-Butadiene	210	231	110	62-144	
74-83-9	Bromomethane	210	193	92	73-123	
75-00-3	Chloroethane	210	206	98	69-122	
64-17-5	Ethanol	1,060	1050	99	62-124	
75-05-8	Acetonitrile	213	212	100	57-114	
107-02-8	Acrolein	212	182	86	62-116	
67-64-1	Acetone	1,060	1040	98	57-117	
75-69-4	Trichlorofluoromethane	210	182	87	63-98	
67-63-0	2-Propanol (Isopropyl Alcohol)	424	427	101	66-121	
107-13-1	Acrylonitrile	213	209	98	68-123	
75-35-4	1,1-Dichloroethene	213	198	93	76-118	
75-09-2	Methylene Chloride	212	199	94	60-118	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	212	217	102	65-126	
76-13-1	Trichlorotrifluoroethane	212	180	85	73-114	
75-15-0	Carbon Disulfide	213	206	97	57-102	
156-60-5	trans-1,2-Dichloroethene	213	204	96	74-123	
75-34-3	1,1-Dichloroethane	212	199	94	69-111	
1634-04-4	Methyl tert-Butyl Ether	213	191	90	69-113	
108-05-4	Vinyl Acetate	1,060	1190	112	76-128	
78-93-3	2-Butanone (MEK)	212	211	100	63-127	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170104-LCS

Test Code: EPA TO-15 Modified

Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: NA

Analyst: Cory Lewis

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.125 Liter(s)

Test Notes:

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
156-59-2	cis-1,2-Dichloroethene	212	202	95	72-117	
141-78-6	Ethyl Acetate	426	479	112	68-127	
110-54-3	n-Hexane	213	228	107	55-116	
67-66-3	Chloroform	212	192	91	70-109	
109-99-9	Tetrahydrofuran (THF)	213	195	92	72-113	
107-06-2	1,2-Dichloroethane	212	193	91	69-113	
71-55-6	1,1,1-Trichloroethane	212	188	89	72-115	
71-43-2	Benzene	212	194	92	65-107	
56-23-5	Carbon Tetrachloride	213	193	91	71-113	
110-82-7	Cyclohexane	425	409	96	71-115	
78-87-5	1,2-Dichloropropane	212	200	94	71-115	
75-27-4	Bromodichloromethane	214	206	96	75-118	
79-01-6	Trichloroethene	212	187	88	68-114	
123-91-1	1,4-Dioxane	213	208	98	81-131	
80-62-6	Methyl Methacrylate	424	419	99	72-130	
142-82-5	n-Heptane	213	205	96	68-116	
10061-01-5	cis-1,3-Dichloropropene	210	213	101	77-126	
108-10-1	4-Methyl-2-pentanone	213	214	100	69-126	
10061-02-6	trans-1,3-Dichloropropene	213	215	101	79-125	
79-00-5	1,1,2-Trichloroethane	212	198	93	75-119	
108-88-3	Toluene	212	185	87	59-118	
591-78-6	2-Hexanone	213	208	98	69-129	
124-48-1	Dibromochloromethane	213	193	91	74-136	
106-93-4	1,2-Dibromoethane	212	190	90	73-131	
123-86-4	n-Butyl Acetate	216	215	100	69-130	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.



# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 3 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170104-LCS

Test Code: EPA TO-15 Modified

Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: NA

Analyst: Cory Lewis

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.125 Liter(s)

Test Notes:

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
111-65-9	n-Octane	212	<b>202</b>	<b>95</b>	66-120	
127-18-4	Tetrachloroethene	213	<b>179</b>	<b>84</b>	65-130	
108-90-7	Chlorobenzene	212	<b>184</b>	<b>87</b>	68-120	
100-41-4	Ethylbenzene	212	<b>197</b>	<b>93</b>	68-122	
179601-23-1	m,p-Xylenes	424	<b>409</b>	<b>96</b>	68-123	
75-25-2	Bromoform	212	<b>201</b>	<b>95</b>	69-130	
100-42-5	Styrene	212	<b>199</b>	<b>94</b>	71-133	
95-47-6	o-Xylene	212	<b>201</b>	<b>95</b>	68-122	
111-84-2	n-Nonane	212	<b>206</b>	<b>97</b>	65-120	
79-34-5	1,1,2,2-Tetrachloroethane	212	<b>223</b>	<b>105</b>	69-130	
98-82-8	Cumene	212	<b>193</b>	<b>91</b>	70-123	
80-56-8	alpha-Pinene	213	<b>199</b>	<b>93</b>	70-128	
103-65-1	n-Propylbenzene	214	<b>208</b>	<b>97</b>	69-125	
622-96-8	4-Ethyltoluene	212	<b>214</b>	<b>101</b>	67-130	
108-67-8	1,3,5-Trimethylbenzene	212	<b>196</b>	<b>92</b>	67-124	
95-63-6	1,2,4-Trimethylbenzene	212	<b>227</b>	<b>107</b>	67-129	
100-44-7	Benzyl Chloride	212	<b>245</b>	<b>116</b>	79-138	
541-73-1	1,3-Dichlorobenzene	212	<b>233</b>	<b>110</b>	65-136	
106-46-7	1,4-Dichlorobenzene	213	<b>192</b>	<b>90</b>	66-141	
95-50-1	1,2-Dichlorobenzene	212	<b>211</b>	<b>100</b>	67-136	
5989-27-5	d-Limonene	212	<b>238</b>	<b>112</b>	71-134	
96-12-8	1,2-Dibromo-3-chloropropane	212	<b>212</b>	<b>100</b>	73-136	
120-82-1	1,2,4-Trichlorobenzene	212	<b>231</b>	<b>109</b>	64-134	
91-20-3	Naphthalene	214	<b>241</b>	<b>113</b>	62-136	
87-68-3	Hexachlorobutadiene	213	<b>199</b>	<b>93</b>	60-133	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 1 of 3

**Client:** Landau Associates, Inc.  
**Client Sample ID:** Lab Control Sample  
**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001  
 ALS Sample ID: P170104-LCS

Test Code: EPA TO-15 Modified  
 Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16  
 Analyst: Lusine Hakobyan  
 Sample Type: 6.0 L Silonite Canister  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 1/4/17  
 Volume(s) Analyzed: 0.125 Liter(s)

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
115-07-1	Propene	210	193	92	52-127	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	189	90	68-109	
74-87-3	Chloromethane	210	173	82	51-130	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	174	82	66-114	
75-01-4	Vinyl Chloride	210	213	101	61-125	
106-99-0	1,3-Butadiene	210	221	105	62-144	
74-83-9	Bromomethane	210	199	95	73-123	
75-00-3	Chloroethane	210	209	100	69-122	
64-17-5	Ethanol	1,060	1060	100	62-124	
75-05-8	Acetonitrile	213	216	101	57-114	
107-02-8	Acrolein	212	188	89	62-116	
67-64-1	Acetone	1,060	1050	99	57-117	
75-69-4	Trichlorofluoromethane	210	184	88	63-98	
67-63-0	2-Propanol (Isopropyl Alcohol)	424	430	101	66-121	
107-13-1	Acrylonitrile	213	209	98	68-123	
75-35-4	1,1-Dichloroethene	213	199	93	76-118	
75-09-2	Methylene Chloride	212	196	92	60-118	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	212	219	103	65-126	
76-13-1	Trichlorotrifluoroethane	212	180	85	73-114	
75-15-0	Carbon Disulfide	213	205	96	57-102	
156-60-5	trans-1,2-Dichloroethene	213	208	98	74-123	
75-34-3	1,1-Dichloroethane	212	201	95	69-111	
1634-04-4	Methyl tert-Butyl Ether	213	193	91	69-113	
108-05-4	Vinyl Acetate	1,060	1130	107	76-128	
78-93-3	2-Butanone (MEK)	212	207	98	63-127	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 2 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170104-LCS

Test Code: EPA TO-15 Modified

Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: NA

Analyst: Lusine Hakobyan

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.125 Liter(s)

Test Notes:

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
156-59-2	cis-1,2-Dichloroethene	212	204	96	72-117	
141-78-6	Ethyl Acetate	426	473	111	68-127	
110-54-3	n-Hexane	213	226	106	55-116	
67-66-3	Chloroform	212	193	91	70-109	
109-99-9	Tetrahydrofuran (THF)	213	194	91	72-113	
107-06-2	1,2-Dichloroethane	212	197	93	69-113	
71-55-6	1,1,1-Trichloroethane	212	187	88	72-115	
71-43-2	Benzene	212	188	89	65-107	
56-23-5	Carbon Tetrachloride	213	192	90	71-113	
110-82-7	Cyclohexane	425	398	94	71-115	
78-87-5	1,2-Dichloropropane	212	198	93	71-115	
75-27-4	Bromodichloromethane	214	203	95	75-118	
79-01-6	Trichloroethene	212	183	86	68-114	
123-91-1	1,4-Dioxane	213	204	96	81-131	
80-62-6	Methyl Methacrylate	424	405	96	72-130	
142-82-5	n-Heptane	213	201	94	68-116	
10061-01-5	cis-1,3-Dichloropropene	210	210	100	77-126	
108-10-1	4-Methyl-2-pentanone	213	210	99	69-126	
10061-02-6	trans-1,3-Dichloropropene	213	214	100	79-125	
79-00-5	1,1,2-Trichloroethane	212	193	91	75-119	
108-88-3	Toluene	212	175	83	59-118	
591-78-6	2-Hexanone	213	198	93	69-129	
124-48-1	Dibromochloromethane	213	185	87	74-136	
106-93-4	1,2-Dibromoethane	212	181	85	73-131	
123-86-4	n-Butyl Acetate	216	206	95	69-130	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

# ALS ENVIRONMENTAL

## LABORATORY CONTROL SAMPLE SUMMARY

Page 3 of 3

**Client:** Landau Associates, Inc.

**Client Sample ID:** Lab Control Sample

**Client Project ID:** Transportation Corridor Investigation / 1148009.010.014

ALS Project ID: P1700001

ALS Sample ID: P170104-LCS

Test Code: EPA TO-15 Modified

Date Collected: NA

Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16

Date Received: NA

Analyst: Lusine Hakobyan

Date Analyzed: 1/4/17

Sample Type: 6.0 L Silonite Canister

Volume(s) Analyzed: 0.125 Liter(s)

Test Notes:

CAS #	Compound	Spike Amount µg/m <sup>3</sup>	Result µg/m <sup>3</sup>	% Recovery	ALS	Data Qualifier
					Acceptance Limits	
111-65-9	n-Octane	212	195	92	66-120	
127-18-4	Tetrachloroethene	213	171	80	65-130	
108-90-7	Chlorobenzene	212	175	83	68-120	
100-41-4	Ethylbenzene	212	186	88	68-122	
179601-23-1	m,p-Xylenes	424	384	91	68-123	
75-25-2	Bromoform	212	191	90	69-130	
100-42-5	Styrene	212	187	88	71-133	
95-47-6	o-Xylene	212	190	90	68-122	
111-84-2	n-Nonane	212	196	92	65-120	
79-34-5	1,1,2,2-Tetrachloroethane	212	208	98	69-130	
98-82-8	Cumene	212	182	86	70-123	
80-56-8	alpha-Pinene	213	188	88	70-128	
103-65-1	n-Propylbenzene	214	194	91	69-125	
622-96-8	4-Ethyltoluene	212	199	94	67-130	
108-67-8	1,3,5-Trimethylbenzene	212	183	86	67-124	
95-63-6	1,2,4-Trimethylbenzene	212	209	99	67-129	
100-44-7	Benzyl Chloride	212	230	108	79-138	
541-73-1	1,3-Dichlorobenzene	212	215	101	65-136	
106-46-7	1,4-Dichlorobenzene	213	178	84	66-141	
95-50-1	1,2-Dichlorobenzene	212	193	91	67-136	
5989-27-5	d-Limonene	212	221	104	71-134	
96-12-8	1,2-Dibromo-3-chloropropane	212	200	94	73-136	
120-82-1	1,2,4-Trichlorobenzene	212	219	103	64-134	
91-20-3	Naphthalene	214	226	106	62-136	
87-68-3	Hexachlorobutadiene	213	191	90	60-133	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result. Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

# LandGEM Model Summary—Scenario 1

**Scenario 1: Waste Acceptance - Wood Debris MSW  
Transportation Corridor  
Yakima, Washington**

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg/year)	(short tons/year)
1920	6.00E+03	6.60E+03	0.00E+00	0.00E+00
1921	6.00E+03	6.60E+03	6.00E+03	6.60E+03
1922	6.00E+03	6.60E+03	1.20E+04	1.32E+04
1923	6.00E+03	6.60E+03	1.80E+04	1.98E+04
1924	6.00E+03	6.60E+03	2.40E+04	2.64E+04
1925	6.00E+03	6.60E+03	3.00E+04	3.30E+04
1926	6.00E+03	6.60E+03	3.60E+04	3.96E+04
1927	6.00E+03	6.60E+03	4.20E+04	4.62E+04
1928	6.00E+03	6.60E+03	4.80E+04	5.28E+04
1929	6.00E+03	6.60E+03	5.40E+04	5.94E+04
1930	6.00E+03	6.60E+03	6.00E+04	6.60E+04
1931	6.00E+03	6.60E+03	6.60E+04	7.26E+04
1932	6.00E+03	6.60E+03	7.20E+04	7.92E+04
1933	6.00E+03	6.60E+03	7.80E+04	8.58E+04
1934	6.00E+03	6.60E+03	8.40E+04	9.24E+04
1935	6.00E+03	6.60E+03	9.00E+04	9.90E+04
1936	6.00E+03	6.60E+03	9.60E+04	1.06E+05
1937	6.00E+03	6.60E+03	1.02E+05	1.12E+05
1938	6.00E+03	6.60E+03	1.08E+05	1.19E+05
1939	6.00E+03	6.60E+03	1.14E+05	1.25E+05
1940	6.00E+03	6.60E+03	1.20E+05	1.32E+05
1941	6.00E+03	6.60E+03	1.26E+05	1.39E+05
1942	6.00E+03	6.60E+03	1.32E+05	1.45E+05
1943	6.00E+03	6.60E+03	1.38E+05	1.52E+05
1944	6.00E+03	6.60E+03	1.44E+05	1.58E+05
1945	6.00E+03	6.60E+03	1.50E+05	1.65E+05
1946	6.00E+03	6.60E+03	1.56E+05	1.72E+05
1947	6.00E+03	6.60E+03	1.62E+05	1.78E+05
1948	6.00E+03	6.60E+03	1.68E+05	1.85E+05
1949	6.00E+03	6.60E+03	1.74E+05	1.91E+05
1950	6.00E+03	6.60E+03	1.80E+05	1.98E+05
1951	6.00E+03	6.60E+03	1.86E+05	2.05E+05
1952	6.00E+03	6.60E+03	1.92E+05	2.11E+05
1953	6.00E+03	6.60E+03	1.98E+05	2.18E+05
1954	6.00E+03	6.60E+03	2.04E+05	2.24E+05
1955	6.00E+03	6.60E+03	2.10E+05	2.31E+05
1956	6.00E+03	6.60E+03	2.16E+05	2.38E+05
1957	6.00E+03	6.60E+03	2.22E+05	2.44E+05
1958	6.00E+03	6.60E+03	2.28E+05	2.51E+05
1959	6.00E+03	6.60E+03	2.34E+05	2.57E+05
1960	6.00E+03	6.60E+03	2.40E+05	2.64E+05
1961	6.00E+03	6.60E+03	2.46E+05	2.71E+05

**Scenario 1: Waste Acceptance - Wood Debris MSW  
Transportation Corridor  
Yakima, Washington**

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg/year)	(short tons/year)
1962	6.00E+03	6.60E+03	2.52E+05	2.77E+05
1963	7.56E+04	8.32E+04	2.58E+05	2.84E+05
1964	7.56E+04	8.32E+04	3.34E+05	3.67E+05
1965	7.56E+04	8.32E+04	4.09E+05	4.50E+05
1966	7.56E+04	8.32E+04	4.85E+05	5.33E+05
1967	7.56E+04	8.32E+04	5.60E+05	6.16E+05
1968	7.56E+04	8.32E+04	6.36E+05	7.00E+05
1969	7.56E+04	8.32E+04	7.12E+05	7.83E+05
1970	7.56E+04	8.32E+04	7.87E+05	8.66E+05
1971	6.00E+03	6.60E+03	8.63E+05	9.49E+05
1972	6.00E+03	6.60E+03	8.69E+05	9.56E+05
1973	6.00E+03	6.60E+03	8.75E+05	9.62E+05
1974	6.00E+03	6.60E+03	8.81E+05	9.69E+05
1975	6.00E+03	6.60E+03	8.87E+05	9.76E+05
1976	6.00E+03	6.60E+03	8.93E+05	9.82E+05
1977	6.00E+03	6.60E+03	8.99E+05	9.89E+05
1978	6.00E+03	6.60E+03	9.05E+05	9.95E+05
1979	6.00E+03	6.60E+03	9.11E+05	1.00E+06
1980	6.00E+03	6.60E+03	9.17E+05	1.01E+06
1981	6.00E+03	6.60E+03	9.23E+05	1.02E+06
1982	6.00E+03	6.60E+03	9.29E+05	1.02E+06
1983	6.00E+03	6.60E+03	9.35E+05	1.03E+06
1984	6.00E+03	6.60E+03	9.41E+05	1.04E+06
1985	6.00E+03	6.60E+03	9.47E+05	1.04E+06
1986	6.00E+03	6.60E+03	9.53E+05	1.05E+06
1987	6.00E+03	6.60E+03	9.59E+05	1.05E+06
1988	6.00E+03	6.60E+03	9.65E+05	1.06E+06
1989	6.00E+03	6.60E+03	9.71E+05	1.07E+06
1990	6.00E+03	6.60E+03	9.77E+05	1.07E+06
1991	6.00E+03	6.60E+03	9.83E+05	1.08E+06
1992	6.00E+03	6.60E+03	9.89E+05	1.09E+06
1993	6.00E+03	6.60E+03	9.95E+05	1.09E+06
1994	6.00E+03	6.60E+03	1.00E+06	1.10E+06
1995	6.00E+03	6.60E+03	1.01E+06	1.11E+06
1996	6.00E+03	6.60E+03	1.01E+06	1.11E+06
1997	6.00E+03	6.60E+03	1.02E+06	1.12E+06
1998	6.00E+03	6.60E+03	1.02E+06	1.13E+06
1999	6.00E+03	6.60E+03	1.03E+06	1.13E+06
2000	6.00E+03	6.60E+03	1.04E+06	1.13E+06
2001	6.00E+03	6.60E+03	1.04E+06	1.14E+06
2002	6.00E+03	6.60E+03	1.05E+06	1.15E+06
2003	6.00E+03	6.60E+03	1.05E+06	1.15E+06

**Scenario 1: Waste Acceptance - Wood Debris MSW  
Transportation Corridor  
Yakima, Washington**

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg/year)	(short tons/year)
2004	6.00E+03	6.60E+03	1.06E+06	1.16E+06
2005	6.00E+03	6.60E+03	1.07E+06	1.17E+06
2006	6.00E+03	6.60E+03	1.04E+06	1.13E+06
2007	6.00E+03	6.60E+03	1.04E+06	1.14E+06
2008	6.00E+03	6.60E+03	1.05E+06	1.15E+06
2009	6.00E+03	6.60E+03	1.05E+06	1.15E+06
2010	6.00E+03	6.60E+03	1.06E+06	1.16E+06
2011	6.00E+03	6.60E+03	1.07E+06	1.17E+06
2012	6.00E+03	6.60E+03	1.07E+06	1.17E+06
2013	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2014	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2015	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2016	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2017	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2018	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2019	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2020	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2021	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2022	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2023	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2024	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2025	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2026	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2027	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2028	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2029	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2030	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2031	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2032	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2033	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2034	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2035	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2036	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2037	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2038	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2039	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2040	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2041	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2042	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2043	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2044	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2045	0.00E+00	0.00E+00	1.08E+06	1.18E+06



**Scenario 1: Waste Acceptance - Wood Debris MSW  
Transportation Corridor  
Yakima, Washington**

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg/year)	(short tons/year)
2046	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2047	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2048	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2049	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2050	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2051	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2052	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2053	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2054	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2055	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2056	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2057	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2058	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2059	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2060	0.00E+00	0.00E+00	1.08E+06	1.18E+06

**Scenario 1: Total LFG and Methane Production - Wood Debris MSW  
Transportation Corridor  
Yakima, Washington**

Year	Total landfill gas (Wood Debris & MSW)			Methane (Wood Debris & MSW)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
1920	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1921	3.40E+01	2.84E+04	1.91E+00	7.97E+00	1.19E+04	8.02E-01
1922	6.76E+01	5.66E+04	3.80E+00	1.59E+01	2.38E+04	1.60E+00
1923	1.01E+02	8.45E+04	5.67E+00	2.37E+01	3.55E+04	2.38E+00
1924	1.34E+02	1.12E+05	7.53E+00	3.14E+01	4.71E+04	3.16E+00
1925	1.67E+02	1.39E+05	9.36E+00	3.91E+01	5.85E+04	3.93E+00
1926	1.99E+02	1.66E+05	1.12E+01	4.66E+01	6.99E+04	4.70E+00
1927	2.31E+02	1.93E+05	1.30E+01	5.41E+01	8.11E+04	5.45E+00
1928	2.63E+02	2.20E+05	1.48E+01	6.16E+01	9.23E+04	6.20E+00
1929	2.94E+02	2.46E+05	1.65E+01	6.89E+01	1.03E+05	6.94E+00
1930	3.25E+02	2.72E+05	1.83E+01	7.62E+01	1.14E+05	7.67E+00
1931	3.56E+02	2.98E+05	2.00E+01	8.34E+01	1.25E+05	8.40E+00
1932	3.86E+02	3.23E+05	2.17E+01	9.05E+01	1.36E+05	9.12E+00
1933	4.16E+02	3.48E+05	2.34E+01	9.76E+01	1.46E+05	9.83E+00
1934	4.46E+02	3.73E+05	2.51E+01	1.05E+02	1.57E+05	1.05E+01
1935	4.76E+02	3.98E+05	2.67E+01	1.12E+02	1.67E+05	1.12E+01
1936	5.05E+02	4.23E+05	2.84E+01	1.18E+02	1.77E+05	1.19E+01
1937	5.34E+02	4.47E+05	3.00E+01	1.25E+02	1.88E+05	1.26E+01
1938	5.63E+02	4.71E+05	3.16E+01	1.32E+02	1.98E+05	1.33E+01
1939	5.91E+02	4.94E+05	3.32E+01	1.39E+02	2.08E+05	1.40E+01
1940	6.19E+02	5.18E+05	3.48E+01	1.45E+02	2.18E+05	1.46E+01
1941	6.47E+02	5.41E+05	3.64E+01	1.52E+02	2.27E+05	1.53E+01
1942	6.75E+02	5.64E+05	3.79E+01	1.58E+02	2.37E+05	1.59E+01
1943	7.02E+02	5.87E+05	3.95E+01	1.65E+02	2.47E+05	1.66E+01
1944	7.29E+02	6.10E+05	4.10E+01	1.71E+02	2.56E+05	1.72E+01
1945	7.56E+02	6.32E+05	4.25E+01	1.77E+02	2.65E+05	1.78E+01
1946	7.82E+02	6.54E+05	4.40E+01	1.83E+02	2.75E+05	1.85E+01
1947	8.08E+02	6.76E+05	4.54E+01	1.89E+02	2.84E+05	1.91E+01
1948	8.34E+02	6.98E+05	4.69E+01	1.96E+02	2.93E+05	1.97E+01
1949	8.60E+02	7.19E+05	4.83E+01	2.02E+02	3.02E+05	2.03E+01
1950	8.85E+02	7.41E+05	4.98E+01	2.08E+02	3.11E+05	2.09E+01
1951	9.11E+02	7.62E+05	5.12E+01	2.13E+02	3.20E+05	2.15E+01
1952	9.36E+02	7.83E+05	5.26E+01	2.19E+02	3.29E+05	2.21E+01
1953	9.60E+02	8.03E+05	5.40E+01	2.25E+02	3.37E+05	2.27E+01
1954	9.85E+02	8.24E+05	5.53E+01	2.31E+02	3.46E+05	2.32E+01
1955	1.01E+03	8.44E+05	5.67E+01	2.36E+02	3.54E+05	2.38E+01
1956	1.03E+03	8.64E+05	5.80E+01	2.42E+02	3.63E+05	2.44E+01
1957	1.06E+03	8.84E+05	5.94E+01	2.48E+02	3.71E+05	2.49E+01
1958	1.08E+03	9.03E+05	6.07E+01	2.53E+02	3.79E+05	2.55E+01
1959	1.10E+03	9.23E+05	6.20E+01	2.59E+02	3.88E+05	2.60E+01
1960	1.13E+03	9.42E+05	6.33E+01	2.64E+02	3.96E+05	2.66E+01
1961	1.15E+03	9.61E+05	6.46E+01	2.69E+02	4.04E+05	2.71E+01
1962	1.17E+03	9.80E+05	6.59E+01	2.75E+02	4.12E+05	2.77E+01

**Scenario 1: Total LFG and Methane Production - Wood Debris MSW  
Transportation Corridor  
Yakima, Washington**

Year	Total landfill gas (Wood Debris & MSW)			Methane (Wood Debris & MSW)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
1963	1.19E+03	9.99E+05	6.71E+01	2.80E+02	4.19E+05	2.82E+01
1964	1.88E+03	1.58E+06	1.06E+02	4.42E+02	6.62E+05	4.45E+01
1965	2.56E+03	2.14E+06	1.44E+02	6.00E+02	9.00E+05	6.04E+01
1966	3.22E+03	2.70E+06	1.81E+02	7.56E+02	1.13E+06	7.61E+01
1967	3.87E+03	3.24E+06	2.18E+02	9.08E+02	1.36E+06	9.15E+01
1968	4.51E+03	3.77E+06	2.54E+02	1.06E+03	1.59E+06	1.07E+02
1969	5.14E+03	4.30E+06	2.89E+02	1.20E+03	1.80E+06	1.21E+02
1970	5.75E+03	4.81E+06	3.23E+02	1.35E+03	2.02E+06	1.36E+02
1971	6.35E+03	5.31E+06	3.57E+02	1.49E+03	2.23E+06	1.50E+02
1972	6.27E+03	5.25E+06	3.53E+02	1.47E+03	2.20E+06	1.48E+02
1973	6.20E+03	5.18E+06	3.48E+02	1.45E+03	2.18E+06	1.46E+02
1974	6.12E+03	5.12E+06	3.44E+02	1.43E+03	2.15E+06	1.45E+02
1975	6.05E+03	5.06E+06	3.40E+02	1.42E+03	2.13E+06	1.43E+02
1976	5.98E+03	5.00E+06	3.36E+02	1.40E+03	2.10E+06	1.41E+02
1977	5.91E+03	4.94E+06	3.32E+02	1.38E+03	2.08E+06	1.39E+02
1978	5.84E+03	4.88E+06	3.28E+02	1.37E+03	2.05E+06	1.38E+02
1979	5.77E+03	4.83E+06	3.24E+02	1.35E+03	2.03E+06	1.36E+02
1980	5.71E+03	4.77E+06	3.21E+02	1.34E+03	2.00E+06	1.35E+02
1981	5.64E+03	4.72E+06	3.17E+02	1.32E+03	1.98E+06	1.33E+02
1982	5.58E+03	4.67E+06	3.14E+02	1.31E+03	1.96E+06	1.32E+02
1983	5.52E+03	4.62E+06	3.10E+02	1.29E+03	1.94E+06	1.30E+02
1984	5.46E+03	4.57E+06	3.07E+02	1.28E+03	1.92E+06	1.29E+02
1985	5.40E+03	4.52E+06	3.04E+02	1.27E+03	1.90E+06	1.28E+02
1986	5.34E+03	4.47E+06	3.00E+02	1.25E+03	1.88E+06	1.26E+02
1987	5.29E+03	4.42E+06	2.97E+02	1.24E+03	1.86E+06	1.25E+02
1988	5.23E+03	4.38E+06	2.94E+02	1.23E+03	1.84E+06	1.24E+02
1989	5.18E+03	4.33E+06	2.91E+02	1.21E+03	1.82E+06	1.22E+02
1990	5.13E+03	4.29E+06	2.88E+02	1.20E+03	1.80E+06	1.21E+02
1991	5.08E+03	4.25E+06	2.85E+02	1.19E+03	1.78E+06	1.20E+02
1992	5.03E+03	4.21E+06	2.83E+02	1.18E+03	1.77E+06	1.19E+02
1993	4.98E+03	4.17E+06	2.80E+02	1.17E+03	1.75E+06	1.18E+02
1994	4.93E+03	4.13E+06	2.77E+02	1.16E+03	1.73E+06	1.16E+02
1995	4.89E+03	4.09E+06	2.75E+02	1.15E+03	1.72E+06	1.15E+02
1996	4.84E+03	4.05E+06	2.72E+02	1.14E+03	1.70E+06	1.14E+02
1997	4.80E+03	4.01E+06	2.70E+02	1.12E+03	1.69E+06	1.13E+02
1998	4.76E+03	3.98E+06	2.67E+02	1.11E+03	1.67E+06	1.12E+02
1999	4.71E+03	3.94E+06	2.65E+02	1.10E+03	1.66E+06	1.11E+02
2000	4.67E+03	3.91E+06	2.63E+02	1.10E+03	1.64E+06	1.10E+02
2001	4.63E+03	3.88E+06	2.60E+02	1.09E+03	1.63E+06	1.09E+02
2002	4.59E+03	3.84E+06	2.58E+02	1.08E+03	1.61E+06	1.08E+02
2003	4.56E+03	3.81E+06	2.56E+02	1.07E+03	1.60E+06	1.08E+02
2004	4.52E+03	3.78E+06	2.54E+02	1.06E+03	1.59E+06	1.07E+02
2005	4.48E+03	3.75E+06	2.52E+02	1.05E+03	1.57E+06	1.06E+02

**Scenario 1: Total LFG and Methane Production - Wood Debris MSW  
Transportation Corridor  
Yakima, Washington**

Year	Total landfill gas (Wood Debris & MSW)			Methane (Wood Debris & MSW)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
2006	4.25E+03	3.55E+06	2.50E+02	9.96E+02	1.49E+06	1.05E+02
2007	4.22E+03	3.53E+06	2.48E+02	9.88E+02	1.48E+06	1.04E+02
2008	4.18E+03	3.50E+06	2.44E+02	9.81E+02	1.47E+06	1.03E+02
2009	4.15E+03	3.47E+06	2.40E+02	9.73E+02	1.46E+06	1.01E+02
2010	4.12E+03	3.45E+06	2.37E+02	9.66E+02	1.45E+06	9.94E+01
2011	4.09E+03	3.42E+06	2.33E+02	9.59E+02	1.44E+06	9.79E+01
2012	4.06E+03	3.40E+06	2.30E+02	9.52E+02	1.43E+06	9.64E+01
2013	4.04E+03	3.38E+06	2.26E+02	9.46E+02	1.42E+06	9.49E+01
2014	3.97E+03	3.32E+06	2.23E+02	9.32E+02	1.40E+06	9.35E+01
2015	3.91E+03	3.27E+06	2.19E+02	9.17E+02	1.38E+06	9.21E+01
2016	3.85E+03	3.22E+06	2.16E+02	9.03E+02	1.35E+06	9.07E+01
2017	3.80E+03	3.18E+06	2.13E+02	8.90E+02	1.33E+06	8.93E+01
2018	3.74E+03	3.13E+06	2.09E+02	8.76E+02	1.31E+06	8.80E+01
2019	3.68E+03	3.08E+06	2.06E+02	8.63E+02	1.29E+06	8.66E+01
2020	3.63E+03	3.03E+06	2.03E+02	8.50E+02	1.27E+06	8.53E+01
2021	3.57E+03	2.99E+06	2.00E+02	8.37E+02	1.26E+06	8.40E+01
2022	3.52E+03	2.94E+06	1.97E+02	8.25E+02	1.24E+06	8.28E+01
2023	3.47E+03	2.90E+06	1.94E+02	8.12E+02	1.22E+06	8.15E+01
2024	3.41E+03	2.86E+06	1.91E+02	8.00E+02	1.20E+06	8.03E+01
2025	3.36E+03	2.81E+06	1.88E+02	7.88E+02	1.18E+06	7.91E+01
2026	3.31E+03	2.77E+06	1.86E+02	7.77E+02	1.16E+06	7.79E+01
2027	3.26E+03	2.73E+06	1.83E+02	7.65E+02	1.15E+06	7.68E+01
2028	3.22E+03	2.69E+06	1.80E+02	7.54E+02	1.13E+06	7.56E+01
2029	3.17E+03	2.65E+06	1.77E+02	7.42E+02	1.11E+06	7.45E+01
2030	3.12E+03	2.61E+06	1.75E+02	7.31E+02	1.10E+06	7.34E+01
2031	3.07E+03	2.57E+06	1.72E+02	7.21E+02	1.08E+06	7.23E+01
2032	3.03E+03	2.53E+06	1.70E+02	7.10E+02	1.06E+06	7.12E+01
2033	2.98E+03	2.50E+06	1.67E+02	7.00E+02	1.05E+06	7.02E+01
2034	2.94E+03	2.46E+06	1.65E+02	6.89E+02	1.03E+06	6.92E+01
2035	2.90E+03	2.42E+06	1.62E+02	6.79E+02	1.02E+06	6.81E+01
2036	2.86E+03	2.39E+06	1.60E+02	6.69E+02	1.00E+06	6.71E+01
2037	2.81E+03	2.35E+06	1.58E+02	6.59E+02	9.88E+05	6.62E+01
2038	2.77E+03	2.32E+06	1.55E+02	6.50E+02	9.74E+05	6.52E+01
2039	2.73E+03	2.29E+06	1.53E+02	6.40E+02	9.60E+05	6.42E+01
2040	2.69E+03	2.25E+06	1.51E+02	6.31E+02	9.46E+05	6.33E+01
2041	2.65E+03	2.22E+06	1.49E+02	6.22E+02	9.32E+05	6.24E+01
2042	2.61E+03	2.19E+06	1.46E+02	6.13E+02	9.18E+05	6.15E+01
2043	2.58E+03	2.16E+06	1.44E+02	6.04E+02	9.05E+05	6.06E+01
2044	2.54E+03	2.12E+06	1.42E+02	5.95E+02	8.92E+05	5.97E+01
2045	2.50E+03	2.09E+06	1.40E+02	5.87E+02	8.79E+05	5.88E+01
2046	2.47E+03	2.06E+06	1.38E+02	5.78E+02	8.66E+05	5.80E+01
2047	2.43E+03	2.03E+06	1.36E+02	5.70E+02	8.54E+05	5.72E+01
2048	2.40E+03	2.00E+06	1.34E+02	5.62E+02	8.42E+05	5.63E+01

**Scenario 1: Total LFG and Methane Production - Wood Debris MSW  
Transportation Corridor  
Yakima, Washington**

Year	Total landfill gas (Wood Debris & MSW)			Methane (Wood Debris & MSW)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
2049	2.36E+03	1.98E+06	1.32E+02	5.54E+02	8.30E+05	5.55E+01
2050	2.33E+03	1.95E+06	1.30E+02	5.46E+02	8.18E+05	5.47E+01
2051	2.29E+03	1.92E+06	1.28E+02	5.38E+02	8.06E+05	5.39E+01
2052	2.26E+03	1.89E+06	1.27E+02	5.30E+02	7.95E+05	5.32E+01
2053	2.23E+03	1.86E+06	1.25E+02	5.23E+02	7.83E+05	5.24E+01
2054	2.20E+03	1.84E+06	1.23E+02	5.15E+02	7.72E+05	5.17E+01
2055	2.17E+03	1.81E+06	1.21E+02	5.08E+02	7.61E+05	5.09E+01
2056	2.14E+03	1.79E+06	1.20E+02	5.01E+02	7.50E+05	5.02E+01
2057	2.11E+03	1.76E+06	1.18E+02	4.94E+02	7.40E+05	4.95E+01
2058	2.08E+03	1.74E+06	1.16E+02	4.87E+02	7.29E+05	4.88E+01
2059	2.05E+03	1.71E+06	1.15E+02	4.80E+02	7.19E+05	4.81E+01
2060	2.02E+03	1.69E+06	1.13E+02	4.73E+02	7.09E+05	4.74E+01

**Scenario 1: Total LFG and Methane Production - Wood Debris Only**  
**Transportation Corridor**  
**Yakima, Washington**

Year	Total landfill gas (Wood Debris)			Methane (Wood Debris)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
1920	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1921	3.40E+01	2.84E+04	1.91E+00	7.97E+00	1.19E+04	8.02E-01
1922	6.76E+01	5.66E+04	3.80E+00	1.59E+01	2.38E+04	1.60E+00
1923	1.01E+02	8.45E+04	5.67E+00	2.37E+01	3.55E+04	2.38E+00
1924	1.34E+02	1.12E+05	7.53E+00	3.14E+01	4.71E+04	3.16E+00
1925	1.67E+02	1.39E+05	9.36E+00	3.91E+01	5.85E+04	3.93E+00
1926	1.99E+02	1.66E+05	1.12E+01	4.66E+01	6.99E+04	4.70E+00
1927	2.31E+02	1.93E+05	1.30E+01	5.41E+01	8.11E+04	5.45E+00
1928	2.63E+02	2.20E+05	1.48E+01	6.16E+01	9.23E+04	6.20E+00
1929	2.94E+02	2.46E+05	1.65E+01	6.89E+01	1.03E+05	6.94E+00
1930	3.25E+02	2.72E+05	1.83E+01	7.62E+01	1.14E+05	7.67E+00
1931	3.56E+02	2.98E+05	2.00E+01	8.34E+01	1.25E+05	8.40E+00
1932	3.86E+02	3.23E+05	2.17E+01	9.05E+01	1.36E+05	9.12E+00
1933	4.16E+02	3.48E+05	2.34E+01	9.76E+01	1.46E+05	9.83E+00
1934	4.46E+02	3.73E+05	2.51E+01	1.05E+02	1.57E+05	1.05E+01
1935	4.76E+02	3.98E+05	2.67E+01	1.12E+02	1.67E+05	1.12E+01
1936	5.05E+02	4.23E+05	2.84E+01	1.18E+02	1.77E+05	1.19E+01
1937	5.34E+02	4.47E+05	3.00E+01	1.25E+02	1.88E+05	1.26E+01
1938	5.63E+02	4.71E+05	3.16E+01	1.32E+02	1.98E+05	1.33E+01
1939	5.91E+02	4.94E+05	3.32E+01	1.39E+02	2.08E+05	1.40E+01
1940	6.19E+02	5.18E+05	3.48E+01	1.45E+02	2.18E+05	1.46E+01
1941	6.47E+02	5.41E+05	3.64E+01	1.52E+02	2.27E+05	1.53E+01
1942	6.75E+02	5.64E+05	3.79E+01	1.58E+02	2.37E+05	1.59E+01
1943	7.02E+02	5.87E+05	3.95E+01	1.65E+02	2.47E+05	1.66E+01
1944	7.29E+02	6.10E+05	4.10E+01	1.71E+02	2.56E+05	1.72E+01
1945	7.56E+02	6.32E+05	4.25E+01	1.77E+02	2.65E+05	1.78E+01
1946	7.82E+02	6.54E+05	4.40E+01	1.83E+02	2.75E+05	1.85E+01
1947	8.08E+02	6.76E+05	4.54E+01	1.89E+02	2.84E+05	1.91E+01
1948	8.34E+02	6.98E+05	4.69E+01	1.96E+02	2.93E+05	1.97E+01
1949	8.60E+02	7.19E+05	4.83E+01	2.02E+02	3.02E+05	2.03E+01
1950	8.85E+02	7.41E+05	4.98E+01	2.08E+02	3.11E+05	2.09E+01
1951	9.11E+02	7.62E+05	5.12E+01	2.13E+02	3.20E+05	2.15E+01
1952	9.36E+02	7.83E+05	5.26E+01	2.19E+02	3.29E+05	2.21E+01
1953	9.60E+02	8.03E+05	5.40E+01	2.25E+02	3.37E+05	2.27E+01
1954	9.85E+02	8.24E+05	5.53E+01	2.31E+02	3.46E+05	2.32E+01
1955	1.01E+03	8.44E+05	5.67E+01	2.36E+02	3.54E+05	2.38E+01
1956	1.03E+03	8.64E+05	5.80E+01	2.42E+02	3.63E+05	2.44E+01
1957	1.06E+03	8.84E+05	5.94E+01	2.48E+02	3.71E+05	2.49E+01
1958	1.08E+03	9.03E+05	6.07E+01	2.53E+02	3.79E+05	2.55E+01
1959	1.10E+03	9.23E+05	6.20E+01	2.59E+02	3.88E+05	2.60E+01
1960	1.13E+03	9.42E+05	6.33E+01	2.64E+02	3.96E+05	2.66E+01
1961	1.15E+03	9.61E+05	6.46E+01	2.69E+02	4.04E+05	2.71E+01
1962	1.17E+03	9.80E+05	6.59E+01	2.75E+02	4.12E+05	2.77E+01

**Scenario 1: Total LFG and Methane Production - Wood Debris Only**  
**Transportation Corridor**  
**Yakima, Washington**

Year	Total landfill gas (Wood Debris)			Methane (Wood Debris)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
1963	1.19E+03	9.99E+05	6.71E+01	2.80E+02	4.19E+05	2.82E+01
1964	1.22E+03	1.02E+06	6.83E+01	2.85E+02	4.27E+05	2.87E+01
1965	1.24E+03	1.04E+06	6.96E+01	2.90E+02	4.35E+05	2.92E+01
1966	1.26E+03	1.05E+06	7.08E+01	2.95E+02	4.43E+05	2.97E+01
1967	1.28E+03	1.07E+06	7.20E+01	3.00E+02	4.50E+05	3.02E+01
1968	1.30E+03	1.09E+06	7.32E+01	3.05E+02	4.58E+05	3.07E+01
1969	1.32E+03	1.11E+06	7.44E+01	3.10E+02	4.65E+05	3.12E+01
1970	1.34E+03	1.12E+06	7.55E+01	3.15E+02	4.72E+05	3.17E+01
1971	1.36E+03	1.14E+06	7.67E+01	3.20E+02	4.79E+05	3.22E+01
1972	1.39E+03	1.16E+06	7.79E+01	3.25E+02	4.87E+05	3.27E+01
1973	1.41E+03	1.18E+06	7.90E+01	3.29E+02	4.94E+05	3.32E+01
1974	1.43E+03	1.19E+06	8.01E+01	3.34E+02	5.01E+05	3.36E+01
1975	1.45E+03	1.21E+06	8.12E+01	3.39E+02	5.08E+05	3.41E+01
1976	1.46E+03	1.23E+06	8.23E+01	3.43E+02	5.15E+05	3.46E+01
1977	1.48E+03	1.24E+06	8.34E+01	3.48E+02	5.21E+05	3.50E+01
1978	1.50E+03	1.26E+06	8.45E+01	3.52E+02	5.28E+05	3.55E+01
1979	1.52E+03	1.27E+06	8.56E+01	3.57E+02	5.35E+05	3.59E+01
1980	1.54E+03	1.29E+06	8.66E+01	3.61E+02	5.42E+05	3.64E+01
1981	1.56E+03	1.30E+06	8.77E+01	3.66E+02	5.48E+05	3.68E+01
1982	1.58E+03	1.32E+06	8.87E+01	3.70E+02	5.55E+05	3.73E+01
1983	1.60E+03	1.34E+06	8.97E+01	3.74E+02	5.61E+05	3.77E+01
1984	1.61E+03	1.35E+06	9.08E+01	3.79E+02	5.67E+05	3.81E+01
1985	1.63E+03	1.37E+06	9.18E+01	3.83E+02	5.74E+05	3.85E+01
1986	1.65E+03	1.38E+06	9.28E+01	3.87E+02	5.80E+05	3.90E+01
1987	1.67E+03	1.40E+06	9.38E+01	3.91E+02	5.86E+05	3.94E+01
1988	1.69E+03	1.41E+06	9.47E+01	3.95E+02	5.92E+05	3.98E+01
1989	1.70E+03	1.42E+06	9.57E+01	3.99E+02	5.98E+05	4.02E+01
1990	1.72E+03	1.44E+06	9.67E+01	4.03E+02	6.04E+05	4.06E+01
1991	1.74E+03	1.45E+06	9.76E+01	4.07E+02	6.10E+05	4.10E+01
1992	1.75E+03	1.47E+06	9.85E+01	4.11E+02	6.16E+05	4.14E+01
1993	1.77E+03	1.48E+06	9.95E+01	4.15E+02	6.22E+05	4.18E+01
1994	1.79E+03	1.49E+06	1.00E+02	4.19E+02	6.28E+05	4.22E+01
1995	1.80E+03	1.51E+06	1.01E+02	4.22E+02	6.33E+05	4.26E+01
1996	1.82E+03	1.52E+06	1.02E+02	4.26E+02	6.39E+05	4.29E+01
1997	1.83E+03	1.53E+06	1.03E+02	4.30E+02	6.45E+05	4.33E+01
1998	1.85E+03	1.55E+06	1.04E+02	4.34E+02	6.50E+05	4.37E+01
1999	1.87E+03	1.56E+06	1.05E+02	4.37E+02	6.56E+05	4.40E+01
2000	1.88E+03	1.57E+06	1.06E+02	4.41E+02	6.61E+05	4.44E+01
2001	1.90E+03	1.59E+06	1.07E+02	4.45E+02	6.66E+05	4.48E+01
2002	1.91E+03	1.60E+06	1.07E+02	4.48E+02	6.72E+05	4.51E+01
2003	1.93E+03	1.61E+06	1.08E+02	4.52E+02	6.77E+05	4.55E+01
2004	1.94E+03	1.62E+06	1.09E+02	4.55E+02	6.82E+05	4.58E+01
2005	1.96E+03	1.64E+06	1.10E+02	4.58E+02	6.87E+05	4.62E+01

**Scenario 1: Total LFG and Methane Production - Wood Debris Only**  
**Transportation Corridor**  
**Yakima, Washington**

Year	Total landfill gas (Wood Debris)			Methane (Wood Debris)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
2006	1.97E+03	1.65E+06	1.11E+02	4.62E+02	6.92E+05	4.65E+01
2007	1.99E+03	1.66E+06	1.12E+02	4.65E+02	6.97E+05	4.69E+01
2008	1.97E+03	1.64E+06	1.10E+02	4.61E+02	6.90E+05	4.64E+01
2009	1.95E+03	1.63E+06	1.09E+02	4.56E+02	6.84E+05	4.59E+01
2010	1.93E+03	1.61E+06	1.08E+02	4.52E+02	6.77E+05	4.55E+01
2011	1.91E+03	1.60E+06	1.07E+02	4.47E+02	6.70E+05	4.50E+01
2012	1.89E+03	1.58E+06	1.06E+02	4.43E+02	6.63E+05	4.46E+01
2013	1.87E+03	1.56E+06	1.05E+02	4.38E+02	6.57E+05	4.41E+01
2014	1.85E+03	1.55E+06	1.04E+02	4.34E+02	6.50E+05	4.37E+01
2015	1.83E+03	1.53E+06	1.03E+02	4.29E+02	6.44E+05	4.33E+01
2016	1.81E+03	1.52E+06	1.02E+02	4.25E+02	6.37E+05	4.28E+01
2017	1.80E+03	1.50E+06	1.01E+02	4.21E+02	6.31E+05	4.24E+01
2018	1.78E+03	1.49E+06	9.99E+01	4.17E+02	6.25E+05	4.20E+01
2019	1.76E+03	1.47E+06	9.90E+01	4.13E+02	6.19E+05	4.16E+01
2020	1.74E+03	1.46E+06	9.80E+01	4.09E+02	6.12E+05	4.11E+01
2021	1.73E+03	1.44E+06	9.70E+01	4.04E+02	6.06E+05	4.07E+01
2022	1.71E+03	1.43E+06	9.60E+01	4.00E+02	6.00E+05	4.03E+01
2023	1.69E+03	1.41E+06	9.51E+01	3.96E+02	5.94E+05	3.99E+01
2024	1.67E+03	1.40E+06	9.41E+01	3.93E+02	5.88E+05	3.95E+01
2025	1.66E+03	1.39E+06	9.32E+01	3.89E+02	5.83E+05	3.91E+01
2026	1.64E+03	1.37E+06	9.23E+01	3.85E+02	5.77E+05	3.87E+01
2027	1.63E+03	1.36E+06	9.13E+01	3.81E+02	5.71E+05	3.84E+01
2028	1.61E+03	1.35E+06	9.04E+01	3.77E+02	5.65E+05	3.80E+01
2029	1.59E+03	1.33E+06	8.95E+01	3.73E+02	5.60E+05	3.76E+01
2030	1.58E+03	1.32E+06	8.86E+01	3.70E+02	5.54E+05	3.72E+01
2031	1.56E+03	1.31E+06	8.78E+01	3.66E+02	5.49E+05	3.69E+01
2032	1.55E+03	1.29E+06	8.69E+01	3.62E+02	5.43E+05	3.65E+01
2033	1.53E+03	1.28E+06	8.60E+01	3.59E+02	5.38E+05	3.61E+01
2034	1.52E+03	1.27E+06	8.52E+01	3.55E+02	5.32E+05	3.58E+01
2035	1.50E+03	1.25E+06	8.43E+01	3.52E+02	5.27E+05	3.54E+01
2036	1.49E+03	1.24E+06	8.35E+01	3.48E+02	5.22E+05	3.51E+01
2037	1.47E+03	1.23E+06	8.27E+01	3.45E+02	5.17E+05	3.47E+01
2038	1.46E+03	1.22E+06	8.18E+01	3.41E+02	5.12E+05	3.44E+01
2039	1.44E+03	1.21E+06	8.10E+01	3.38E+02	5.06E+05	3.40E+01
2040	1.43E+03	1.19E+06	8.02E+01	3.34E+02	5.01E+05	3.37E+01
2041	1.41E+03	1.18E+06	7.94E+01	3.31E+02	4.96E+05	3.34E+01
2042	1.40E+03	1.17E+06	7.86E+01	3.28E+02	4.91E+05	3.30E+01
2043	1.38E+03	1.16E+06	7.78E+01	3.25E+02	4.87E+05	3.27E+01
2044	1.37E+03	1.15E+06	7.71E+01	3.21E+02	4.82E+05	3.24E+01
2045	1.36E+03	1.14E+06	7.63E+01	3.18E+02	4.77E+05	3.20E+01
2046	1.34E+03	1.12E+06	7.55E+01	3.15E+02	4.72E+05	3.17E+01
2047	1.33E+03	1.11E+06	7.48E+01	3.12E+02	4.67E+05	3.14E+01
2048	1.32E+03	1.10E+06	7.40E+01	3.09E+02	4.63E+05	3.11E+01



**Scenario 1: Total LFG and Methane Production - Wood Debris Only**  
**Transportation Corridor**  
**Yakima, Washington**

Year	Total landfill gas (Wood Debris)			Methane (Wood Debris)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
2049	1.30E+03	1.09E+06	7.33E+01	3.06E+02	4.58E+05	3.08E+01
2050	1.29E+03	1.08E+06	7.26E+01	3.03E+02	4.54E+05	3.05E+01
2051	1.28E+03	1.07E+06	7.19E+01	3.00E+02	4.49E+05	3.02E+01
2052	1.27E+03	1.06E+06	7.11E+01	2.97E+02	4.45E+05	2.99E+01
2053	1.25E+03	1.05E+06	7.04E+01	2.94E+02	4.40E+05	2.96E+01
2054	1.24E+03	1.04E+06	6.97E+01	2.91E+02	4.36E+05	2.93E+01
2055	1.23E+03	1.03E+06	6.90E+01	2.88E+02	4.32E+05	2.90E+01
2056	1.22E+03	1.02E+06	6.83E+01	2.85E+02	4.27E+05	2.87E+01
2057	1.20E+03	1.01E+06	6.77E+01	2.82E+02	4.23E+05	2.84E+01
2058	1.19E+03	9.97E+05	6.70E+01	2.79E+02	4.19E+05	2.81E+01
2059	1.18E+03	9.87E+05	6.63E+01	2.77E+02	4.15E+05	2.79E+01
2060	1.17E+03	9.77E+05	6.57E+01	2.74E+02	4.10E+05	2.76E+01

**Scenario 1: Total LFG and Methane Production - MSW Only  
Transportation Corridor  
Yakima, Washington**

Year	Total landfill gas (MSW)			Methane (MSW)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
1920	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1921	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1922	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1923	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1924	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1925	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1926	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1927	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1928	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1929	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1930	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1931	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1932	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1933	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1934	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1935	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1936	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1937	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1938	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1939	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1940	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1941	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1942	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1943	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1944	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1945	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1946	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1947	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1948	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1949	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1950	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1951	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1952	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1953	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1954	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1955	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1956	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1957	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1958	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1959	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1960	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1961	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**Scenario 1: Total LFG and Methane Production - MSW Only**  
**Transportation Corridor**  
**Yakima, Washington**

Year	Total landfill gas (MSW)			Methane (MSW)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
1962	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1963	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1964	6.68E+02	5.59E+05	3.75E+01	1.57E+02	2.35E+05	1.58E+01
1965	1.32E+03	1.11E+06	7.43E+01	3.10E+02	4.65E+05	3.12E+01
1966	1.96E+03	1.64E+06	1.10E+02	4.60E+02	6.90E+05	4.64E+01
1967	2.59E+03	2.17E+06	1.46E+02	6.08E+02	9.11E+05	6.12E+01
1968	3.21E+03	2.68E+06	1.80E+02	7.52E+02	1.13E+06	7.58E+01
1969	3.81E+03	3.19E+06	2.14E+02	8.94E+02	1.34E+06	9.00E+01
1970	4.41E+03	3.69E+06	2.48E+02	1.03E+03	1.55E+06	1.04E+02
1971	4.99E+03	4.17E+06	2.80E+02	1.17E+03	1.75E+06	1.18E+02
1972	4.89E+03	4.09E+06	2.75E+02	1.15E+03	1.72E+06	1.15E+02
1973	4.79E+03	4.01E+06	2.69E+02	1.12E+03	1.68E+06	1.13E+02
1974	4.70E+03	3.93E+06	2.64E+02	1.10E+03	1.65E+06	1.11E+02
1975	4.60E+03	3.85E+06	2.59E+02	1.08E+03	1.62E+06	1.09E+02
1976	4.51E+03	3.77E+06	2.54E+02	1.06E+03	1.59E+06	1.07E+02
1977	4.42E+03	3.70E+06	2.49E+02	1.04E+03	1.55E+06	1.04E+02
1978	4.34E+03	3.63E+06	2.44E+02	1.02E+03	1.52E+06	1.02E+02
1979	4.25E+03	3.55E+06	2.39E+02	9.96E+02	1.49E+06	1.00E+02
1980	4.17E+03	3.48E+06	2.34E+02	9.76E+02	1.46E+06	9.83E+01
1981	4.08E+03	3.42E+06	2.29E+02	9.57E+02	1.43E+06	9.64E+01
1982	4.00E+03	3.35E+06	2.25E+02	9.38E+02	1.41E+06	9.45E+01
1983	3.92E+03	3.28E+06	2.20E+02	9.19E+02	1.38E+06	9.26E+01
1984	3.84E+03	3.22E+06	2.16E+02	9.01E+02	1.35E+06	9.08E+01
1985	3.77E+03	3.15E+06	2.12E+02	8.83E+02	1.32E+06	8.90E+01
1986	3.69E+03	3.09E+06	2.08E+02	8.66E+02	1.30E+06	8.72E+01
1987	3.62E+03	3.03E+06	2.04E+02	8.49E+02	1.27E+06	8.55E+01
1988	3.55E+03	2.97E+06	1.99E+02	8.32E+02	1.25E+06	8.38E+01
1989	3.48E+03	2.91E+06	1.96E+02	8.15E+02	1.22E+06	8.21E+01
1990	3.41E+03	2.85E+06	1.92E+02	7.99E+02	1.20E+06	8.05E+01
1991	3.34E+03	2.80E+06	1.88E+02	7.83E+02	1.17E+06	7.89E+01
1992	3.28E+03	2.74E+06	1.84E+02	7.68E+02	1.15E+06	7.73E+01
1993	3.21E+03	2.69E+06	1.81E+02	7.53E+02	1.13E+06	7.58E+01
1994	3.15E+03	2.63E+06	1.77E+02	7.38E+02	1.11E+06	7.43E+01
1995	3.09E+03	2.58E+06	1.73E+02	7.23E+02	1.08E+06	7.28E+01
1996	3.02E+03	2.53E+06	1.70E+02	7.09E+02	1.06E+06	7.14E+01
1997	2.96E+03	2.48E+06	1.67E+02	6.95E+02	1.04E+06	7.00E+01
1998	2.91E+03	2.43E+06	1.63E+02	6.81E+02	1.02E+06	6.86E+01
1999	2.85E+03	2.38E+06	1.60E+02	6.68E+02	1.00E+06	6.72E+01
2000	2.79E+03	2.34E+06	1.57E+02	6.54E+02	9.81E+05	6.59E+01
2001	2.74E+03	2.29E+06	1.54E+02	6.41E+02	9.61E+05	6.46E+01
2002	2.68E+03	2.24E+06	1.51E+02	6.29E+02	9.42E+05	6.33E+01
2003	2.63E+03	2.20E+06	1.48E+02	6.16E+02	9.24E+05	6.21E+01

**Scenario 1: Total LFG and Methane Production - MSW Only**  
**Transportation Corridor**  
**Yakima, Washington**

Year	Total landfill gas (MSW)			Methane (MSW)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
2004	2.58E+03	2.16E+06	1.45E+02	6.04E+02	9.06E+05	6.08E+01
2005	2.53E+03	2.11E+06	1.42E+02	5.92E+02	8.88E+05	5.96E+01
2006	2.48E+03	2.07E+06	1.39E+02	5.80E+02	8.70E+05	5.85E+01
2007	2.43E+03	2.03E+06	1.36E+02	5.69E+02	8.53E+05	5.73E+01
2008	2.38E+03	1.99E+06	1.34E+02	5.58E+02	8.36E+05	5.62E+01
2009	2.33E+03	1.95E+06	1.31E+02	5.47E+02	8.19E+05	5.51E+01
2010	2.29E+03	1.91E+06	1.28E+02	5.36E+02	8.03E+05	5.40E+01
2011	2.24E+03	1.87E+06	1.26E+02	5.25E+02	7.87E+05	5.29E+01
2012	2.20E+03	1.84E+06	1.23E+02	5.15E+02	7.72E+05	5.18E+01
2013	2.15E+03	1.80E+06	1.21E+02	5.05E+02	7.56E+05	5.08E+01
2014	2.11E+03	1.77E+06	1.19E+02	4.95E+02	7.41E+05	4.98E+01
2015	2.07E+03	1.73E+06	1.16E+02	4.85E+02	7.27E+05	4.88E+01
2016	2.03E+03	1.70E+06	1.14E+02	4.75E+02	7.12E+05	4.79E+01
2017	1.99E+03	1.66E+06	1.12E+02	4.66E+02	6.98E+05	4.69E+01
2018	1.95E+03	1.63E+06	1.09E+02	4.57E+02	6.84E+05	4.60E+01
2019	1.91E+03	1.60E+06	1.07E+02	4.48E+02	6.71E+05	4.51E+01
2020	1.87E+03	1.57E+06	1.05E+02	4.39E+02	6.58E+05	4.42E+01
2021	1.83E+03	1.53E+06	1.03E+02	4.30E+02	6.45E+05	4.33E+01
2022	1.80E+03	1.50E+06	1.01E+02	4.21E+02	6.32E+05	4.24E+01
2023	1.76E+03	1.47E+06	9.91E+01	4.13E+02	6.19E+05	4.16E+01
2024	1.73E+03	1.45E+06	9.71E+01	4.05E+02	6.07E+05	4.08E+01
2025	1.69E+03	1.42E+06	9.52E+01	3.97E+02	5.95E+05	4.00E+01
2026	1.66E+03	1.39E+06	9.33E+01	3.89E+02	5.83E+05	3.92E+01
2027	1.63E+03	1.36E+06	9.14E+01	3.81E+02	5.72E+05	3.84E+01
2028	1.59E+03	1.33E+06	8.96E+01	3.74E+02	5.60E+05	3.76E+01
2029	1.56E+03	1.31E+06	8.79E+01	3.66E+02	5.49E+05	3.69E+01
2030	1.53E+03	1.28E+06	8.61E+01	3.59E+02	5.38E+05	3.62E+01
2031	1.50E+03	1.26E+06	8.44E+01	3.52E+02	5.28E+05	3.55E+01
2032	1.47E+03	1.23E+06	8.27E+01	3.45E+02	5.17E+05	3.48E+01
2033	1.44E+03	1.21E+06	8.11E+01	3.38E+02	5.07E+05	3.41E+01
2034	1.41E+03	1.18E+06	7.95E+01	3.32E+02	4.97E+05	3.34E+01
2035	1.39E+03	1.16E+06	7.79E+01	3.25E+02	4.87E+05	3.27E+01
2036	1.36E+03	1.14E+06	7.64E+01	3.19E+02	4.77E+05	3.21E+01
2037	1.33E+03	1.11E+06	7.49E+01	3.12E+02	4.68E+05	3.14E+01
2038	1.31E+03	1.09E+06	7.34E+01	3.06E+02	4.59E+05	3.08E+01
2039	1.28E+03	1.07E+06	7.19E+01	3.00E+02	4.50E+05	3.02E+01
2040	1.25E+03	1.05E+06	7.05E+01	2.94E+02	4.41E+05	2.96E+01
2041	1.23E+03	1.03E+06	6.91E+01	2.88E+02	4.32E+05	2.90E+01
2042	1.21E+03	1.01E+06	6.77E+01	2.83E+02	4.23E+05	2.85E+01
2043	1.18E+03	9.88E+05	6.64E+01	2.77E+02	4.15E+05	2.79E+01
2044	1.16E+03	9.69E+05	6.51E+01	2.71E+02	4.07E+05	2.73E+01
2045	1.14E+03	9.50E+05	6.38E+01	2.66E+02	3.99E+05	2.68E+01

**Scenario 1: Total LFG and Methane Production - MSW Only**  
**Transportation Corridor**  
**Yakima, Washington**

Year	Total landfill gas (MSW)			Methane (MSW)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
2046	1.11E+03	9.31E+05	6.25E+01	2.61E+02	3.91E+05	2.63E+01
2047	1.09E+03	9.12E+05	6.13E+01	2.56E+02	3.83E+05	2.57E+01
2048	1.07E+03	8.94E+05	6.01E+01	2.51E+02	3.76E+05	2.52E+01
2049	1.05E+03	8.77E+05	5.89E+01	2.46E+02	3.68E+05	2.47E+01
2050	1.03E+03	8.59E+05	5.77E+01	2.41E+02	3.61E+05	2.42E+01
2051	1.01E+03	8.42E+05	5.66E+01	2.36E+02	3.54E+05	2.38E+01
2052	9.87E+02	8.26E+05	5.55E+01	2.31E+02	3.47E+05	2.33E+01
2053	9.67E+02	8.09E+05	5.44E+01	2.27E+02	3.40E+05	2.28E+01
2054	9.48E+02	7.93E+05	5.33E+01	2.22E+02	3.33E+05	2.24E+01
2055	9.29E+02	7.77E+05	5.22E+01	2.18E+02	3.27E+05	2.19E+01
2056	9.11E+02	7.62E+05	5.12E+01	2.14E+02	3.20E+05	2.15E+01
2057	8.93E+02	7.47E+05	5.02E+01	2.09E+02	3.14E+05	2.11E+01
2058	8.75E+02	7.32E+05	4.92E+01	2.05E+02	3.08E+05	2.07E+01
2059	8.58E+02	7.18E+05	4.82E+01	2.01E+02	3.01E+05	2.03E+01
2060	8.41E+02	7.03E+05	4.73E+01	1.97E+02	2.95E+05	1.99E+01

**Scenario 1: Carbon Dioxide and NMOCs Production - Wood Debris & MSW  
Transportation Corridor  
Yakima, Washington**

Year	Carbon Dioxide			NMOCs		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
1920	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1921	3.02E+01	1.65E+04	1.11E+00	6.83E-03	1.91E+00	1.28E-04
1922	6.01E+01	3.28E+04	2.21E+00	1.36E-02	3.79E+00	2.55E-04
1923	8.97E+01	4.90E+04	3.29E+00	2.03E-02	5.66E+00	3.80E-04
1924	1.19E+02	6.50E+04	4.37E+00	2.69E-02	7.51E+00	5.04E-04
1925	1.48E+02	8.08E+04	5.43E+00	3.35E-02	9.34E+00	6.27E-04
1926	1.77E+02	9.65E+04	6.49E+00	4.00E-02	1.12E+01	7.49E-04
1927	2.05E+02	1.12E+05	7.53E+00	4.64E-02	1.29E+01	8.70E-04
1928	2.33E+02	1.27E+05	8.56E+00	5.28E-02	1.47E+01	9.89E-04
1929	2.61E+02	1.43E+05	9.59E+00	5.91E-02	1.65E+01	1.11E-03
1930	2.89E+02	1.58E+05	1.06E+01	6.53E-02	1.82E+01	1.22E-03
1931	3.16E+02	1.73E+05	1.16E+01	7.15E-02	1.99E+01	1.34E-03
1932	3.43E+02	1.87E+05	1.26E+01	7.76E-02	2.17E+01	1.45E-03
1933	3.70E+02	2.02E+05	1.36E+01	8.37E-02	2.33E+01	1.57E-03
1934	3.96E+02	2.17E+05	1.45E+01	8.97E-02	2.50E+01	1.68E-03
1935	4.23E+02	2.31E+05	1.55E+01	9.56E-02	2.67E+01	1.79E-03
1936	4.49E+02	2.45E+05	1.65E+01	1.01E-01	2.83E+01	1.90E-03
1937	4.74E+02	2.59E+05	1.74E+01	1.07E-01	2.99E+01	2.01E-03
1938	5.00E+02	2.73E+05	1.83E+01	1.13E-01	3.15E+01	2.12E-03
1939	5.25E+02	2.87E+05	1.93E+01	1.19E-01	3.31E+01	2.23E-03
1940	5.50E+02	3.00E+05	2.02E+01	1.24E-01	3.47E+01	2.33E-03
1941	5.75E+02	3.14E+05	2.11E+01	1.30E-01	3.63E+01	2.44E-03
1942	5.99E+02	3.27E+05	2.20E+01	1.36E-01	3.78E+01	2.54E-03
1943	6.23E+02	3.41E+05	2.29E+01	1.41E-01	3.93E+01	2.64E-03
1944	6.47E+02	3.54E+05	2.38E+01	1.46E-01	4.09E+01	2.74E-03
1945	6.71E+02	3.67E+05	2.46E+01	1.52E-01	4.24E+01	2.85E-03
1946	6.95E+02	3.79E+05	2.55E+01	1.57E-01	4.38E+01	2.95E-03
1947	7.18E+02	3.92E+05	2.64E+01	1.62E-01	4.53E+01	3.04E-03
1948	7.41E+02	4.05E+05	2.72E+01	1.68E-01	4.68E+01	3.14E-03
1949	7.64E+02	4.17E+05	2.80E+01	1.73E-01	4.82E+01	3.24E-03
1950	7.86E+02	4.30E+05	2.89E+01	1.78E-01	4.96E+01	3.33E-03
1951	8.09E+02	4.42E+05	2.97E+01	1.83E-01	5.10E+01	3.43E-03
1952	8.31E+02	4.54E+05	3.05E+01	1.88E-01	5.24E+01	3.52E-03
1953	8.53E+02	4.66E+05	3.13E+01	1.93E-01	5.38E+01	3.62E-03
1954	8.74E+02	4.78E+05	3.21E+01	1.98E-01	5.52E+01	3.71E-03
1955	8.96E+02	4.89E+05	3.29E+01	2.03E-01	5.65E+01	3.80E-03
1956	9.17E+02	5.01E+05	3.37E+01	2.07E-01	5.79E+01	3.89E-03
1957	9.38E+02	5.13E+05	3.44E+01	2.12E-01	5.92E+01	3.98E-03
1958	9.59E+02	5.24E+05	3.52E+01	2.17E-01	6.05E+01	4.07E-03
1959	9.80E+02	5.35E+05	3.60E+01	2.22E-01	6.18E+01	4.15E-03
1960	1.00E+03	5.46E+05	3.67E+01	2.26E-01	6.31E+01	4.24E-03
1961	1.02E+03	5.57E+05	3.75E+01	2.31E-01	6.44E+01	4.33E-03
1962	1.04E+03	5.68E+05	3.82E+01	2.35E-01	6.57E+01	4.41E-03

**Scenario 1: Carbon Dioxide and NMOCs Production - Wood Debris & MSW  
Transportation Corridor  
Yakima, Washington**

Year	Carbon Dioxide			NMOCs		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
1963	1.06E+03	5.79E+05	3.89E+01	2.40E-01	6.69E+01	4.50E-03
1964	1.67E+03	9.14E+05	6.14E+01	3.78E-01	1.06E+02	7.09E-03
1965	2.27E+03	1.24E+06	8.35E+01	5.14E-01	1.43E+02	9.64E-03
1966	2.86E+03	1.56E+06	1.05E+02	6.48E-01	1.81E+02	1.21E-02
1967	3.44E+03	1.88E+06	1.26E+02	7.78E-01	2.17E+02	1.46E-02
1968	4.01E+03	2.19E+06	1.47E+02	9.06E-01	2.53E+02	1.70E-02
1969	4.56E+03	2.49E+06	1.67E+02	1.03E+00	2.88E+02	1.93E-02
1970	5.11E+03	2.79E+06	1.87E+02	1.16E+00	3.22E+02	2.17E-02
1971	5.64E+03	3.08E+06	2.07E+02	1.28E+00	3.56E+02	2.39E-02
1972	5.57E+03	3.04E+06	2.04E+02	1.26E+00	3.52E+02	2.36E-02
1973	5.50E+03	3.01E+06	2.02E+02	1.24E+00	3.47E+02	2.33E-02
1974	5.44E+03	2.97E+06	2.00E+02	1.23E+00	3.43E+02	2.31E-02
1975	5.37E+03	2.93E+06	1.97E+02	1.22E+00	3.39E+02	2.28E-02
1976	5.31E+03	2.90E+06	1.95E+02	1.20E+00	3.35E+02	2.25E-02
1977	5.25E+03	2.87E+06	1.93E+02	1.19E+00	3.31E+02	2.22E-02
1978	5.19E+03	2.83E+06	1.90E+02	1.17E+00	3.27E+02	2.20E-02
1979	5.13E+03	2.80E+06	1.88E+02	1.16E+00	3.23E+02	2.17E-02
1980	5.07E+03	2.77E+06	1.86E+02	1.15E+00	3.20E+02	2.15E-02
1981	5.01E+03	2.74E+06	1.84E+02	1.13E+00	3.16E+02	2.12E-02
1982	4.96E+03	2.71E+06	1.82E+02	1.12E+00	3.13E+02	2.10E-02
1983	4.90E+03	2.68E+06	1.80E+02	1.11E+00	3.09E+02	2.08E-02
1984	4.85E+03	2.65E+06	1.78E+02	1.10E+00	3.06E+02	2.06E-02
1985	4.80E+03	2.62E+06	1.76E+02	1.09E+00	3.03E+02	2.03E-02
1986	4.75E+03	2.59E+06	1.74E+02	1.07E+00	3.00E+02	2.01E-02
1987	4.70E+03	2.57E+06	1.72E+02	1.06E+00	2.96E+02	1.99E-02
1988	4.65E+03	2.54E+06	1.71E+02	1.05E+00	2.93E+02	1.97E-02
1989	4.60E+03	2.51E+06	1.69E+02	1.04E+00	2.90E+02	1.95E-02
1990	4.56E+03	2.49E+06	1.67E+02	1.03E+00	2.88E+02	1.93E-02
1991	4.51E+03	2.46E+06	1.66E+02	1.02E+00	2.85E+02	1.91E-02
1992	4.47E+03	2.44E+06	1.64E+02	1.01E+00	2.82E+02	1.89E-02
1993	4.42E+03	2.42E+06	1.62E+02	1.00E+00	2.79E+02	1.88E-02
1994	4.38E+03	2.39E+06	1.61E+02	9.91E-01	2.77E+02	1.86E-02
1995	4.34E+03	2.37E+06	1.59E+02	9.82E-01	2.74E+02	1.84E-02
1996	4.30E+03	2.35E+06	1.58E+02	9.73E-01	2.71E+02	1.82E-02
1997	4.26E+03	2.33E+06	1.56E+02	9.64E-01	2.69E+02	1.81E-02
1998	4.22E+03	2.31E+06	1.55E+02	9.55E-01	2.67E+02	1.79E-02
1999	4.19E+03	2.29E+06	1.54E+02	9.47E-01	2.64E+02	1.78E-02
2000	4.15E+03	2.27E+06	1.52E+02	9.39E-01	2.62E+02	1.76E-02
2001	4.11E+03	2.25E+06	1.51E+02	9.31E-01	2.60E+02	1.74E-02
2002	4.08E+03	2.23E+06	1.50E+02	9.23E-01	2.57E+02	1.73E-02
2003	4.05E+03	2.21E+06	1.49E+02	9.15E-01	2.55E+02	1.72E-02
2004	4.01E+03	2.19E+06	1.47E+02	9.08E-01	2.53E+02	1.70E-02
2005	3.98E+03	2.17E+06	1.46E+02	9.00E-01	2.51E+02	1.69E-02

**Scenario 1: Carbon Dioxide and NMOCs Production - Wood Debris & MSW  
Transportation Corridor  
Yakima, Washington**

Year	Carbon Dioxide			NMOCs		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
2006	3.77E+03	2.06E+06	1.38E+02	8.53E-01	2.38E+02	1.60E-02
2007	3.74E+03	2.05E+06	1.37E+02	8.47E-01	2.36E+02	1.59E-02
2008	3.72E+03	2.03E+06	1.36E+02	8.40E-01	2.34E+02	1.58E-02
2009	3.69E+03	2.01E+06	1.35E+02	8.34E-01	2.33E+02	1.56E-02
2010	3.66E+03	2.00E+06	1.34E+02	8.28E-01	2.31E+02	1.55E-02
2011	3.63E+03	1.99E+06	1.33E+02	8.22E-01	2.29E+02	1.54E-02
2012	3.61E+03	1.97E+06	1.32E+02	8.16E-01	2.28E+02	1.53E-02
2013	3.58E+03	1.96E+06	1.32E+02	8.11E-01	2.26E+02	1.52E-02
2014	3.53E+03	1.93E+06	1.30E+02	7.98E-01	2.23E+02	1.50E-02
2015	3.48E+03	1.90E+06	1.28E+02	7.86E-01	2.19E+02	1.47E-02
2016	3.42E+03	1.87E+06	1.26E+02	7.74E-01	2.16E+02	1.45E-02
2017	3.37E+03	1.84E+06	1.24E+02	7.63E-01	2.13E+02	1.43E-02
2018	3.32E+03	1.81E+06	1.22E+02	7.51E-01	2.10E+02	1.41E-02
2019	3.27E+03	1.79E+06	1.20E+02	7.40E-01	2.06E+02	1.39E-02
2020	3.22E+03	1.76E+06	1.18E+02	7.29E-01	2.03E+02	1.37E-02
2021	3.17E+03	1.73E+06	1.16E+02	7.18E-01	2.00E+02	1.35E-02
2022	3.13E+03	1.71E+06	1.15E+02	7.07E-01	1.97E+02	1.33E-02
2023	3.08E+03	1.68E+06	1.13E+02	6.96E-01	1.94E+02	1.31E-02
2024	3.03E+03	1.66E+06	1.11E+02	6.86E-01	1.91E+02	1.29E-02
2025	2.99E+03	1.63E+06	1.10E+02	6.76E-01	1.89E+02	1.27E-02
2026	2.94E+03	1.61E+06	1.08E+02	6.66E-01	1.86E+02	1.25E-02
2027	2.90E+03	1.58E+06	1.06E+02	6.56E-01	1.83E+02	1.23E-02
2028	2.86E+03	1.56E+06	1.05E+02	6.46E-01	1.80E+02	1.21E-02
2029	2.81E+03	1.54E+06	1.03E+02	6.36E-01	1.78E+02	1.19E-02
2030	2.77E+03	1.51E+06	1.02E+02	6.27E-01	1.75E+02	1.18E-02
2031	2.73E+03	1.49E+06	1.00E+02	6.18E-01	1.72E+02	1.16E-02
2032	2.69E+03	1.47E+06	9.87E+01	6.09E-01	1.70E+02	1.14E-02
2033	2.65E+03	1.45E+06	9.73E+01	6.00E-01	1.67E+02	1.12E-02
2034	2.61E+03	1.43E+06	9.59E+01	5.91E-01	1.65E+02	1.11E-02
2035	2.57E+03	1.41E+06	9.45E+01	5.82E-01	1.62E+02	1.09E-02
2036	2.54E+03	1.39E+06	9.31E+01	5.74E-01	1.60E+02	1.08E-02
2037	2.50E+03	1.36E+06	9.17E+01	5.65E-01	1.58E+02	1.06E-02
2038	2.46E+03	1.34E+06	9.04E+01	5.57E-01	1.55E+02	1.04E-02
2039	2.43E+03	1.33E+06	8.90E+01	5.49E-01	1.53E+02	1.03E-02
2040	2.39E+03	1.31E+06	8.78E+01	5.41E-01	1.51E+02	1.01E-02
2041	2.36E+03	1.29E+06	8.65E+01	5.33E-01	1.49E+02	9.99E-03
2042	2.32E+03	1.27E+06	8.52E+01	5.25E-01	1.47E+02	9.84E-03
2043	2.29E+03	1.25E+06	8.40E+01	5.18E-01	1.44E+02	9.70E-03
2044	2.25E+03	1.23E+06	8.28E+01	5.10E-01	1.42E+02	9.56E-03
2045	2.22E+03	1.21E+06	8.16E+01	5.03E-01	1.40E+02	9.42E-03
2046	2.19E+03	1.20E+06	8.04E+01	4.95E-01	1.38E+02	9.29E-03
2047	2.16E+03	1.18E+06	7.92E+01	4.88E-01	1.36E+02	9.15E-03
2048	2.13E+03	1.16E+06	7.81E+01	4.81E-01	1.34E+02	9.02E-03



**Scenario 1: Carbon Dioxide and NMOCs Production - Wood Debris & MSW  
Transportation Corridor  
Yakima, Washington**

Year	Carbon Dioxide			NMOCs		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
2049	2.10E+03	1.15E+06	7.70E+01	4.74E-01	1.32E+02	8.89E-03
2050	2.07E+03	1.13E+06	7.59E+01	4.68E-01	1.30E+02	8.77E-03
2051	2.04E+03	1.11E+06	7.48E+01	4.61E-01	1.29E+02	8.64E-03
2052	2.01E+03	1.10E+06	7.37E+01	4.54E-01	1.27E+02	8.52E-03
2053	1.98E+03	1.08E+06	7.27E+01	4.48E-01	1.25E+02	8.40E-03
2054	1.95E+03	1.07E+06	7.16E+01	4.42E-01	1.23E+02	8.28E-03
2055	1.92E+03	1.05E+06	7.06E+01	4.35E-01	1.21E+02	8.16E-03
2056	1.90E+03	1.04E+06	6.96E+01	4.29E-01	1.20E+02	8.04E-03
2057	1.87E+03	1.02E+06	6.86E+01	4.23E-01	1.18E+02	7.93E-03
2058	1.84E+03	1.01E+06	6.77E+01	4.17E-01	1.16E+02	7.82E-03
2059	1.82E+03	9.93E+05	6.67E+01	4.11E-01	1.15E+02	7.71E-03
2060	1.79E+03	9.79E+05	6.58E+01	4.05E-01	1.13E+02	7.60E-03

## **LandGEM Model Summary—Scenario 2**

**Scenario 2: Waste Acceptance - Wood Debris MSW  
Transportation Corridor  
Yakima, Washington**

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg/year)	(short tons/year)
1920	6.00E+03	6.60E+03	0.00E+00	0.00E+00
1921	6.00E+03	6.60E+03	6.00E+03	6.60E+03
1922	6.00E+03	6.60E+03	1.20E+04	1.32E+04
1923	6.00E+03	6.60E+03	1.80E+04	1.98E+04
1924	6.00E+03	6.60E+03	2.40E+04	2.64E+04
1925	6.00E+03	6.60E+03	3.00E+04	3.30E+04
1926	6.00E+03	6.60E+03	3.60E+04	3.96E+04
1927	6.00E+03	6.60E+03	4.20E+04	4.62E+04
1928	6.00E+03	6.60E+03	4.80E+04	5.28E+04
1929	6.00E+03	6.60E+03	5.40E+04	5.94E+04
1930	6.00E+03	6.60E+03	6.00E+04	6.60E+04
1931	6.00E+03	6.60E+03	6.60E+04	7.26E+04
1932	6.00E+03	6.60E+03	7.20E+04	7.92E+04
1933	6.00E+03	6.60E+03	7.80E+04	8.58E+04
1934	6.00E+03	6.60E+03	8.40E+04	9.24E+04
1935	6.00E+03	6.60E+03	9.00E+04	9.90E+04
1936	6.00E+03	6.60E+03	9.60E+04	1.06E+05
1937	6.00E+03	6.60E+03	1.02E+05	1.12E+05
1938	6.00E+03	6.60E+03	1.08E+05	1.19E+05
1939	6.00E+03	6.60E+03	1.14E+05	1.25E+05
1940	6.00E+03	6.60E+03	1.20E+05	1.32E+05
1941	6.00E+03	6.60E+03	1.26E+05	1.39E+05
1942	6.00E+03	6.60E+03	1.32E+05	1.45E+05
1943	6.00E+03	6.60E+03	1.38E+05	1.52E+05
1944	6.00E+03	6.60E+03	1.44E+05	1.58E+05
1945	6.00E+03	6.60E+03	1.50E+05	1.65E+05
1946	6.00E+03	6.60E+03	1.56E+05	1.72E+05
1947	6.00E+03	6.60E+03	1.62E+05	1.78E+05
1948	6.00E+03	6.60E+03	1.68E+05	1.85E+05
1949	6.00E+03	6.60E+03	1.74E+05	1.91E+05
1950	6.00E+03	6.60E+03	1.80E+05	1.98E+05
1951	6.00E+03	6.60E+03	1.86E+05	2.05E+05
1952	6.00E+03	6.60E+03	1.92E+05	2.11E+05
1953	6.00E+03	6.60E+03	1.98E+05	2.18E+05
1954	6.00E+03	6.60E+03	2.04E+05	2.24E+05
1955	6.00E+03	6.60E+03	2.10E+05	2.31E+05
1956	6.00E+03	6.60E+03	2.16E+05	2.38E+05
1957	6.00E+03	6.60E+03	2.22E+05	2.44E+05
1958	6.00E+03	6.60E+03	2.28E+05	2.51E+05
1959	6.00E+03	6.60E+03	2.34E+05	2.57E+05
1960	6.00E+03	6.60E+03	2.40E+05	2.64E+05
1961	6.00E+03	6.60E+03	2.46E+05	2.71E+05
1962	6.00E+03	6.60E+03	2.52E+05	2.77E+05

**Scenario 2: Waste Acceptance - Wood Debris MSW  
Transportation Corridor  
Yakima, Washington**

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg/year)	(short tons/year)
1963	7.56E+04	8.32E+04	2.58E+05	2.84E+05
1964	7.56E+04	8.32E+04	3.34E+05	3.67E+05
1965	7.56E+04	8.32E+04	4.09E+05	4.50E+05
1966	7.56E+04	8.32E+04	4.85E+05	5.33E+05
1967	7.56E+04	8.32E+04	5.60E+05	6.16E+05
1968	7.56E+04	8.32E+04	6.36E+05	7.00E+05
1969	7.56E+04	8.32E+04	7.12E+05	7.83E+05
1970	7.56E+04	8.32E+04	7.87E+05	8.66E+05
1971	6.00E+03	6.60E+03	8.63E+05	9.49E+05
1972	6.00E+03	6.60E+03	8.69E+05	9.56E+05
1973	6.00E+03	6.60E+03	8.75E+05	9.62E+05
1974	6.00E+03	6.60E+03	8.81E+05	9.69E+05
1975	6.00E+03	6.60E+03	8.87E+05	9.76E+05
1976	6.00E+03	6.60E+03	8.93E+05	9.82E+05
1977	6.00E+03	6.60E+03	8.99E+05	9.89E+05
1978	6.00E+03	6.60E+03	9.05E+05	9.95E+05
1979	6.00E+03	6.60E+03	9.11E+05	1.00E+06
1980	6.00E+03	6.60E+03	9.17E+05	1.01E+06
1981	6.00E+03	6.60E+03	9.23E+05	1.02E+06
1982	6.00E+03	6.60E+03	9.29E+05	1.02E+06
1983	6.00E+03	6.60E+03	9.35E+05	1.03E+06
1984	6.00E+03	6.60E+03	9.41E+05	1.04E+06
1985	6.00E+03	6.60E+03	9.47E+05	1.04E+06
1986	6.00E+03	6.60E+03	9.53E+05	1.05E+06
1987	6.00E+03	6.60E+03	9.59E+05	1.05E+06
1988	6.00E+03	6.60E+03	9.65E+05	1.06E+06
1989	6.00E+03	6.60E+03	9.71E+05	1.07E+06
1990	6.00E+03	6.60E+03	9.77E+05	1.07E+06
1991	6.00E+03	6.60E+03	9.83E+05	1.08E+06
1992	6.00E+03	6.60E+03	9.89E+05	1.09E+06
1993	6.00E+03	6.60E+03	9.95E+05	1.09E+06
1994	6.00E+03	6.60E+03	1.00E+06	1.10E+06
1995	6.00E+03	6.60E+03	1.01E+06	1.11E+06
1996	6.00E+03	6.60E+03	1.01E+06	1.11E+06
1997	6.00E+03	6.60E+03	1.02E+06	1.12E+06
1998	6.00E+03	6.60E+03	1.02E+06	1.13E+06
1999	6.00E+03	6.60E+03	1.03E+06	1.13E+06
2000	0.00E+00	0.00E+00	1.04E+06	1.13E+06
2001	0.00E+00	0.00E+00	1.04E+06	1.13E+06
2002	0.00E+00	0.00E+00	1.04E+06	1.13E+06
2003	0.00E+00	0.00E+00	1.04E+06	1.13E+06
2004	0.00E+00	0.00E+00	1.04E+06	1.13E+06
2005	0.00E+00	0.00E+00	1.04E+06	1.13E+06

**Scenario 2: Waste Acceptance - Wood Debris MSW  
Transportation Corridor  
Yakima, Washington**

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg/year)	(short tons/year)
2006	6.00E+03	6.60E+03	1.04E+06	1.13E+06
2007	6.00E+03	6.60E+03	1.04E+06	1.14E+06
2008	6.00E+03	6.60E+03	1.05E+06	1.15E+06
2009	6.00E+03	6.60E+03	1.05E+06	1.15E+06
2010	6.00E+03	6.60E+03	1.06E+06	1.16E+06
2011	6.00E+03	6.60E+03	1.07E+06	1.17E+06
2012	6.00E+03	6.60E+03	1.07E+06	1.17E+06
2013	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2014	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2015	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2016	0.00E+00	0.00E+00	1.08E+06	1.18E+06
2017	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2018	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2019	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2020	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2021	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2022	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2023	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2024	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2025	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2026	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2027	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2028	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2029	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2030	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2031	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2032	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2033	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2034	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2035	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2036	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2037	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2038	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2039	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2040	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2041	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2042	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2043	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2044	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2045	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2046	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2047	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2048	0.00E+00	0.00E+00	9.01E+05	9.85E+05

**Table D-1**  
**Scenario 2: Waste Acceptance - Wood Debris MSW**  
**Transportation Corridor**  
**Yakima, Washington**

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg/year)	(short tons/year)
2049	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2050	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2051	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2052	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2053	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2054	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2055	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2056	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2057	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2058	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2059	0.00E+00	0.00E+00	9.01E+05	9.85E+05
2060	0.00E+00	0.00E+00	9.01E+05	9.85E+05

**Scenario 2: Total LFG and Methane Production - Wood Debris & MSW  
Transportation Corridor  
Yakima, Washington**

Year	Total landfill gas			Methane		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
1920	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1921	3.40E+01	2.84E+04	1.91E+00	7.97E+00	1.19E+04	8.02E-01
1922	6.76E+01	5.66E+04	3.80E+00	1.59E+01	2.38E+04	1.60E+00
1923	1.01E+02	8.45E+04	5.67E+00	2.37E+01	3.55E+04	2.38E+00
1924	1.34E+02	1.12E+05	7.53E+00	3.14E+01	4.71E+04	3.16E+00
1925	1.67E+02	1.39E+05	9.36E+00	3.91E+01	5.85E+04	3.93E+00
1926	1.99E+02	1.66E+05	1.12E+01	4.66E+01	6.99E+04	4.70E+00
1927	2.31E+02	1.93E+05	1.30E+01	5.41E+01	8.11E+04	5.45E+00
1928	2.63E+02	2.20E+05	1.48E+01	6.16E+01	9.23E+04	6.20E+00
1929	2.94E+02	2.46E+05	1.65E+01	6.89E+01	1.03E+05	6.94E+00
1930	3.25E+02	2.72E+05	1.83E+01	7.62E+01	1.14E+05	7.67E+00
1931	3.56E+02	2.98E+05	2.00E+01	8.34E+01	1.25E+05	8.40E+00
1932	3.86E+02	3.23E+05	2.17E+01	9.05E+01	1.36E+05	9.12E+00
1933	4.16E+02	3.48E+05	2.34E+01	9.76E+01	1.46E+05	9.83E+00
1934	4.46E+02	3.73E+05	2.51E+01	1.05E+02	1.57E+05	1.05E+01
1935	4.76E+02	3.98E+05	2.67E+01	1.12E+02	1.67E+05	1.12E+01
1936	5.05E+02	4.23E+05	2.84E+01	1.18E+02	1.77E+05	1.19E+01
1937	5.34E+02	4.47E+05	3.00E+01	1.25E+02	1.88E+05	1.26E+01
1938	5.63E+02	4.71E+05	3.16E+01	1.32E+02	1.98E+05	1.33E+01
1939	5.91E+02	4.94E+05	3.32E+01	1.39E+02	2.08E+05	1.40E+01
1940	6.19E+02	5.18E+05	3.48E+01	1.45E+02	2.18E+05	1.46E+01
1941	6.47E+02	5.41E+05	3.64E+01	1.52E+02	2.27E+05	1.53E+01
1942	6.75E+02	5.64E+05	3.79E+01	1.58E+02	2.37E+05	1.59E+01
1943	7.02E+02	5.87E+05	3.95E+01	1.65E+02	2.47E+05	1.66E+01
1944	7.29E+02	6.10E+05	4.10E+01	1.71E+02	2.56E+05	1.72E+01
1945	7.56E+02	6.32E+05	4.25E+01	1.77E+02	2.65E+05	1.78E+01
1946	7.82E+02	6.54E+05	4.40E+01	1.83E+02	2.75E+05	1.85E+01
1947	8.08E+02	6.76E+05	4.54E+01	1.89E+02	2.84E+05	1.91E+01
1948	8.34E+02	6.98E+05	4.69E+01	1.96E+02	2.93E+05	1.97E+01
1949	8.60E+02	7.19E+05	4.83E+01	2.02E+02	3.02E+05	2.03E+01
1950	8.85E+02	7.41E+05	4.98E+01	2.08E+02	3.11E+05	2.09E+01
1951	9.11E+02	7.62E+05	5.12E+01	2.13E+02	3.20E+05	2.15E+01
1952	9.36E+02	7.83E+05	5.26E+01	2.19E+02	3.29E+05	2.21E+01
1953	9.60E+02	8.03E+05	5.40E+01	2.25E+02	3.37E+05	2.27E+01
1954	9.85E+02	8.24E+05	5.53E+01	2.31E+02	3.46E+05	2.32E+01
1955	1.01E+03	8.44E+05	5.67E+01	2.36E+02	3.54E+05	2.38E+01
1956	1.03E+03	8.64E+05	5.80E+01	2.42E+02	3.63E+05	2.44E+01
1957	1.06E+03	8.84E+05	5.94E+01	2.48E+02	3.71E+05	2.49E+01
1958	1.08E+03	9.03E+05	6.07E+01	2.53E+02	3.79E+05	2.55E+01
1959	1.10E+03	9.23E+05	6.20E+01	2.59E+02	3.88E+05	2.60E+01
1960	1.13E+03	9.42E+05	6.33E+01	2.64E+02	3.96E+05	2.66E+01
1961	1.15E+03	9.61E+05	6.46E+01	2.69E+02	4.04E+05	2.71E+01
1962	1.17E+03	9.80E+05	6.59E+01	2.75E+02	4.12E+05	2.77E+01

**Scenario 2: Total LFG and Methane Production - Wood Debris & MSW  
Transportation Corridor  
Yakima, Washington**

Year	Total landfill gas			Methane		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
1963	1.19E+03	9.99E+05	6.71E+01	2.80E+02	4.19E+05	2.82E+01
1964	1.88E+03	1.58E+06	1.06E+02	4.42E+02	6.62E+05	4.45E+01
1965	2.56E+03	2.14E+06	1.44E+02	6.00E+02	9.00E+05	6.04E+01
1966	3.22E+03	2.70E+06	1.81E+02	7.56E+02	1.13E+06	7.61E+01
1967	3.87E+03	3.24E+06	2.18E+02	9.08E+02	1.36E+06	9.15E+01
1968	4.51E+03	3.77E+06	2.54E+02	1.06E+03	1.59E+06	1.07E+02
1969	5.14E+03	4.30E+06	2.89E+02	1.20E+03	1.80E+06	1.21E+02
1970	5.75E+03	4.81E+06	3.23E+02	1.35E+03	2.02E+06	1.36E+02
1971	6.35E+03	5.31E+06	3.57E+02	1.49E+03	2.23E+06	1.50E+02
1972	6.27E+03	5.25E+06	3.53E+02	1.47E+03	2.20E+06	1.48E+02
1973	6.20E+03	5.18E+06	3.48E+02	1.45E+03	2.18E+06	1.46E+02
1974	6.12E+03	5.12E+06	3.44E+02	1.43E+03	2.15E+06	1.45E+02
1975	6.05E+03	5.06E+06	3.40E+02	1.42E+03	2.13E+06	1.43E+02
1976	5.98E+03	5.00E+06	3.36E+02	1.40E+03	2.10E+06	1.41E+02
1977	5.91E+03	4.94E+06	3.32E+02	1.38E+03	2.08E+06	1.39E+02
1978	5.84E+03	4.88E+06	3.28E+02	1.37E+03	2.05E+06	1.38E+02
1979	5.77E+03	4.83E+06	3.24E+02	1.35E+03	2.03E+06	1.36E+02
1980	5.71E+03	4.77E+06	3.21E+02	1.34E+03	2.00E+06	1.35E+02
1981	5.64E+03	4.72E+06	3.17E+02	1.32E+03	1.98E+06	1.33E+02
1982	5.58E+03	4.67E+06	3.14E+02	1.31E+03	1.96E+06	1.32E+02
1983	5.52E+03	4.62E+06	3.10E+02	1.29E+03	1.94E+06	1.30E+02
1984	5.46E+03	4.57E+06	3.07E+02	1.28E+03	1.92E+06	1.29E+02
1985	5.40E+03	4.52E+06	3.04E+02	1.27E+03	1.90E+06	1.28E+02
1986	5.34E+03	4.47E+06	3.00E+02	1.25E+03	1.88E+06	1.26E+02
1987	5.29E+03	4.42E+06	2.97E+02	1.24E+03	1.86E+06	1.25E+02
1988	5.23E+03	4.38E+06	2.94E+02	1.23E+03	1.84E+06	1.24E+02
1989	5.18E+03	4.33E+06	2.91E+02	1.21E+03	1.82E+06	1.22E+02
1990	5.13E+03	4.29E+06	2.88E+02	1.20E+03	1.80E+06	1.21E+02
1991	5.08E+03	4.25E+06	2.85E+02	1.19E+03	1.78E+06	1.20E+02
1992	5.03E+03	4.21E+06	2.83E+02	1.18E+03	1.77E+06	1.19E+02
1993	4.98E+03	4.17E+06	2.80E+02	1.17E+03	1.75E+06	1.18E+02
1994	4.93E+03	4.13E+06	2.77E+02	1.16E+03	1.73E+06	1.16E+02
1995	4.89E+03	4.09E+06	2.75E+02	1.15E+03	1.72E+06	1.15E+02
1996	4.84E+03	4.05E+06	2.72E+02	1.14E+03	1.70E+06	1.14E+02
1997	4.80E+03	4.01E+06	2.70E+02	1.12E+03	1.69E+06	1.13E+02
1998	4.76E+03	3.98E+06	2.67E+02	1.11E+03	1.67E+06	1.12E+02
1999	4.71E+03	3.94E+06	2.65E+02	1.10E+03	1.66E+06	1.11E+02
2000	4.67E+03	3.91E+06	2.63E+02	1.10E+03	1.64E+06	1.10E+02
2001	4.60E+03	3.85E+06	2.58E+02	1.08E+03	1.62E+06	1.09E+02
2002	4.53E+03	3.79E+06	2.54E+02	1.06E+03	1.59E+06	1.07E+02
2003	4.46E+03	3.73E+06	2.50E+02	1.04E+03	1.57E+06	1.05E+02
2004	4.38E+03	3.67E+06	2.46E+02	1.03E+03	1.54E+06	1.04E+02
2005	4.32E+03	3.61E+06	2.43E+02	1.01E+03	1.52E+06	1.02E+02



**Scenario 2: Total LFG and Methane Production - Wood Debris & MSW  
Transportation Corridor  
Yakima, Washington**

Year	Total landfill gas			Methane		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
2006	4.25E+03	3.55E+06	2.39E+02	9.96E+02	1.49E+06	1.00E+02
2007	4.22E+03	3.53E+06	2.37E+02	9.88E+02	1.48E+06	9.95E+01
2008	4.18E+03	3.50E+06	2.35E+02	9.81E+02	1.47E+06	9.88E+01
2009	4.15E+03	3.47E+06	2.33E+02	9.73E+02	1.46E+06	9.80E+01
2010	4.12E+03	3.45E+06	2.32E+02	9.66E+02	1.45E+06	9.73E+01
2011	4.09E+03	3.42E+06	2.30E+02	9.59E+02	1.44E+06	9.66E+01
2012	4.06E+03	3.40E+06	2.28E+02	9.52E+02	1.43E+06	9.59E+01
2013	4.04E+03	3.38E+06	2.27E+02	9.46E+02	1.42E+06	9.53E+01
2014	3.97E+03	3.32E+06	2.23E+02	9.32E+02	1.40E+06	9.38E+01
2015	3.91E+03	3.27E+06	2.20E+02	9.17E+02	1.38E+06	9.24E+01
2016	3.85E+03	3.22E+06	2.17E+02	9.03E+02	1.35E+06	9.10E+01
2017	3.15E+03	2.64E+06	1.77E+02	7.39E+02	1.11E+06	7.44E+01
2018	3.11E+03	2.60E+06	1.75E+02	7.28E+02	1.09E+06	7.33E+01
2019	3.06E+03	2.56E+06	1.72E+02	7.18E+02	1.08E+06	7.23E+01
2020	3.02E+03	2.53E+06	1.70E+02	7.08E+02	1.06E+06	7.13E+01
2021	2.98E+03	2.49E+06	1.67E+02	6.97E+02	1.05E+06	7.02E+01
2022	2.93E+03	2.45E+06	1.65E+02	6.87E+02	1.03E+06	6.92E+01
2023	2.89E+03	2.42E+06	1.62E+02	6.78E+02	1.02E+06	6.82E+01
2024	2.85E+03	2.38E+06	1.60E+02	6.68E+02	1.00E+06	6.73E+01
2025	2.81E+03	2.35E+06	1.58E+02	6.59E+02	9.87E+05	6.63E+01
2026	2.77E+03	2.32E+06	1.56E+02	6.49E+02	9.73E+05	6.54E+01
2027	2.73E+03	2.28E+06	1.53E+02	6.40E+02	9.59E+05	6.45E+01
2028	2.69E+03	2.25E+06	1.51E+02	6.31E+02	9.46E+05	6.35E+01
2029	2.65E+03	2.22E+06	1.49E+02	6.22E+02	9.32E+05	6.26E+01
2030	2.62E+03	2.19E+06	1.47E+02	6.13E+02	9.19E+05	6.18E+01
2031	2.58E+03	2.16E+06	1.45E+02	6.05E+02	9.06E+05	6.09E+01
2032	2.54E+03	2.13E+06	1.43E+02	5.96E+02	8.94E+05	6.00E+01
2033	2.51E+03	2.10E+06	1.41E+02	5.88E+02	8.81E+05	5.92E+01
2034	2.47E+03	2.07E+06	1.39E+02	5.80E+02	8.69E+05	5.84E+01
2035	2.44E+03	2.04E+06	1.37E+02	5.72E+02	8.57E+05	5.76E+01
2036	2.40E+03	2.01E+06	1.35E+02	5.64E+02	8.45E+05	5.68E+01
2037	2.37E+03	1.98E+06	1.33E+02	5.56E+02	8.33E+05	5.60E+01
2038	2.34E+03	1.96E+06	1.31E+02	5.48E+02	8.21E+05	5.52E+01
2039	2.31E+03	1.93E+06	1.30E+02	5.40E+02	8.10E+05	5.44E+01
2040	2.27E+03	1.90E+06	1.28E+02	5.33E+02	7.99E+05	5.37E+01
2041	2.24E+03	1.88E+06	1.26E+02	5.26E+02	7.88E+05	5.29E+01
2042	2.21E+03	1.85E+06	1.24E+02	5.18E+02	7.77E+05	5.22E+01
2043	2.18E+03	1.82E+06	1.23E+02	5.11E+02	7.66E+05	5.15E+01
2044	2.15E+03	1.80E+06	1.21E+02	5.04E+02	7.56E+05	5.08E+01
2045	2.12E+03	1.77E+06	1.19E+02	4.97E+02	7.45E+05	5.01E+01
2046	2.09E+03	1.75E+06	1.18E+02	4.90E+02	7.35E+05	4.94E+01
2047	2.06E+03	1.73E+06	1.16E+02	4.84E+02	7.25E+05	4.87E+01
2048	2.04E+03	1.70E+06	1.14E+02	4.77E+02	7.15E+05	4.80E+01

**Scenario 2: Total LFG and Methane Production - Wood Debris & MSW  
Transportation Corridor  
Yakima, Washington**

Year	Total landfill gas			Methane		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
2049	2.01E+03	1.68E+06	1.13E+02	4.71E+02	7.05E+05	4.74E+01
2050	1.98E+03	1.66E+06	1.11E+02	4.64E+02	6.96E+05	4.67E+01
2051	1.95E+03	1.63E+06	1.10E+02	4.58E+02	6.86E+05	4.61E+01
2052	1.93E+03	1.61E+06	1.08E+02	4.52E+02	6.77E+05	4.55E+01
2053	1.90E+03	1.59E+06	1.07E+02	4.46E+02	6.68E+05	4.49E+01
2054	1.88E+03	1.57E+06	1.05E+02	4.39E+02	6.59E+05	4.43E+01
2055	1.85E+03	1.55E+06	1.04E+02	4.34E+02	6.50E+05	4.37E+01
2056	1.82E+03	1.53E+06	1.03E+02	4.28E+02	6.41E+05	4.31E+01
2057	1.80E+03	1.51E+06	1.01E+02	4.22E+02	6.32E+05	4.25E+01
2058	1.78E+03	1.49E+06	9.98E+01	4.16E+02	6.24E+05	4.19E+01
2059	1.75E+03	1.47E+06	9.85E+01	4.11E+02	6.16E+05	4.14E+01
2060	1.73E+03	1.45E+06	9.72E+01	4.05E+02	6.07E+05	4.08E+01

**Scenario 2: Total LFG and Methane Production - Wood Debris Only**  
**Transportation Corridor**  
**Yakima, Washington**

Year	Total landfill gas (Wood Debris)			Methane (Wood Debris)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
1920	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1921	3.40E+01	2.84E+04	1.91E+00	7.97E+00	1.19E+04	8.02E-01
1922	6.76E+01	5.66E+04	3.80E+00	1.59E+01	2.38E+04	1.60E+00
1923	1.01E+02	8.45E+04	5.67E+00	2.37E+01	3.55E+04	2.38E+00
1924	1.34E+02	1.12E+05	7.53E+00	3.14E+01	4.71E+04	3.16E+00
1925	1.67E+02	1.39E+05	9.36E+00	3.91E+01	5.85E+04	3.93E+00
1926	1.99E+02	1.66E+05	1.12E+01	4.66E+01	6.99E+04	4.70E+00
1927	2.31E+02	1.93E+05	1.30E+01	5.41E+01	8.11E+04	5.45E+00
1928	2.63E+02	2.20E+05	1.48E+01	6.16E+01	9.23E+04	6.20E+00
1929	2.94E+02	2.46E+05	1.65E+01	6.89E+01	1.03E+05	6.94E+00
1930	3.25E+02	2.72E+05	1.83E+01	7.62E+01	1.14E+05	7.67E+00
1931	3.56E+02	2.98E+05	2.00E+01	8.34E+01	1.25E+05	8.40E+00
1932	3.86E+02	3.23E+05	2.17E+01	9.05E+01	1.36E+05	9.12E+00
1933	4.16E+02	3.48E+05	2.34E+01	9.76E+01	1.46E+05	9.83E+00
1934	4.46E+02	3.73E+05	2.51E+01	1.05E+02	1.57E+05	1.05E+01
1935	4.76E+02	3.98E+05	2.67E+01	1.12E+02	1.67E+05	1.12E+01
1936	5.05E+02	4.23E+05	2.84E+01	1.18E+02	1.77E+05	1.19E+01
1937	5.34E+02	4.47E+05	3.00E+01	1.25E+02	1.88E+05	1.26E+01
1938	5.63E+02	4.71E+05	3.16E+01	1.32E+02	1.98E+05	1.33E+01
1939	5.91E+02	4.94E+05	3.32E+01	1.39E+02	2.08E+05	1.40E+01
1940	6.19E+02	5.18E+05	3.48E+01	1.45E+02	2.18E+05	1.46E+01
1941	6.47E+02	5.41E+05	3.64E+01	1.52E+02	2.27E+05	1.53E+01
1942	6.75E+02	5.64E+05	3.79E+01	1.58E+02	2.37E+05	1.59E+01
1943	7.02E+02	5.87E+05	3.95E+01	1.65E+02	2.47E+05	1.66E+01
1944	7.29E+02	6.10E+05	4.10E+01	1.71E+02	2.56E+05	1.72E+01
1945	7.56E+02	6.32E+05	4.25E+01	1.77E+02	2.65E+05	1.78E+01
1946	7.82E+02	6.54E+05	4.40E+01	1.83E+02	2.75E+05	1.85E+01
1947	8.08E+02	6.76E+05	4.54E+01	1.89E+02	2.84E+05	1.91E+01
1948	8.34E+02	6.98E+05	4.69E+01	1.96E+02	2.93E+05	1.97E+01
1949	8.60E+02	7.19E+05	4.83E+01	2.02E+02	3.02E+05	2.03E+01
1950	8.85E+02	7.41E+05	4.98E+01	2.08E+02	3.11E+05	2.09E+01
1951	9.11E+02	7.62E+05	5.12E+01	2.13E+02	3.20E+05	2.15E+01
1952	9.36E+02	7.83E+05	5.26E+01	2.19E+02	3.29E+05	2.21E+01
1953	9.60E+02	8.03E+05	5.40E+01	2.25E+02	3.37E+05	2.27E+01
1954	9.85E+02	8.24E+05	5.53E+01	2.31E+02	3.46E+05	2.32E+01
1955	1.01E+03	8.44E+05	5.67E+01	2.36E+02	3.54E+05	2.38E+01
1956	1.03E+03	8.64E+05	5.80E+01	2.42E+02	3.63E+05	2.44E+01
1957	1.06E+03	8.84E+05	5.94E+01	2.48E+02	3.71E+05	2.49E+01
1958	1.08E+03	9.03E+05	6.07E+01	2.53E+02	3.79E+05	2.55E+01
1959	1.10E+03	9.23E+05	6.20E+01	2.59E+02	3.88E+05	2.60E+01
1960	1.13E+03	9.42E+05	6.33E+01	2.64E+02	3.96E+05	2.66E+01
1961	1.15E+03	9.61E+05	6.46E+01	2.69E+02	4.04E+05	2.71E+01
1962	1.17E+03	9.80E+05	6.59E+01	2.75E+02	4.12E+05	2.77E+01

**Scenario 2: Total LFG and Methane Production - Wood Debris Only**  
**Transportation Corridor**  
**Yakima, Washington**

Year	Total landfill gas (Wood Debris)			Methane (Wood Debris)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
1963	1.19E+03	9.99E+05	6.71E+01	2.80E+02	4.19E+05	2.82E+01
1964	1.22E+03	1.02E+06	6.83E+01	2.85E+02	4.27E+05	2.87E+01
1965	1.24E+03	1.04E+06	6.96E+01	2.90E+02	4.35E+05	2.92E+01
1966	1.26E+03	1.05E+06	7.08E+01	2.95E+02	4.43E+05	2.97E+01
1967	1.28E+03	1.07E+06	7.20E+01	3.00E+02	4.50E+05	3.02E+01
1968	1.30E+03	1.09E+06	7.32E+01	3.05E+02	4.58E+05	3.07E+01
1969	1.32E+03	1.11E+06	7.44E+01	3.10E+02	4.65E+05	3.12E+01
1970	1.34E+03	1.12E+06	7.55E+01	3.15E+02	4.72E+05	3.17E+01
1971	1.36E+03	1.14E+06	7.67E+01	3.20E+02	4.79E+05	3.22E+01
1972	1.39E+03	1.16E+06	7.79E+01	3.25E+02	4.87E+05	3.27E+01
1973	1.41E+03	1.18E+06	7.90E+01	3.29E+02	4.94E+05	3.32E+01
1974	1.43E+03	1.19E+06	8.01E+01	3.34E+02	5.01E+05	3.36E+01
1975	1.45E+03	1.21E+06	8.12E+01	3.39E+02	5.08E+05	3.41E+01
1976	1.46E+03	1.23E+06	8.23E+01	3.43E+02	5.15E+05	3.46E+01
1977	1.48E+03	1.24E+06	8.34E+01	3.48E+02	5.21E+05	3.50E+01
1978	1.50E+03	1.26E+06	8.45E+01	3.52E+02	5.28E+05	3.55E+01
1979	1.52E+03	1.27E+06	8.56E+01	3.57E+02	5.35E+05	3.59E+01
1980	1.54E+03	1.29E+06	8.66E+01	3.61E+02	5.42E+05	3.64E+01
1981	1.56E+03	1.30E+06	8.77E+01	3.66E+02	5.48E+05	3.68E+01
1982	1.58E+03	1.32E+06	8.87E+01	3.70E+02	5.55E+05	3.73E+01
1983	1.60E+03	1.34E+06	8.97E+01	3.74E+02	5.61E+05	3.77E+01
1984	1.61E+03	1.35E+06	9.08E+01	3.79E+02	5.67E+05	3.81E+01
1985	1.63E+03	1.37E+06	9.18E+01	3.83E+02	5.74E+05	3.85E+01
1986	1.65E+03	1.38E+06	9.28E+01	3.87E+02	5.80E+05	3.90E+01
1987	1.67E+03	1.40E+06	9.38E+01	3.91E+02	5.86E+05	3.94E+01
1988	1.69E+03	1.41E+06	9.47E+01	3.95E+02	5.92E+05	3.98E+01
1989	1.70E+03	1.42E+06	9.57E+01	3.99E+02	5.98E+05	4.02E+01
1990	1.72E+03	1.44E+06	9.67E+01	4.03E+02	6.04E+05	4.06E+01
1991	1.74E+03	1.45E+06	9.76E+01	4.07E+02	6.10E+05	4.10E+01
1992	1.75E+03	1.47E+06	9.85E+01	4.11E+02	6.16E+05	4.14E+01
1993	1.77E+03	1.48E+06	9.95E+01	4.15E+02	6.22E+05	4.18E+01
1994	1.79E+03	1.49E+06	1.00E+02	4.19E+02	6.28E+05	4.22E+01
1995	1.80E+03	1.51E+06	1.01E+02	4.22E+02	6.33E+05	4.26E+01
1996	1.82E+03	1.52E+06	1.02E+02	4.26E+02	6.39E+05	4.29E+01
1997	1.83E+03	1.53E+06	1.03E+02	4.30E+02	6.45E+05	4.33E+01
1998	1.85E+03	1.55E+06	1.04E+02	4.34E+02	6.50E+05	4.37E+01
1999	1.87E+03	1.56E+06	1.05E+02	4.37E+02	6.56E+05	4.40E+01
2000	1.88E+03	1.57E+06	1.06E+02	4.41E+02	6.61E+05	4.44E+01
2001	1.90E+03	1.59E+06	1.07E+02	4.45E+02	6.66E+05	4.48E+01
2002	1.91E+03	1.60E+06	1.07E+02	4.48E+02	6.72E+05	4.51E+01
2003	1.93E+03	1.61E+06	1.08E+02	4.52E+02	6.77E+05	4.55E+01
2004	1.94E+03	1.62E+06	1.09E+02	4.55E+02	6.82E+05	4.58E+01
2005	1.96E+03	1.64E+06	1.10E+02	4.58E+02	6.87E+05	4.62E+01

**Scenario 2: Total LFG and Methane Production - Wood Debris Only**  
**Transportation Corridor**  
**Yakima, Washington**

Year	Total landfill gas (Wood Debris)			Methane (Wood Debris)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
2006	1.77E+03	1.48E+06	9.96E+01	4.15E+02	6.22E+05	4.18E+01
2007	1.79E+03	1.50E+06	1.00E+02	4.19E+02	6.28E+05	4.22E+01
2008	1.80E+03	1.51E+06	1.01E+02	4.23E+02	6.34E+05	4.26E+01
2009	1.82E+03	1.52E+06	1.02E+02	4.27E+02	6.40E+05	4.30E+01
2010	1.84E+03	1.54E+06	1.03E+02	4.30E+02	6.45E+05	4.33E+01
2011	1.85E+03	1.55E+06	1.04E+02	4.34E+02	6.51E+05	4.37E+01
2012	1.87E+03	1.56E+06	1.05E+02	4.38E+02	6.56E+05	4.41E+01
2013	1.88E+03	1.58E+06	1.06E+02	4.41E+02	6.62E+05	4.44E+01
2014	1.86E+03	1.56E+06	1.05E+02	4.37E+02	6.55E+05	4.40E+01
2015	1.85E+03	1.54E+06	1.04E+02	4.33E+02	6.48E+05	4.36E+01
2016	1.83E+03	1.53E+06	1.03E+02	4.28E+02	6.42E+05	4.31E+01
2017	1.74E+03	1.45E+06	9.76E+01	4.07E+02	6.10E+05	4.10E+01
2018	1.72E+03	1.44E+06	9.66E+01	4.03E+02	6.04E+05	4.06E+01
2019	1.70E+03	1.42E+06	9.57E+01	3.99E+02	5.98E+05	4.02E+01
2020	1.69E+03	1.41E+06	9.47E+01	3.95E+02	5.92E+05	3.98E+01
2021	1.67E+03	1.40E+06	9.38E+01	3.91E+02	5.86E+05	3.94E+01
2022	1.65E+03	1.38E+06	9.29E+01	3.87E+02	5.80E+05	3.90E+01
2023	1.64E+03	1.37E+06	9.19E+01	3.83E+02	5.75E+05	3.86E+01
2024	1.62E+03	1.35E+06	9.10E+01	3.80E+02	5.69E+05	3.82E+01
2025	1.60E+03	1.34E+06	9.01E+01	3.76E+02	5.63E+05	3.78E+01
2026	1.59E+03	1.33E+06	8.92E+01	3.72E+02	5.58E+05	3.75E+01
2027	1.57E+03	1.31E+06	8.83E+01	3.68E+02	5.52E+05	3.71E+01
2028	1.56E+03	1.30E+06	8.74E+01	3.65E+02	5.47E+05	3.67E+01
2029	1.54E+03	1.29E+06	8.66E+01	3.61E+02	5.41E+05	3.64E+01
2030	1.53E+03	1.28E+06	8.57E+01	3.57E+02	5.36E+05	3.60E+01
2031	1.51E+03	1.26E+06	8.49E+01	3.54E+02	5.30E+05	3.56E+01
2032	1.49E+03	1.25E+06	8.40E+01	3.50E+02	5.25E+05	3.53E+01
2033	1.48E+03	1.24E+06	8.32E+01	3.47E+02	5.20E+05	3.49E+01
2034	1.47E+03	1.23E+06	8.24E+01	3.43E+02	5.15E+05	3.46E+01
2035	1.45E+03	1.21E+06	8.15E+01	3.40E+02	5.10E+05	3.42E+01
2036	1.44E+03	1.20E+06	8.07E+01	3.37E+02	5.05E+05	3.39E+01
2037	1.42E+03	1.19E+06	7.99E+01	3.33E+02	5.00E+05	3.36E+01
2038	1.41E+03	1.18E+06	7.91E+01	3.30E+02	4.95E+05	3.32E+01
2039	1.39E+03	1.17E+06	7.83E+01	3.27E+02	4.90E+05	3.29E+01
2040	1.38E+03	1.15E+06	7.76E+01	3.23E+02	4.85E+05	3.26E+01
2041	1.37E+03	1.14E+06	7.68E+01	3.20E+02	4.80E+05	3.23E+01
2042	1.35E+03	1.13E+06	7.60E+01	3.17E+02	4.75E+05	3.19E+01
2043	1.34E+03	1.12E+06	7.53E+01	3.14E+02	4.70E+05	3.16E+01
2044	1.33E+03	1.11E+06	7.45E+01	3.11E+02	4.66E+05	3.13E+01
2045	1.31E+03	1.10E+06	7.38E+01	3.08E+02	4.61E+05	3.10E+01
2046	1.30E+03	1.09E+06	7.30E+01	3.05E+02	4.57E+05	3.07E+01
2047	1.29E+03	1.08E+06	7.23E+01	3.02E+02	4.52E+05	3.04E+01
2048	1.27E+03	1.07E+06	7.16E+01	2.99E+02	4.48E+05	3.01E+01

**Scenario 2: Total LFG and Methane Production - Wood Debris Only**  
**Transportation Corridor**  
**Yakima, Washington**

Year	Total landfill gas (Wood Debris)			Methane (Wood Debris)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
2049	1.26E+03	1.05E+06	7.09E+01	2.96E+02	4.43E+05	2.98E+01
2050	1.25E+03	1.04E+06	7.02E+01	2.93E+02	4.39E+05	2.95E+01
2051	1.24E+03	1.03E+06	6.95E+01	2.90E+02	4.34E+05	2.92E+01
2052	1.22E+03	1.02E+06	6.88E+01	2.87E+02	4.30E+05	2.89E+01
2053	1.21E+03	1.01E+06	6.81E+01	2.84E+02	4.26E+05	2.86E+01
2054	1.20E+03	1.00E+06	6.74E+01	2.81E+02	4.21E+05	2.83E+01
2055	1.19E+03	9.94E+05	6.68E+01	2.78E+02	4.17E+05	2.80E+01
2056	1.18E+03	9.84E+05	6.61E+01	2.76E+02	4.13E+05	2.78E+01
2057	1.16E+03	9.74E+05	6.54E+01	2.73E+02	4.09E+05	2.75E+01
2058	1.15E+03	9.64E+05	6.48E+01	2.70E+02	4.05E+05	2.72E+01
2059	1.14E+03	9.55E+05	6.41E+01	2.67E+02	4.01E+05	2.69E+01
2060	1.13E+03	9.45E+05	6.35E+01	2.65E+02	3.97E+05	2.67E+01

**Scenario 2: Total LFG and Methane Production - MSW Only  
Transportation Corridor  
Yakima, Washington**

Year	Total landfill gas (MSW)			Methane (MSW)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
1920	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1921	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1922	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1923	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1924	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1925	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1926	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1927	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1928	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1929	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1930	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1931	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1932	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1933	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1934	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1935	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1936	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1937	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1938	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1939	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1940	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1941	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1942	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1943	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1944	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1945	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1946	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1947	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1948	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1949	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1950	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1951	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1952	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1953	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1954	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1955	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1956	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1957	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1958	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1959	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1960	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1961	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

**Scenario 2: Total LFG and Methane Production - MSW Only**  
**Transportation Corridor**  
**Yakima, Washington**

Year	Total landfill gas (MSW)			Methane (MSW)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
1962	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1963	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1964	4.76E+02	3.98E+05	2.67E+01	1.12E+02	1.67E+05	1.12E+01
1965	9.42E+02	7.88E+05	5.29E+01	2.21E+02	3.31E+05	2.22E+01
1966	1.40E+03	1.17E+06	7.86E+01	3.28E+02	4.92E+05	3.30E+01
1967	1.85E+03	1.55E+06	1.04E+02	4.33E+02	6.49E+05	4.36E+01
1968	2.29E+03	1.91E+06	1.29E+02	5.36E+02	8.03E+05	5.40E+01
1969	2.72E+03	2.27E+06	1.53E+02	6.37E+02	9.54E+05	6.41E+01
1970	3.14E+03	2.63E+06	1.76E+02	7.36E+02	1.10E+06	7.41E+01
1971	3.55E+03	2.97E+06	2.00E+02	8.33E+02	1.25E+06	8.39E+01
1972	3.48E+03	2.91E+06	1.96E+02	8.16E+02	1.22E+06	8.22E+01
1973	3.41E+03	2.86E+06	1.92E+02	8.00E+02	1.20E+06	8.06E+01
1974	3.35E+03	2.80E+06	1.88E+02	7.84E+02	1.18E+06	7.90E+01
1975	3.28E+03	2.74E+06	1.84E+02	7.69E+02	1.15E+06	7.74E+01
1976	3.21E+03	2.69E+06	1.81E+02	7.53E+02	1.13E+06	7.59E+01
1977	3.15E+03	2.64E+06	1.77E+02	7.38E+02	1.11E+06	7.44E+01
1978	3.09E+03	2.58E+06	1.74E+02	7.24E+02	1.08E+06	7.29E+01
1979	3.03E+03	2.53E+06	1.70E+02	7.10E+02	1.06E+06	7.15E+01
1980	2.97E+03	2.48E+06	1.67E+02	6.95E+02	1.04E+06	7.00E+01
1981	2.91E+03	2.43E+06	1.63E+02	6.82E+02	1.02E+06	6.87E+01
1982	2.85E+03	2.38E+06	1.60E+02	6.68E+02	1.00E+06	6.73E+01
1983	2.79E+03	2.34E+06	1.57E+02	6.55E+02	9.82E+05	6.60E+01
1984	2.74E+03	2.29E+06	1.54E+02	6.42E+02	9.62E+05	6.47E+01
1985	2.68E+03	2.25E+06	1.51E+02	6.29E+02	9.43E+05	6.34E+01
1986	2.63E+03	2.20E+06	1.48E+02	6.17E+02	9.25E+05	6.21E+01
1987	2.58E+03	2.16E+06	1.45E+02	6.05E+02	9.06E+05	6.09E+01
1988	2.53E+03	2.12E+06	1.42E+02	5.93E+02	8.88E+05	5.97E+01
1989	2.48E+03	2.07E+06	1.39E+02	5.81E+02	8.71E+05	5.85E+01
1990	2.43E+03	2.03E+06	1.37E+02	5.69E+02	8.53E+05	5.73E+01
1991	2.38E+03	1.99E+06	1.34E+02	5.58E+02	8.37E+05	5.62E+01
1992	2.33E+03	1.95E+06	1.31E+02	5.47E+02	8.20E+05	5.51E+01
1993	2.29E+03	1.91E+06	1.29E+02	5.36E+02	8.04E+05	5.40E+01
1994	2.24E+03	1.88E+06	1.26E+02	5.26E+02	7.88E+05	5.29E+01
1995	2.20E+03	1.84E+06	1.24E+02	5.15E+02	7.72E+05	5.19E+01
1996	2.15E+03	1.80E+06	1.21E+02	5.05E+02	7.57E+05	5.09E+01
1997	2.11E+03	1.77E+06	1.19E+02	4.95E+02	7.42E+05	4.99E+01
1998	2.07E+03	1.73E+06	1.16E+02	4.85E+02	7.27E+05	4.89E+01
1999	2.03E+03	1.70E+06	1.14E+02	4.76E+02	7.13E+05	4.79E+01
2000	1.99E+03	1.66E+06	1.12E+02	4.66E+02	6.99E+05	4.70E+01
2001	1.95E+03	1.63E+06	1.10E+02	4.57E+02	6.85E+05	4.60E+01
2002	1.91E+03	1.60E+06	1.07E+02	4.48E+02	6.71E+05	4.51E+01
2003	1.87E+03	1.57E+06	1.05E+02	4.39E+02	6.58E+05	4.42E+01



**Scenario 2: Total LFG and Methane Production - MSW Only**  
**Transportation Corridor**  
**Yakima, Washington**

Year	Total landfill gas (MSW)			Methane (MSW)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
2004	1.84E+03	1.54E+06	1.03E+02	4.30E+02	6.45E+05	4.33E+01
2005	1.80E+03	1.51E+06	1.01E+02	4.22E+02	6.32E+05	4.25E+01
2006	1.76E+03	1.48E+06	9.91E+01	4.13E+02	6.20E+05	4.16E+01
2007	1.73E+03	1.45E+06	9.72E+01	4.05E+02	6.07E+05	4.08E+01
2008	1.69E+03	1.42E+06	9.53E+01	3.97E+02	5.95E+05	4.00E+01
2009	1.66E+03	1.39E+06	9.34E+01	3.89E+02	5.84E+05	3.92E+01
2010	1.63E+03	1.36E+06	9.15E+01	3.82E+02	5.72E+05	3.84E+01
2011	1.60E+03	1.34E+06	8.97E+01	3.74E+02	5.61E+05	3.77E+01
2012	1.56E+03	1.31E+06	8.79E+01	3.67E+02	5.50E+05	3.69E+01
2013	1.53E+03	1.28E+06	8.62E+01	3.59E+02	5.39E+05	3.62E+01
2014	1.50E+03	1.26E+06	8.45E+01	3.52E+02	5.28E+05	3.55E+01
2015	1.47E+03	1.23E+06	8.28E+01	3.45E+02	5.18E+05	3.48E+01
2016	1.44E+03	1.21E+06	8.12E+01	3.39E+02	5.07E+05	3.41E+01
2017	1.42E+03	1.18E+06	7.96E+01	3.32E+02	4.97E+05	3.34E+01
2018	1.39E+03	1.16E+06	7.80E+01	3.25E+02	4.88E+05	3.28E+01
2019	1.36E+03	1.14E+06	7.64E+01	3.19E+02	4.78E+05	3.21E+01
2020	1.33E+03	1.12E+06	7.49E+01	3.12E+02	4.68E+05	3.15E+01
2021	1.31E+03	1.09E+06	7.34E+01	3.06E+02	4.59E+05	3.08E+01
2022	1.28E+03	1.07E+06	7.20E+01	3.00E+02	4.50E+05	3.02E+01
2023	1.26E+03	1.05E+06	7.06E+01	2.94E+02	4.41E+05	2.96E+01
2024	1.23E+03	1.03E+06	6.92E+01	2.88E+02	4.32E+05	2.91E+01
2025	1.21E+03	1.01E+06	6.78E+01	2.83E+02	4.24E+05	2.85E+01
2026	1.18E+03	9.89E+05	6.65E+01	2.77E+02	4.15E+05	2.79E+01
2027	1.16E+03	9.70E+05	6.51E+01	2.72E+02	4.07E+05	2.74E+01
2028	1.14E+03	9.50E+05	6.39E+01	2.66E+02	3.99E+05	2.68E+01
2029	1.11E+03	9.32E+05	6.26E+01	2.61E+02	3.91E+05	2.63E+01
2030	1.09E+03	9.13E+05	6.14E+01	2.56E+02	3.83E+05	2.58E+01
2031	1.07E+03	8.95E+05	6.01E+01	2.51E+02	3.76E+05	2.53E+01
2032	1.05E+03	8.77E+05	5.89E+01	2.46E+02	3.68E+05	2.48E+01
2033	1.03E+03	8.60E+05	5.78E+01	2.41E+02	3.61E+05	2.43E+01
2034	1.01E+03	8.43E+05	5.66E+01	2.36E+02	3.54E+05	2.38E+01
2035	9.88E+02	8.26E+05	5.55E+01	2.32E+02	3.47E+05	2.33E+01
2036	9.68E+02	8.10E+05	5.44E+01	2.27E+02	3.40E+05	2.29E+01
2037	9.49E+02	7.94E+05	5.33E+01	2.22E+02	3.33E+05	2.24E+01
2038	9.30E+02	7.78E+05	5.23E+01	2.18E+02	3.27E+05	2.20E+01
2039	9.12E+02	7.63E+05	5.12E+01	2.14E+02	3.20E+05	2.15E+01
2040	8.94E+02	7.48E+05	5.02E+01	2.09E+02	3.14E+05	2.11E+01
2041	8.76E+02	7.33E+05	4.92E+01	2.05E+02	3.08E+05	2.07E+01
2042	8.59E+02	7.18E+05	4.83E+01	2.01E+02	3.02E+05	2.03E+01
2043	8.42E+02	7.04E+05	4.73E+01	1.97E+02	2.96E+05	1.99E+01
2044	8.25E+02	6.90E+05	4.64E+01	1.93E+02	2.90E+05	1.95E+01
2045	8.09E+02	6.76E+05	4.54E+01	1.90E+02	2.84E+05	1.91E+01

**Scenario 2: Total LFG and Methane Production - MSW Only**  
**Transportation Corridor**  
**Yakima, Washington**

Year	Total landfill gas (MSW)			Methane (MSW)		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
2046	7.93E+02	6.63E+05	4.45E+01	1.86E+02	2.78E+05	1.87E+01
2047	7.77E+02	6.50E+05	4.37E+01	1.82E+02	2.73E+05	1.83E+01
2048	7.62E+02	6.37E+05	4.28E+01	1.78E+02	2.68E+05	1.80E+01
2049	7.46E+02	6.24E+05	4.20E+01	1.75E+02	2.62E+05	1.76E+01
2050	7.32E+02	6.12E+05	4.11E+01	1.72E+02	2.57E+05	1.73E+01
2051	7.17E+02	6.00E+05	4.03E+01	1.68E+02	2.52E+05	1.69E+01
2052	7.03E+02	5.88E+05	3.95E+01	1.65E+02	2.47E+05	1.66E+01
2053	6.89E+02	5.76E+05	3.87E+01	1.62E+02	2.42E+05	1.63E+01
2054	6.75E+02	5.65E+05	3.80E+01	1.58E+02	2.37E+05	1.59E+01
2055	6.62E+02	5.54E+05	3.72E+01	1.55E+02	2.33E+05	1.56E+01
2056	6.49E+02	5.43E+05	3.65E+01	1.52E+02	2.28E+05	1.53E+01
2057	6.36E+02	5.32E+05	3.58E+01	1.49E+02	2.23E+05	1.50E+01
2058	6.24E+02	5.22E+05	3.50E+01	1.46E+02	2.19E+05	1.47E+01
2059	6.11E+02	5.11E+05	3.43E+01	1.43E+02	2.15E+05	1.44E+01
2060	5.99E+02	5.01E+05	3.37E+01	1.40E+02	2.10E+05	1.41E+01

**Scenario 2: Carbon Dioxide NMOCs - Wood Debris MSW  
Transportation Corridor  
Yakima, Washington**

Year	Carbon Dioxide			NMOCs		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
1920	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1921	3.02E+01	1.65E+04	1.11E+00	6.83E-03	1.91E+00	1.28E-04
1922	6.01E+01	3.28E+04	2.21E+00	1.36E-02	3.79E+00	2.55E-04
1923	8.97E+01	4.90E+04	3.29E+00	2.03E-02	5.66E+00	3.80E-04
1924	1.19E+02	6.50E+04	4.37E+00	2.69E-02	7.51E+00	5.04E-04
1925	1.48E+02	8.08E+04	5.43E+00	3.35E-02	9.34E+00	6.27E-04
1926	1.77E+02	9.65E+04	6.49E+00	4.00E-02	1.12E+01	7.49E-04
1927	2.05E+02	1.12E+05	7.53E+00	4.64E-02	1.29E+01	8.70E-04
1928	2.33E+02	1.27E+05	8.56E+00	5.28E-02	1.47E+01	9.89E-04
1929	2.61E+02	1.43E+05	9.59E+00	5.91E-02	1.65E+01	1.11E-03
1930	2.89E+02	1.58E+05	1.06E+01	6.53E-02	1.82E+01	1.22E-03
1931	3.16E+02	1.73E+05	1.16E+01	7.15E-02	1.99E+01	1.34E-03
1932	3.43E+02	1.87E+05	1.26E+01	7.76E-02	2.17E+01	1.45E-03
1933	3.70E+02	2.02E+05	1.36E+01	8.37E-02	2.33E+01	1.57E-03
1934	3.96E+02	2.17E+05	1.45E+01	8.97E-02	2.50E+01	1.68E-03
1935	4.23E+02	2.31E+05	1.55E+01	9.56E-02	2.67E+01	1.79E-03
1936	4.49E+02	2.45E+05	1.65E+01	1.01E-01	2.83E+01	1.90E-03
1937	4.74E+02	2.59E+05	1.74E+01	1.07E-01	2.99E+01	2.01E-03
1938	5.00E+02	2.73E+05	1.83E+01	1.13E-01	3.15E+01	2.12E-03
1939	5.25E+02	2.87E+05	1.93E+01	1.19E-01	3.31E+01	2.23E-03
1940	5.50E+02	3.00E+05	2.02E+01	1.24E-01	3.47E+01	2.33E-03
1941	5.75E+02	3.14E+05	2.11E+01	1.30E-01	3.63E+01	2.44E-03
1942	5.99E+02	3.27E+05	2.20E+01	1.36E-01	3.78E+01	2.54E-03
1943	6.23E+02	3.41E+05	2.29E+01	1.41E-01	3.93E+01	2.64E-03
1944	6.47E+02	3.54E+05	2.38E+01	1.46E-01	4.09E+01	2.74E-03
1945	6.71E+02	3.67E+05	2.46E+01	1.52E-01	4.24E+01	2.85E-03
1946	6.95E+02	3.79E+05	2.55E+01	1.57E-01	4.38E+01	2.95E-03
1947	7.18E+02	3.92E+05	2.64E+01	1.62E-01	4.53E+01	3.04E-03
1948	7.41E+02	4.05E+05	2.72E+01	1.68E-01	4.68E+01	3.14E-03
1949	7.64E+02	4.17E+05	2.80E+01	1.73E-01	4.82E+01	3.24E-03
1950	7.86E+02	4.30E+05	2.89E+01	1.78E-01	4.96E+01	3.33E-03
1951	8.09E+02	4.42E+05	2.97E+01	1.83E-01	5.10E+01	3.43E-03
1952	8.31E+02	4.54E+05	3.05E+01	1.88E-01	5.24E+01	3.52E-03
1953	8.53E+02	4.66E+05	3.13E+01	1.93E-01	5.38E+01	3.62E-03
1954	8.74E+02	4.78E+05	3.21E+01	1.98E-01	5.52E+01	3.71E-03
1955	8.96E+02	4.89E+05	3.29E+01	2.03E-01	5.65E+01	3.80E-03
1956	9.17E+02	5.01E+05	3.37E+01	2.07E-01	5.79E+01	3.89E-03
1957	9.38E+02	5.13E+05	3.44E+01	2.12E-01	5.92E+01	3.98E-03
1958	9.59E+02	5.24E+05	3.52E+01	2.17E-01	6.05E+01	4.07E-03
1959	9.80E+02	5.35E+05	3.60E+01	2.22E-01	6.18E+01	4.15E-03
1960	1.00E+03	5.46E+05	3.67E+01	2.26E-01	6.31E+01	4.24E-03
1961	1.02E+03	5.57E+05	3.75E+01	2.31E-01	6.44E+01	4.33E-03

**Scenario 2: Carbon Dioxide NMOCs - Wood Debris MSW  
Transportation Corridor  
Yakima, Washington**

Year	Carbon Dioxide			NMOCs		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
1962	1.04E+03	5.68E+05	3.82E+01	2.35E-01	6.57E+01	4.41E-03
1963	1.06E+03	5.79E+05	3.89E+01	2.40E-01	6.69E+01	4.50E-03
1964	1.67E+03	9.14E+05	6.14E+01	3.78E-01	1.06E+02	7.09E-03
1965	2.27E+03	1.24E+06	8.35E+01	5.14E-01	1.43E+02	9.64E-03
1966	2.86E+03	1.56E+06	1.05E+02	6.48E-01	1.81E+02	1.21E-02
1967	3.44E+03	1.88E+06	1.26E+02	7.78E-01	2.17E+02	1.46E-02
1968	4.01E+03	2.19E+06	1.47E+02	9.06E-01	2.53E+02	1.70E-02
1969	4.56E+03	2.49E+06	1.67E+02	1.03E+00	2.88E+02	1.93E-02
1970	5.11E+03	2.79E+06	1.87E+02	1.16E+00	3.22E+02	2.17E-02
1971	5.64E+03	3.08E+06	2.07E+02	1.28E+00	3.56E+02	2.39E-02
1972	5.57E+03	3.04E+06	2.04E+02	1.26E+00	3.52E+02	2.36E-02
1973	5.50E+03	3.01E+06	2.02E+02	1.24E+00	3.47E+02	2.33E-02
1974	5.44E+03	2.97E+06	2.00E+02	1.23E+00	3.43E+02	2.31E-02
1975	5.37E+03	2.93E+06	1.97E+02	1.22E+00	3.39E+02	2.28E-02
1976	5.31E+03	2.90E+06	1.95E+02	1.20E+00	3.35E+02	2.25E-02
1977	5.25E+03	2.87E+06	1.93E+02	1.19E+00	3.31E+02	2.22E-02
1978	5.19E+03	2.83E+06	1.90E+02	1.17E+00	3.27E+02	2.20E-02
1979	5.13E+03	2.80E+06	1.88E+02	1.16E+00	3.23E+02	2.17E-02
1980	5.07E+03	2.77E+06	1.86E+02	1.15E+00	3.20E+02	2.15E-02
1981	5.01E+03	2.74E+06	1.84E+02	1.13E+00	3.16E+02	2.12E-02
1982	4.96E+03	2.71E+06	1.82E+02	1.12E+00	3.13E+02	2.10E-02
1983	4.90E+03	2.68E+06	1.80E+02	1.11E+00	3.09E+02	2.08E-02
1984	4.85E+03	2.65E+06	1.78E+02	1.10E+00	3.06E+02	2.06E-02
1985	4.80E+03	2.62E+06	1.76E+02	1.09E+00	3.03E+02	2.03E-02
1986	4.75E+03	2.59E+06	1.74E+02	1.07E+00	3.00E+02	2.01E-02
1987	4.70E+03	2.57E+06	1.72E+02	1.06E+00	2.96E+02	1.99E-02
1988	4.65E+03	2.54E+06	1.71E+02	1.05E+00	3.83E+02	1.97E-02
1989	4.60E+03	2.51E+06	1.69E+02	1.04E+00	2.90E+02	1.95E-02
1990	4.56E+03	2.49E+06	1.67E+02	1.03E+00	2.88E+02	1.93E-02
1991	4.51E+03	2.46E+06	1.66E+02	1.02E+00	2.85E+02	1.91E-02
1992	4.47E+03	2.44E+06	1.64E+02	1.01E+00	2.82E+02	1.89E-02
1993	4.42E+03	2.42E+06	1.62E+02	1.00E+00	2.79E+02	1.88E-02
1994	4.38E+03	2.39E+06	1.61E+02	9.91E-01	2.77E+02	1.86E-02
1995	4.34E+03	2.37E+06	1.59E+02	9.82E-01	2.74E+02	1.84E-02
1996	4.30E+03	2.35E+06	1.63E+02	9.73E-01	2.71E+02	1.82E-02
1997	4.26E+03	2.33E+06	2.03E+02	9.64E-01	2.69E+02	1.81E-02
1998	4.22E+03	2.31E+06	1.93E+02	9.55E-01	2.67E+02	1.79E-02
1999	4.19E+03	2.29E+06	2.43E+02	9.47E-01	2.64E+02	1.78E-02
2000	4.15E+03	2.27E+06	1.52E+02	9.39E-01	2.62E+02	1.76E-02
2001	4.08E+03	2.23E+06	1.50E+02	9.24E-01	2.58E+02	1.73E-02
2002	4.02E+03	2.20E+06	1.48E+02	9.09E-01	2.54E+02	1.70E-02
2003	3.96E+03	2.16E+06	1.45E+02	8.95E-01	2.50E+02	1.68E-02

**Scenario 2: Carbon Dioxide NMOCs - Wood Debris MSW  
Transportation Corridor  
Yakima, Washington**

Year	Carbon Dioxide			NMOCs		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
2004	3.89E+03	2.13E+06	1.43E+02	8.81E-01	2.46E+02	1.65E-02
2005	3.83E+03	2.09E+06	1.41E+02	8.67E-01	2.42E+02	1.63E-02
2006	3.77E+03	2.06E+06	1.38E+02	8.53E-01	2.38E+02	1.60E-02
2007	3.74E+03	2.05E+06	1.37E+02	8.47E-01	2.36E+02	1.59E-02
2008	3.72E+03	2.03E+06	1.36E+02	8.40E-01	2.34E+02	1.58E-02
2009	3.69E+03	2.01E+06	1.35E+02	8.34E-01	2.33E+02	1.56E-02
2010	3.66E+03	2.00E+06	1.34E+02	8.28E-01	2.31E+02	1.55E-02
2011	3.63E+03	1.99E+06	1.33E+02	8.22E-01	2.29E+02	1.54E-02
2012	3.61E+03	1.97E+06	1.32E+02	8.16E-01	2.28E+02	1.53E-02
2013	3.58E+03	1.96E+06	1.32E+02	8.11E-01	2.26E+02	1.52E-02
2014	3.53E+03	1.93E+06	1.30E+02	7.98E-01	2.23E+02	1.50E-02
2015	3.48E+03	1.90E+06	1.28E+02	7.86E-01	2.19E+02	1.47E-02
2016	3.42E+03	1.87E+06	1.26E+02	7.74E-01	2.16E+02	1.45E-02
2017	2.80E+03	1.53E+06	1.03E+02	6.33E-01	1.77E+02	1.19E-02
2018	2.76E+03	1.51E+06	1.01E+02	6.24E-01	1.74E+02	1.17E-02
2019	2.72E+03	1.49E+06	9.98E+01	6.15E-01	1.72E+02	1.15E-02
2020	2.68E+03	1.46E+06	9.84E+01	6.06E-01	1.69E+02	1.14E-02
2021	2.64E+03	1.44E+06	9.70E+01	5.98E-01	1.67E+02	1.12E-02
2022	2.60E+03	1.42E+06	9.56E+01	5.89E-01	1.64E+02	1.10E-02
2023	2.57E+03	1.40E+06	9.42E+01	5.81E-01	1.62E+02	1.09E-02
2024	2.53E+03	1.38E+06	9.29E+01	5.73E-01	1.60E+02	1.07E-02
2025	2.50E+03	1.36E+06	9.16E+01	5.64E-01	1.57E+02	1.06E-02
2026	2.46E+03	1.34E+06	9.03E+01	5.56E-01	1.55E+02	1.04E-02
2027	2.43E+03	1.32E+06	8.90E+01	5.49E-01	1.53E+02	1.03E-02
2028	2.39E+03	1.31E+06	8.78E+01	5.41E-01	1.51E+02	1.01E-02
2029	2.36E+03	1.29E+06	8.65E+01	5.33E-01	1.49E+02	9.99E-03
2030	2.32E+03	1.27E+06	8.53E+01	5.26E-01	1.47E+02	9.85E-03
2031	2.29E+03	1.25E+06	8.41E+01	5.18E-01	1.45E+02	9.71E-03
2032	2.26E+03	1.23E+06	8.29E+01	5.11E-01	1.43E+02	9.58E-03
2033	2.23E+03	1.22E+06	8.18E+01	5.04E-01	1.41E+02	9.44E-03
2034	2.20E+03	1.20E+06	8.06E+01	4.97E-01	1.39E+02	9.31E-03
2035	2.17E+03	1.18E+06	7.95E+01	4.90E-01	1.37E+02	9.18E-03
2036	2.14E+03	1.17E+06	7.84E+01	4.83E-01	1.35E+02	9.05E-03
2037	2.11E+03	1.15E+06	7.73E+01	4.76E-01	1.33E+02	8.93E-03
2038	2.08E+03	1.13E+06	7.62E+01	4.70E-01	1.31E+02	8.80E-03
2039	2.05E+03	1.12E+06	7.52E+01	4.63E-01	1.29E+02	8.68E-03
2040	2.02E+03	1.10E+06	7.41E+01	4.57E-01	1.27E+02	8.56E-03
2041	1.99E+03	1.09E+06	7.31E+01	4.50E-01	1.26E+02	8.44E-03
2042	1.96E+03	1.07E+06	7.21E+01	4.44E-01	1.24E+02	8.33E-03
2043	1.94E+03	1.06E+06	7.11E+01	4.38E-01	1.22E+02	8.21E-03
2044	1.91E+03	1.04E+06	7.01E+01	4.32E-01	1.21E+02	8.10E-03
2045	1.88E+03	1.03E+06	6.92E+01	4.26E-01	1.19E+02	7.99E-03

**Scenario 2: Carbon Dioxide NMOCs - Wood Debris MSW  
Transportation Corridor  
Yakima, Washington**

Year	Carbon Dioxide			NMOCs		
	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)	(Mg/year)	(m3/year)	(av ft <sup>3</sup> /min)
2046	1.86E+03	1.02E+06	6.82E+01	4.20E-01	1.17E+02	7.88E-03
2047	1.83E+03	1.00E+06	6.73E+01	4.15E-01	1.16E+02	7.77E-03
2048	1.81E+03	9.88E+05	6.64E+01	4.09E-01	1.14E+02	7.66E-03
2049	1.78E+03	9.74E+05	6.54E+01	4.03E-01	1.13E+02	7.56E-03
2050	1.76E+03	9.61E+05	6.46E+01	3.98E-01	1.11E+02	7.46E-03
2051	1.73E+03	9.48E+05	6.37E+01	3.92E-01	1.09E+02	7.36E-03
2052	1.71E+03	9.35E+05	6.28E+01	3.87E-01	1.08E+02	7.26E-03
2053	1.69E+03	9.22E+05	6.20E+01	3.82E-01	1.07E+02	7.16E-03
2054	1.67E+03	9.10E+05	6.11E+01	3.77E-01	1.05E+02	7.06E-03
2055	1.64E+03	8.97E+05	6.03E+01	3.72E-01	1.04E+02	6.97E-03
2056	1.62E+03	8.85E+05	5.95E+01	3.67E-01	1.02E+02	6.87E-03
2057	1.60E+03	8.73E+05	5.87E+01	3.62E-01	1.01E+02	6.78E-03
2058	1.58E+03	8.62E+05	5.79E+01	3.57E-01	9.95E+01	6.69E-03
2059	1.56E+03	8.50E+05	5.71E+01	3.52E-01	9.82E+01	6.60E-03
2060	1.54E+03	8.39E+05	5.64E+01	3.47E-01	9.69E+01	6.51E-03

# **Excavated Materials Management Plan**

**Excavated Materials Management Plan  
Roadway Project  
Closed City of Yakima Landfill Site  
Yakima, Washington**

April 26, 2019

Prepared for  
City of Yakima



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**Excavated Materials Management Plan  
Roadway Project  
Closed City of Yakima Landfill Site  
Yakima, Washington**

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## LIST OF ABBREVIATIONS AND ACRONYMS

ACM .....	asbestos-containing materials
AHERA .....	Asbestos Hazard Emergency Response Act
bgs.....	below ground surface
BMPs .....	best management practices
CFR.....	Code of Federal Regulations
City.....	City of Yakima
DAHP .....	Department of Archaeology and Historic Preservation
Ecology.....	Washington State Department of Ecology
EMMP.....	Excavated Materials Management Plan
eV.....	electron volt
ft.....	feet
IAWP .....	Interim Action Work Plan
LAI .....	Landau Associates, Inc.
Landfill Site.....	closed City of Yakima Landfill Site
mm.....	millimeter
MSW .....	municipal solid waste
OSHA.....	Occupational Safety and Health Administration
PAH .....	polycyclic aromatic hydrocarbons
PCB.....	polychlorinated biphenyl
PCP.....	pentachlorophenol
PID.....	photoionization detector
ppm.....	parts per million
RCW .....	Revised Code of Washington
RI.....	remedial investigation
SAP .....	Sampling and Analysis Plan
SVOC .....	semi-volatile organic compound
SWPPP.....	stormwater pollution prevention plan
TCLP .....	toxicity characteristic leaching procedure
TPH.....	total petroleum hydrocarbons
TPH D/O .....	TPH diesel range/oil range
VOC .....	volatile organic compound
WAC .....	Washington Administrative Code
WISHA .....	Washington Industrial Safety and Health Act

## **1.0 INTRODUCTION**

The purpose of this Excavated Materials Management Plan (EMMP) is to outline the approach and procedures for managing known and unanticipated contaminated soil, municipal solid waste (MSW), and wood debris encountered during construction activities, and for management of stormwater and groundwater entering the excavation during activities associated with construction of the roadway corridor at the closed City of Yakima Landfill Site (Landfill Site) located in Yakima, Washington (Figure C-1). The roadway corridor alignment also crosses the southern end of the Boise Cascade Mill Site (Mill Site). The sections of the roadway corridor that cross both the Landfill Site and the Mill Site are collectively referred to as the “Site” in this document (Figure C-2). This EMMP was developed by Landau Associates, Inc. (LAI) for use by the City of Yakima (City) and its contractors during the construction activities. This document addresses recognition of known and unanticipated contamination and characterization of contamination, as well as issues related to excavated materials and stormwater handling and disposal. This EMMP is an appendix to the Interim Action Work Plan (IAWP) and is intended to be used in conjunction with the complete IAWP report and other attachments, not as a standalone document.

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## 2.0 KNOWN AND SUSPECTED CONTAMINATION

Prior investigations at the Site have identified areas of known and suspected contamination at the Site (Figure C-3). The following sections summarize the contaminants, waste materials, and other debris that may be encountered in soil or groundwater at various areas within the Landfill Site and Mill Site.

It should be clearly understood that decomposing MSW and wood debris at the Site continue to generate methane at the Site at concentrations in and above the explosive limits. The presence of methane (and other landfill gases) is a health and safety risk that must be appropriately managed by the contractor, but is not the focus of this document.

### 2.1 Landfill Site

Subsurface conditions at the Landfill Site are generally characterized by the presence of MSW deposited during the landfill's active years and buried wood debris (on both the Mill Site and Landfill Site) associated with the historic mill activities, and. These materials have been mixed with Site soil over the years through excavation and regrading.

MSW on the Landfill Site is known to be present to the approximate extent shown on Figure C3 and is present at thicknesses of up to 15 feet (ft), with an average thickness of approximately 10 ft; the top of the MSW occurs from approximately 2 to 12 ft below ground surface (bgs), and the bottom of the MSW occurs from approximately 5 to 19.5 ft bgs. The MSW consists of organic-putrescible material (food, garden, and animal waste), organic non-putrescible waste (paper, wood, textiles, leather, plastic, rubber, paints, and sludge), and inorganic materials (metals, glass, ceramics, soil, ash, concrete, etc.).

Extensive sampling of soil/MSW and groundwater at the Landfill Site indicates that a wide variety of contaminants. Although the main contaminants of concern/indicator hazardous substances at the Site are limited to methane and vinyl chloride in landfill gas, and dissolved metals (arsenic, iron, and manganese in groundwater), other contaminants have been detected at low levels and are potentially present in the MSW including:

- petroleum hydrocarbons
- metals including: arsenic, barium, cadmium, chromium (III), iron, lead, manganese, mercury, silver, and sodium; hexavalent chromium and selenium
- pesticides
- polychlorinated biphenyls (PCBs)
- volatile organic compounds (VOCs)
- semi-volatile organic compounds (SVOCs)
- polycyclic aromatic hydrocarbons (PAHs).

Therefore, it should be expected that low-level contamination is present in the MSW and potentially in soil and wood debris that comes in contact with it. Excavated MSW materials will be treated as a solid waste and sampled, as required by the applicable disposal facility, for waste characterization as

described in the Sampling and Analysis Plan (SAP) included as Appendix D of the Interim Action Work Plan.<sup>1</sup>

Discrete contamination or other potential contaminant sources that have more specialized management and disposal requirements (such as free product hydrocarbons or solvents; industrial wastes like drums, tanks, transformers, batteries, and cement kiln dust/lime wastes; chemically treated wood products like creosote treated poles or railroad ties and chemical pressure treated lumber; and/or other regulated materials that may be a health and safety risk like friable asbestos-containing materials [ACM]) have not been encountered or identified in prior explorations at the Landfill Site. Although unlikely, these types of materials may be present and encountered during construction and may require special procedures for identification and management (see Section 3.1).

## 2.2 Mill Site

Subsurface conditions at the Mill Site are generally characterized by the presence of buried wood debris along the eastern end of the portion of the roadway alignment located on the Mill Site in the historical log pond areas. Excavated wood debris from the Mill Site or Landfill Site may be recycled at an appropriate composting facility, contingent upon sampling results demonstrating that it is not contaminated with Site contaminants of concern. Alternately, wood debris can be managed and disposed in the same manner as MSW.

Other areas of known or suspected contamination at the Mill Site that may require special characterization, management, and disposal include:

- The presence of total petroleum hydrocarbons (TPH) in the diesel and oil range (TPH-D/O) has been identified in shallow soil (within approximately 2 feet of ground surface) within the section of the roadway alignment located proximate to the north of the railroad tracks.
- Chromium (unspeciated) and PAHs have been identified in a limited number of soil samples in the area around the former “Boiler House”; however, the nature and extent have not been determined. PCBs and mineral oil may also be present in this area due to the former presence of electrical capacitors in the Boiler House and other oil-filled transformers in this area.
- Dissolved metals are also present in groundwater at the Mill Site due to reducing conditions associated with groundwater contact with and leaching of organic materials from wood debris located at the Mill Site. Similar to the Landfill Site, the primary metals of concern are arsenic, iron, and manganese. The western portion of the roadway alignment passes through areas of historical wood mill buildings, where some suspected areas of contamination exist related to historical site operations. Additionally, investigations at the former Plywood Mill area of the Mill Site located adjacent to the northwest of the Landfill Site (south of the railroad tracks) have identified groundwater contamination that may have migrated beneath portions of the roadway alignment.
- TPH-D/O have been detected in groundwater in the vicinity of the former plywood mill area; based on groundwater data from monitoring wells, dissolved-phase TPH-D/O may have migrated beneath the roadway corridor in the area east of the former plywood mill of the south of the railroad tracks.

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<sup>1</sup> LAI. 2019. Interim Action Work Plan, Closed City of Yakima Landfill Site, Yakima, Washington. Landau Associates, Inc. March 1.

Discrete contamination or other potential contaminant sources that have more specialized management and disposal requirements (such as petroleum hydrocarbons, solvents, industrial wastes like drums or tanks, chemically treated wood products like creosote-treated poles or railroad ties and chemical pressure-treated lumber, and/or other regulated materials that may be a health and safety risk like friable ACM) have not been encountered or identified in prior explorations at the Mill Site. Although unlikely, these types of materials may be present and encountered during construction and may require special procedures for identification and management (see Section 3.1).



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## 3.0 RECOGNIZING CONTAMINATION

Roadway construction activities are currently planned in areas of known landfill debris (Landfill Site) and former industrial (wood/plywood mill) facilities and operations areas (Mill Site) and could result in discovery of unanticipated contamination associated with previously unknown/undiscovered waste materials. Landfill debris at the Site has been generally characterized as MSW, but there is the potential for industrial wastes to be present and/or hazardous household wastes such as, but not limited to, oils, pesticides, paint thinners, storage drums, transformers, batteries, and asbestos-containing demolition debris. Construction field personnel must be aware of the known contamination associated with MSW and understand how to recognize other potentially contaminated materials at the Site. This EMMP should be implemented during all intrusive work at the Site to maintain work zone health and safety and to mitigate further impact to the environment if known or unanticipated contamination is encountered.

### 3.1 Unanticipated Contamination

The landfill portion of the Site has generally been found to consist primarily of MSW and wood debris deposition in the former log pond areas as described above. The rest of the Site (Mill Site) consists of former mill facilities and processing areas and wood debris deposition areas in former log pond areas. For the purposes of this EMMP, unanticipated contamination can be determined using knowledge of historical site operations and activities (as documented in the landfill remedial investigation [RI] report and Mill Site RI work plan); physical observations; and field screening equipment and procedures. Physical observations include use of the visual and olfactory senses. Field screening equipment may include instrumentation such explosive gas meters, organic vapor meters, and dust meters. Contamination has previously been associated with the following materials and conditions at the Site:

- **Petroleum Hydrocarbons:** Petroleum hydrocarbon products, such as gasoline, diesel, and motor oil. Low levels of petroleum hydrocarbon contamination are known to be present in MSW at the Site. However, hydrocarbon contamination may be present in soil separate from MSW, and pockets of gross contamination associated with dumped drums or tanks may be present that will require additional characterization and special handling and disposal. Contamination may be present in soil, MSW, or wood debris and typically exhibits one or more of the following characteristics: iridescent sheen; black, oily, tarry, or greasy appearance; petroleum (gas, diesel, motor oil, kerosene) odor; and dark staining in soil.
- **Solvents:** Industrial or commercial chemical solvents have commonly been used in the past for cleaning and degreasing metal parts. No significant solvent contamination has been identified at the Site, but could be encountered in containers or discrete pockets of contamination. Solvent contamination may be present in soil, MSW, or wood debris and is typically exhibits the following characteristics: clear liquid with a sweet chemical odor.
- **Buried Debris:** MSW at the Site contains organic wastes (household refuse) and inorganic materials such as metals, glass, ceramics, soil, ash, and concrete that may be household wastes or construction/demolition debris. Other buried materials may also be encountered in areas of buried wood debris or historical industrial operations areas. While these have not

been encountered in explorations at the Site, construction/demolition/industrial debris could include materials such as metal drums, burnt wood, creosote-impregnated wood piles/poles or railroad ties, chemically pressure treated wood, and/or friable ACM:

- Creosote-impregnated wood piles/poles or railroad ties exhibit a strong “mothball” odor and are typically darker in color, or possibly having a tar-like coating.
  - Chemically pressure-treated wood often has a greenish coloration and indentation patterns from the pressure treating process. Pentachlorophenol (PCP), a commonly used historic wood-treating insecticide/fungicide, may appear as clear or white to dark grayish-brown solid crystalline beads or flakes with a sweet gasoline- or benzene-like odor.
  - Friable ACM, such as pipe wrap, boiler insulation, and “popcorn” ceiling texture, is often white and fibrous and can be easily reduced to powder by hand when dry.
- **Industrial Wastes:** Waste materials originating from industrial sites/processes have not been encountered in explorations at the Site, but if present could consist of drums or tanks of waste chemicals or petroleum products, PCB-containing transformer reservoirs or debris, PAHs, and/or lime wastes/cement kiln dust. PCB-containing transformers are typically metal and cylindrical with electrical connections, some of which are lined with heat sink plates. Damaged, undrained transformers may leak oils that are dark amber or black in color. PAHs may be encountered in the form of tar, creosote, or other dark stained areas (potentially in discarded containers or associated with treated wood piles/poles or railroad ties). Lime wastes/cement kiln dusts are typically light gray and flaky or powdery and exhibit a slight “fishy” odor. Cement kiln dust may be consolidated in a mass that has the appearance of a light gray/off-white clay material that exhibits a brittle, flaky character when broken up.
  - **Other:** The listed items above are not meant to be exhaustive and construction personnel should be diligent in looking for any materials and excavated materials that may be encountered that appear or behave differently from typical MSW, wood debris, and soil. If any chemical or other unidentifiable odors, viscous or odd colored liquids, odd appearing or colored powders/dusts/crystals, or discarded industrial-type equipment or containers are encountered, these materials should be assumed to be potentially contaminated and dealt with cautiously and safely. Potential metals-contaminated soil may also be encountered that may not have any physically observable evidence of contamination and may require special screening techniques or sampling and laboratory analysis (see Section 6.1).

If the materials or conditions noted above are observed during construction activities, work is to be suspended within the affected area and LAI and the City shall be notified immediately. Similar procedures are to be followed if other indications of potential contamination, such as material with an unusual appearance or odor, are observed during excavation activities.

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## **4.0 RECOGNIZING POTENTIALLY CONTAMINATED GROUNDWATER AND STORMWATER**

Groundwater at the Site is known to be contaminated with dissolved metals related to leaching of organic materials from MSW and/or the reducing conditions associated with degradation of MSW and wood debris. The depth to groundwater varies, but some areas of excavation will extend to depths that are likely to intersect the groundwater interface. If necessary for excavation activities, groundwater control in these areas may be performed through dewatering well points and/or sumps. Groundwater generated through dewatering will likely require treatment prior to discharge to the City's sanitary or storm sewer system in accordance with applicable permit conditions and requirements.

Stormwater that comes in contact with contaminated soils and/or MSW can become contaminated either by suspension of contaminated particles or by solution of chemicals and, therefore, accumulated or collected stormwater may also be treated as a contaminated material. Procedures for containment, characterization, and disposal of potentially contaminated stormwater will be the same as the procedures listed in Section 6.0 for other potentially contaminated materials.

Implementation of a project-specific stormwater pollution prevention plan (SWPPP) may also be necessary as required under a Construction Stormwater General Permit. Administering stormwater best management practices (BMPs) and erosion and sediment control procedures may be necessary to minimize the accumulation of potentially contaminated stormwater. If necessary, a project-specific SWPPP will be prepared separately by the City or construction contractor in adherence with the applicable construction-related permits and regulations.

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## 5.0 MANAGING KNOWN OR UNANTICIPATED CONTAMINATED MATERIAL

All excavation and associated subsurface activities that place workers in contact with potentially contaminated material should be conducted by workers who have proper Occupational Safety and Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) training and certification for working at a hazardous waste site. All work conducted by the contractor related to the excavation and handling of potentially contaminated materials should be performed under a contractor-prepared Site-specific health and safety plan prepared in accordance with Code of Federal Regulations (CFR) 29.1926.120 and approved by the City.

When unanticipated or unidentified materials (other than general MSW and wood debris) are encountered, the procedures shown on Figure C-4 and detailed below may be used as a guide for decision-making:

- 1) If the material encountered is unanticipated or unidentified, work will cease in this area, as needed, to avoid disturbing the affected material and the construction contractor will notify the appropriate City personnel. The construction contractor will follow the material handling guidelines listed in Section 6.0.
- 2) If warranted, the City will notify LAI of the conditions and, if warranted, an environmental professional from LAI will visit the Site to evaluate the environmental conditions and determine appropriate notification procedures to the Washington Department of Ecology (Ecology) or other applicable regulatory agency.
- 3) LAI will consult with Ecology to determine appropriate next steps for characterization. Based on existing data, field observations, and Ecology approval, LAI will collect analytical samples and submit for appropriate laboratory analysis.
- 4) Once the nature of the material (e.g., whether it is contaminated by regulated substances) is appropriately identified, the affected material may be stockpiled (if the material is soil, MSW, and/or wood debris) separately from stockpiles of other excavated materials and tested to determine waste profiling at the direction of the City. Affected groundwater or stormwater should be contained in place or in appropriate containers to minimize contamination of other clean materials. If applicable, it may also be routed to the dewatering treatment system for appropriate treatment and discharge.
- 5) As warranted, an LAI environmental professional will conduct material screening and characterization (Section 6.0), and collect samples for waste characterization purposes, as well as possibly delineate the extent of the affected area within the planned limits of the excavation. The material will be analyzed (as necessary) and results will be reported to the City in a timely manner to minimize work delays.
- 6) Material (soil, MSW, wood debris, groundwater, or stormwater) that is determined to be uncontaminated (i.e. contaminant concentrations below regulatory screening levels or limits, or does not otherwise represent a risk to human health or the environment) will be left in place or disposed of along with other like excavated materials.

- 7) Excavated material and/or containerized water that is determined to be contaminated and requires removal will be profiled by LAI on behalf of the City for appropriate disposal at an appropriate waste disposal/treatment facility.
- 8) Once an appropriate disposal method is determined and the waste profile is accepted by the selected waste disposal/treatment facility, the soil, groundwater, or stormwater can be transported to the selected facility for treatment or disposal under appropriate waste hauling bill of lading or manifest. The facility will be notified in advance of the approximate quantity and type of material being transported. All disposal facilities should provide the City with the appropriate paperwork to document the quantity and type of material received and the disposal method.
- 9) Once the contaminated material is removed, confirmation samples will be collected, if requested by the City or Ecology, from the previously affected area by an LAI representative to document the soil quality at the limits of the contaminated material excavation.
- 10) The City will notify the contractor when work can resume in the previously affected area.

---

## 6.0 MATERIAL SCREENING AND CHARACTERIZATION

This section describes the procedures that may be used by environmental professionals to field-screen and characterize potentially contaminated materials at the Site.

### 6.1 Field Screening of Potentially Contaminated Materials

The following field-screening methods may be used by the environmental professional to evaluate potentially contaminated materials:

- Petroleum sheen testing
- Chemical vapor screening with a photoionization detector (PID) or similar equipment
- Comparison of material to previously contaminated materials encountered at the Site, as listed in Section 2.0.

Sheen testing can be conducted on material that exhibits evidence of petroleum hydrocarbon contamination, if encountered. The sheen test is conducted by placing a representative sample of the soil in a clear glass jar with tap water. The jar will be agitated and amount of sheen (light, medium, or heavy) will be observed and recorded. The judgment of the environmental professional will be used to determine if suspect soil is likely contaminated with petroleum hydrocarbons based on sheen testing. Materials exhibiting petroleum sheen will be considered contaminated, unless laboratory testing demonstrates otherwise.

If needed, screening with the PID can be conducted on materials exhibiting a petroleum or chemical odor to determine if VOCs are present. Field screening with a PID is conducted by placing a representative sample of the soil in a sealed plastic bag. The bag and soil will be agitated, allowed to stand for 5 minutes, and then a headspace reading will be taken of vapor in the bag using the PID. A sustained reading above background or ambient conditions will be used as a general indication of potential VOC contamination. The PID will be calibrated on a daily basis using a standard of 100 parts per million (ppm) of isobutylene. The PID will be equipped with a 10.6 electron volt (eV) lamp, which is capable of detecting most common aromatic and aliphatic hydrocarbon compounds. Other field screening equipment, such as explosive gas meters or dust meters will be used as appropriate depending on the observed nature of the contaminant and/or other field screening results.

Areas of known or potential metals-contaminated soil are also present on the Mill Site area (see Figure C-3); these areas may not have any physically observable evidence of contamination and may require special screening techniques, such as field test kits, or sampling and laboratory analysis. Where identified and delineated by the Mill Site RI or as otherwise applicable, this type of screening/sampling during construction will be performed by LAI.

Suspect material screening may be conducted in the area of possible unidentified contamination and used to assist in delineating the extent of contamination to the planned limits of the excavations and

to inform stockpiling decisions. Should previously unidentified contaminated material be excavated and stockpiled, the screening will generally be conducted for approximately every 20 loose cubic yards of excavated material from the area. The frequency of field screening may be more or less, as needed, depending on the conditions encountered and whether there are varying material types and levels of impact. Field-screening results will be recorded in a field report.

## **6.2 Potentially Contaminated Material Characterization**

After appropriate identification procedures have been performed as identified above, newly discovered contaminated material should be stockpiled separately from other excavated materials (i.e. MSW, wood debris, and soil) to reduce the potential for cross-contamination. Samples will be collected, as necessary, by the environmental professional to further evaluate and characterize whether potentially contaminated materials oil and/or water, as identified during field screening, should be classified as contaminated and, if contaminated, to profile and determine appropriate disposition of the contaminated material. Sampling will be conducted in accordance with the SAP.

Characterization samples will be tested consistent with the type of potential contamination recognized in the field (e.g., motor oil-range hydrocarbons, paint thinners). The testing protocol will be consistent with the requirements of the destination waste disposal/treatment facility. Samples of potential ACM will be collected only by individuals certified as Asbestos Hazard Emergency Response Act (AHERA) Building Inspectors.

Sample analytical results will be compared with appropriate regulatory criteria to determine whether a material is contaminated and/or requires special handling and disposal.

## **6.3 Management of Contaminated or Potentially Contaminated Materials**

This section provides information about how excavated soil, MSW, and wood debris can be handled by the construction contractor. Guidelines and general information about the handling of excavated soil, MSW, and wood debris are provided in this section.

### **6.3.1 Plan for Instructing Workers**

Excavation supervisors and workers should be provided with training and other information from this EMMP about the nature of hazardous substances in the soil they are excavating and how to identify suspect soil (Section 3.0). These personnel should be provided with the authority to stop excavation operations and request direction and assistance in evaluating materials that appear to be contaminated.

### **6.3.2 Excavation**

Excavation should be conducted with the appropriate hydraulic excavating equipment. A smooth-edged bucket should be used when excavating potentially contaminated materials, as applicable. Based on field measurements in areas where methane is known or likely to be present in MSW and/or wood debris, the excavation may need to be ventilated with fans to prevent a potential accumulation of methane above its lower explosive limit of 5 percent by volume.

Suspect or positively identified ACM should not be disturbed and should be covered in place, immediately upon discovery, with plastic sheeting to prevent a potential fiber release. The material should then be properly contained and disposed as soon as possible by appropriately trained and certified asbestos-mitigation professionals.

### **6.3.3 Stockpiling**

Excavated soil, MSW, and wood debris may be segregated for waste characterization as needed prior to hauling to appropriate disposal facilities. Stockpiled materials that have been determined to be contaminated through field screening or testing should be placed on minimum 10-millimeter (mm) plastic sheeting and bermed around the edges with sand bags or hay bales to prevent run-on and run-off of stormwater. The stockpiles should also be covered with minimum 6-mm plastic sheeting when not being actively worked or loaded. The cover plastic can be weighted or secured by appropriate means and seams sealed to prevent tearing or removal by weather. The environmental professional may need access to stockpiles for sampling or other activities. An inventory of stockpiled materials should be kept by the contractor. Soil in stockpiles will be removed and disposed of or reused based on the results of analytical testing as appropriate. Contaminated soil in stockpiles should be removed from the Site within 90 days of placement.

### **6.3.4 Waste Characterization**

Previous waste characterization sampling for conducted using the toxicity characteristic leaching procedure (TCLP) for metals and VOCs did not indicate that the MSW would be considered a Dangerous Waste under Washington Administrative Code (WAC) 173-303. However, soil/excavated materials containing contaminant concentrations above regulatory limits or exhibiting evidence of contamination, and stockpiled or other potentially contaminated material from anywhere in the Site, may need to be sampled for waste characterization analysis in accordance with applicable regulations, procedures identified in the SAP, and the individual disposal facility acceptance criteria (if different from the SAP) prior to transport and disposal.

### **6.3.5 Loading**

Excavated material will generally be directly loaded into trucks for transport to export destination sites to the extent possible. The moisture and consistency of soil should be monitored to ensure that



the loaded soils are in a condition suitable to prevent spills during transit to stockpile locations or other destination areas.

### **6.3.6 Transport**

Excavated material transport to offsite locations should be monitored to ensure that the cargo is fully contained, covered, and protected in transit, in compliance with local, state, and federal transportation requirements. In general, truck and trailer combinations are suitable for this type of hauling operation.

### **6.3.7 Disposal Facilities**

Profiling, manifesting, and testing requirements are generally similar for all solid waste disposal facilities. Sufficient generator information and representative sample analytical data are needed to properly characterize the material. Each facility's permit has site-specific restrictions on the types of waste that can be accepted, which is addressed in the profiling process. Bills of lading are used to document non-dangerous waste disposal. Hazardous waste manifests are used to transport and document dangerous waste disposal.

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## 7.0 NOTIFICATIONS AND REPORTING

If unanticipated environmental conditions are encountered during construction activities, the City should be notified by the contractor immediately; and the findings, resulting actions implemented, and remaining Site conditions documented for the project files, and for reporting to the applicable regulatory agencies, if warranted and required under local, state, and federal regulations.<sup>2</sup> The documentation may be prepared in focused technical memoranda, or other appropriate formats depending on the location of the affected area, the nature and extent of contamination, actions taken, and regulatory requirements.

Although not identified during previous Site investigation activities, if archaeological resources are discovered, work will be stopped immediately and Ecology, the Department of Archaeology and Historic Preservation (DAHP), the City, and the appropriate Tribes' Cultural Resources Department will be notified by the close of business on the day of discovery. A licensed archaeologist will inspect the Site and document the discovery, provide a professionally documented site form, and report to the above-listed parties. In the event of an inadvertent discovery of human remains, work will be immediately halted in the discovery area, the remains will be covered and secured against further disturbance, and the Yakima Police Department and Yakima County Medical Examiner will be immediately contacted, along with the DAHP Physical Anthropologist and authorized Tribal representatives. A treatment plan by a licensed archaeologist would then be developed in consultation with the above-listed parties consistent with Revised Code of Washington (RCW) 27.44 and RCW 27.53 and implemented according to Chapter 25-48 WAC.

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<sup>2</sup> See spill reporting requirements in Washington: <https://ecology.wa.gov/About-us/Get-involved/Report-an-environmental-issue/Report-a-spill>.

## **8.0 USE OF THIS PLAN**

This Excavated Materials Management Plan has been prepared for the exclusive use of the City of Yakima for specific application to the Former Yakima Landfill Site roadway corridor project. Reliance on this report by third parties, or others who do not have a contractual relationship with the City or LAI on this project is at their sole risk. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by LAI, shall be at the user's sole risk. LAI warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.



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Data Source: Esri 2012

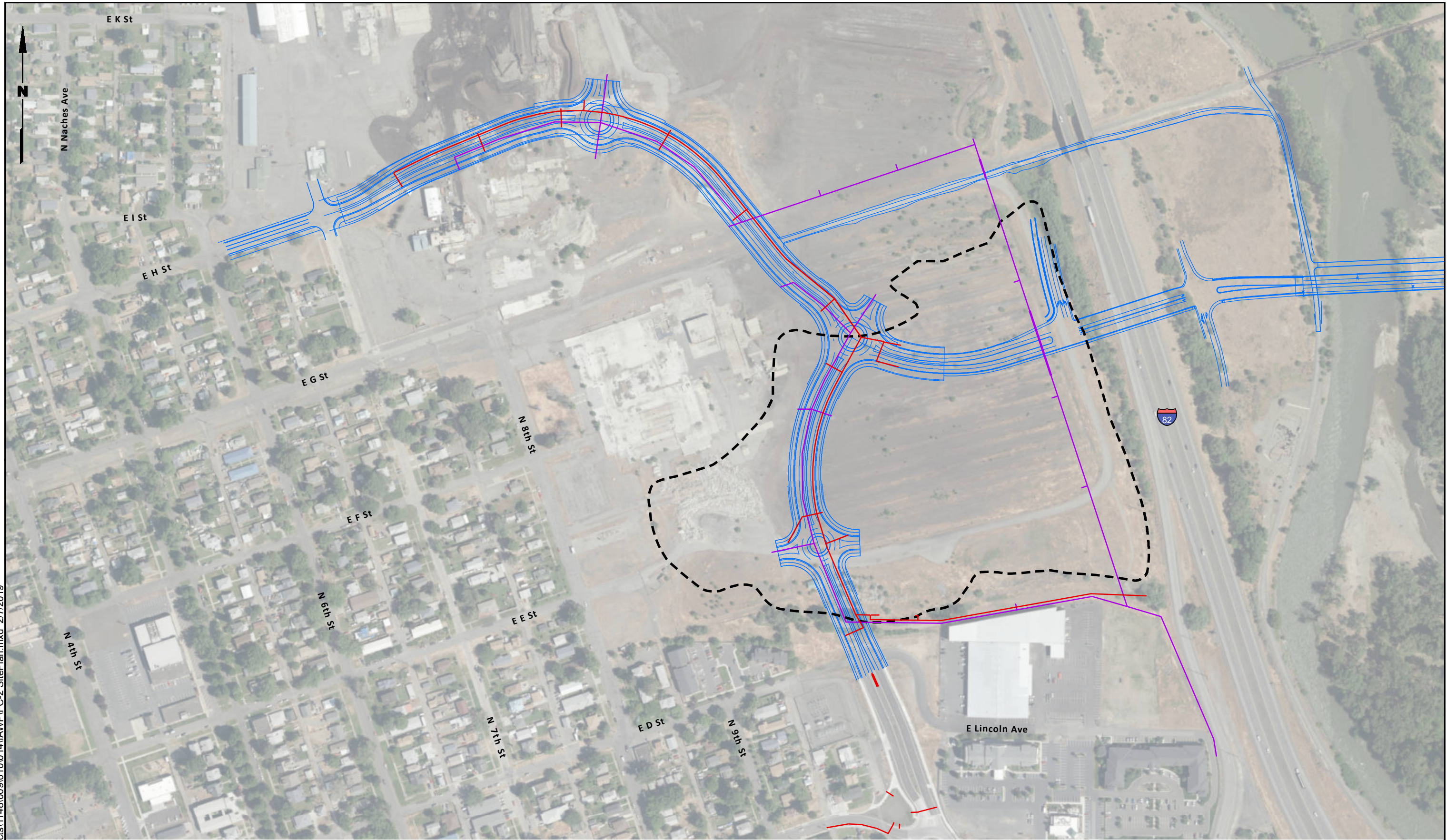
Closed City of Yakima  
Landfill Site  
Yakima, Washington

**Vicinity Map**

Figure  
**C-1**



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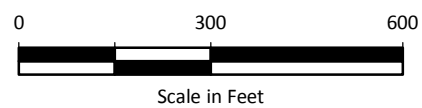


**Legend**

- Sanitary Sewer Line
- Storm Sewer Line
- Approximate Extents of Municipal Solid Waste

**Notes**

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



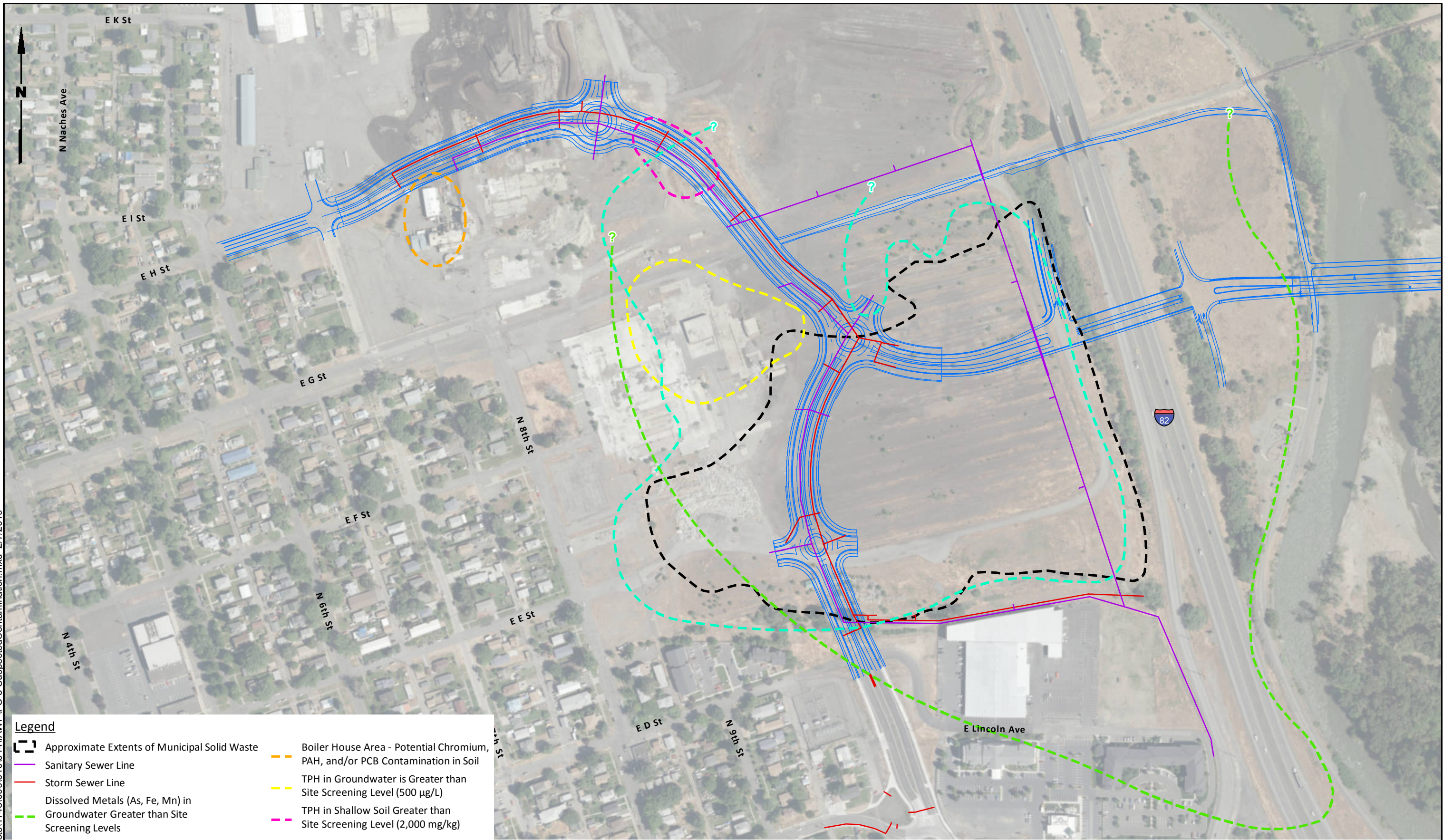
Data Source: HLA Engineering and Land Surveying, Inc; Lochner Engineering; Esri World Imagery.

Closed City of Yakima  
Landfill Site  
Yakima, Washington

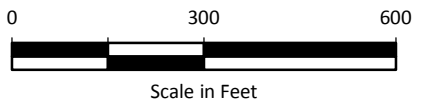
**Site Plan and  
Proposed Roadway Alignment**

Figure  
**C-2**

C:\Projects\1148\009\010014\IAW\PIFC-3 SuspectedContamination.mxd 2/7/2019



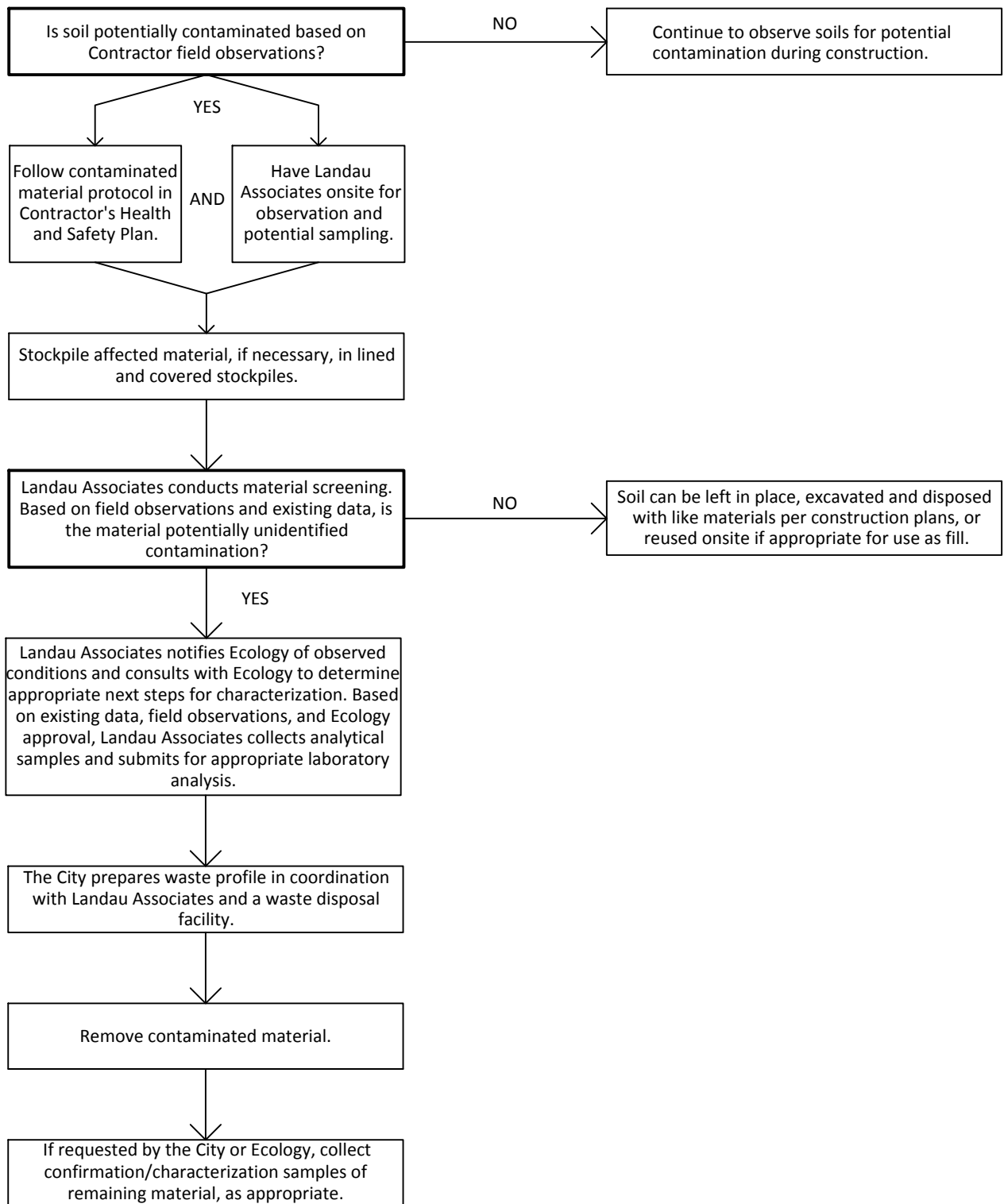
- Legend**
- Approximate Extents of Municipal Solid Waste
  - Sanitary Sewer Line
  - Storm Sewer Line
  - Boiler House Area - Potential Chromium, PAH, and/or PCB Contamination in Soil
  - TPH in Groundwater is Greater than Site Screening Level (500 µg/L)
  - TPH in Shallow Soil Greater than Site Screening Level (2,000 mg/kg)
  - Approximate Extent of Landfill Gas (Methane >5% by volume)
  - Dissolved Metals (As, Fe, Mn) in Groundwater Greater than Site Screening Levels



**Notes**  
 1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Data Source: HLA Engineering and Land Surveying, Inc; Lochner Engineering; Esri World Imagery.

Closed City of Yakima Landfill Site Yakima, Washington	<b>Approximate Areas of Known          or Suspected Contamination</b>	Figure <b>C-3</b>
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# Sampling and Analysis Plan



**Sampling and Analysis Plan  
Roadway Project  
Closed City of Yakima Landfill Site  
Yakima, Washington**

April 26, 2019


Prepared for  
City of Yakima



130 2nd Avenue South  
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**Sampling and Analysis Plan  
Roadway Project  
Closed City of Yakima Landfill Site  
Yakima, Washington**

This document was prepared by, or under the direct supervision of, the technical professionals noted below.

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Project Coordinator: LJJ/TAM

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## TABLES

<u>Table</u>	<u>Title</u>
1	Screening Levels for Contaminants of Concern

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## LIST OF ABBREVIATIONS AND ACRONYMS

ACM .....	asbestos-containing material
AHERA .....	Asbestos Hazard Emergency Response Act
ASTM.....	ASTM International
BTU.....	British thermal unit
City.....	City of Yakima
CSV .....	comma-separated value
DAHP .....	Department of Archaeology and Historic Preservation
Ecology.....	Washington State Department of Ecology
EPA.....	US Environmental Protection Agency
IAWP .....	Interim Action Work Plan
LAI .....	Landau Associates, Inc.
lb .....	pound
LCS/LCSD .....	laboratory control sample/laboratory control sample duplicate
LFG .....	landfill gas
MS/MSD.....	matrix spike/matrix spike duplicate
MSW .....	municipal solid waste
NWTPH-Dx .....	Northwest total petroleum hydrocarbon diesel-range extended
NWTPH-Gx .....	Northwest total petroleum hydrocarbon gasoline-range extended
PCB.....	polychlorinated biphenyl
PQL.....	practical quantitation limit
QA/QC.....	quality assurance/quality control
RCRA .....	Resource Conservation and Recovery Act
RCW .....	Revised Code of Washington
RI.....	Remedial Investigation
RPD.....	relative percent difference
SAP .....	sampling and analysis plan
Landfill Site.....	closed City of Yakima Landfill Site
SVOC .....	semivolatile organic compound
TAT .....	turnaround times
TCLP .....	toxicity characteristic leaching procedure
TPH.....	total petroleum hydrocarbon
VOC .....	volatile organic compound
WAC .....	Washington Administrative Code

---

## 1.0 INTRODUCTION

This sampling and analysis plan (SAP) describes the procedures for conducting performance and confirmation sampling field activities during and following construction of the roadway corridor at the closed City of Yakima (City) Landfill Site (Landfill Site), located at the southern end of the former Boise Cascade Sawmill and Plywood Facility. The roadway corridor alignment also crosses the southern end of the Boise Cascade Mill Site (Mill Site). The sections of the roadway corridor that cross both the Landfill Site and the Mill Site are collectively referred to as the “Site” in this document. This SAP is an appendix to the Interim Action Work Plan (IAWP; Landau Associates, Inc. [LAI] 2018) and is intended to be used in conjunction with the complete IAWP report and other attachments, not as a standalone document.

The primary objective of this SAP is to provide sampling and analysis procedures and methodologies consistent with accepted procedures such that the data collected will be adequate and representative for use in:

- Characterizing for disposal soil, wood debris, and municipal solid waste (MSW) excavated for construction of the roadway alignment;
- Conducting landfill gas (LFG) monitoring and sampling to confirm the effectiveness of the LFG mitigation system; and
- Confirming that stormwater and groundwater accumulating in the excavation that is removed for discharge meets the permitted discharge criteria.

This SAP was prepared consistent with the requirements of Washington Administrative Code (WAC) 173-340-820. It provides field, sampling, and analytical procedures to be used during roadway construction, as needed.

Although not identified during previous Site investigation activities, if archaeological resources are discovered, work will be stopped immediately and the Washington State Department of Ecology (Ecology), the Department of Archaeology and Historic Preservation (DAHP), the City, and the appropriate Tribes’ Cultural Resources Department will be notified by the close of business on the day of discovery. A licensed archaeologist will inspect the Site and document the discovery, provide a professionally documented site form, and report to the above-listed parties. In the event of an inadvertent discovery of human remains, work will be immediately halted in the discovery area, the remains will be covered and secured against further disturbance, and the Yakima Police Department and Yakima County Medical Examiner will be immediately contacted, along with the DAHP Physical Anthropologist and authorized Tribal representatives. A treatment plan by a licensed archaeologist would then be developed in consultation with the above-listed parties consistent with Revised Code of Washington (RCW) 27.44 and RCW 27.53 and implemented according to Chapter 25-48 WAC.

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## 2.0 SAMPLING PROCEDURES

The following sections describe confirmation and performance monitoring procedures for construction of the roadway alignment. As detailed in Sections 6.1.2 and 6.1.3 of the IAWP, performance monitoring will consist of collection and analysis of samples of stockpiled soil, wood debris, and MSW excavated during construction for the purposes of characterization and/or identification of unanticipated contamination. Confirmation monitoring will consist of monitoring for LFG within soil vapor monitoring wells installed within the roadway prism, and may include air sampling within utility vaults associated with the roadway alignment. Field activities will be performed in accordance with a Site-specific health and safety plan.

### 2.1 Waste Characterization

Based on current construction design drawings, construction of the roadway alignment will include excavation and removal of all wood debris and MSW below the roadway to the depth of the underlying native material or to the depth required for utility installation, whichever is deeper. Soil overlying or intermingled with the MSW and wood debris will also be removed and disposed of as part of the construction activities. The different media (soil, wood debris, and MSW) may be segregated as needed for management and disposal. Materials may be stockpiled for characterization if unanticipated or unidentified contamination is discovered and/or as otherwise required by the receiving disposal or recycling facilities.

Waste characterization sample analysis results for waste materials that will be disposed offsite will be compared against applicable disposal facility acceptance criteria and applicable solid and state/federal dangerous/hazardous waste regulatory criteria to determine applicable waste management and disposal requirements. Where waste materials or potentially contaminated soil are to remain onsite (e.g., at the edge of the roadway excavation limits), characterization results will be compared against applicable Site screening levels, or other applicable Model Toxic Control Act and state and federal requirements. Table 1 includes screening levels and associated practical quantitation limits (PQLs) for contaminants of concern at the Landfill Site that were developed for the Landfill Site remedial investigation (RI). The Mill Site RI Work Plan (Barr/Fulcrum 2019; Exhibit B Table 2 - Quality Assurance Project Plan) provides soil screening criteria and PQLs for contaminants of concern at the Mill Site. Note that these screening levels are preliminary values established for these sites and may not be representative of final approved cleanup levels for the sites.

#### 2.1.1 Stockpile Characterization Sampling

Characterization of stockpile samples to determine appropriate management and disposition requirements will consist of three-point composite samples collected from locations within the pile that are representative of the stockpiled material. Samples will be collected using hand auguring techniques, and will consist of material from within the interior of the stockpile. A description of the material characteristics will be recorded. Logs and other large pieces of wood debris will be separated

out from the stockpile and will not be sampled unless field observations indicate the potential presence of wood preservatives (e.g., creosote or pentachlorophenol).

At each composite sub-sample location, a discrete material sample will be collected from the interior of the stockpile. Larger-sized material (gravel/wood/debris greater than approximately ¼- to ½-inch diameter) will be removed by hand sorting and the samples placed in the appropriate laboratory-supplied containers. Material for samples to be analyzed for non-volatile constituents will be placed in a decontaminated stainless steel bowl, composited, and homogenized.

The stockpile samples will be labeled using the following format:

“stockpile number-material (i.e. wood, soil, or MSW)-date (mmddyyyy)”

For example, a sample of MSW taken from stockpile 2 on September 26, 2018 will be labeled “SP2-MSW-09262018”.

The number of samples to be collected from a stockpile for characterization purposes is dependent on the size of the stockpile. Field personnel will map the stockpile and record measurements. The table below will be used as a guide to determine sampling frequency.

Cubic Yards	Number of Samples
0–100	3
101–500	5
501–1,000	7
1,001–2,000	10
>2,000	10, plus 1 for each additional 500 cubic yards

### 2.1.2 Excavation Sidewall Sample Collection Procedures

Where contaminant characterization/delineation or confirmation samples need to be taken from within the excavation limits, soil/MSW/wood debris samples will be collected from the base or sidewalls of the roadway excavation at selected locations within the affected area or at the limits of removed material. A shallow hole will be hand-dug at each sample location using decontaminated hand implements, including stainless steel spoons and steel shovels, picks, and similar equipment. The sidewall surface of the hand-dug hole will be scraped to expose a fresh surface for sample collection. Soil will be collected using a decontaminated stainless steel spoon, placed in a decontaminated stainless steel bowl, homogenized, and transferred to the appropriate sample containers. Material larger than approximately ¼ inch will be removed from the sample prior to placing the soil in the sample container. Soil testing for possible volatile organic compound (VOC) or total petroleum hydrocarbon (TPH) contamination will not be homogenized, but rather sampled using US Environmental Protection Agency (EPA) Method 5035 and placed directly into laboratory-provided vials with appropriate preservatives.



The samples will be labeled using the following format:

“Approximate stationing/coordinates/location-material (i.e. wood, soil, or MSW)-date (mmdyyy)”

For example, a sample of soil collected from the western sidewall of the excavation at roadway corridor station 305+25 on September 26, 2018 will be labeled “STA305+25-WSIDEWALL-SOIL-09262018”.

### **2.1.3 Potential Asbestos Sample Collection Procedures**

If necessary, samples of potential asbestos containing material (ACM) will be collected only by individuals certified as Asbestos Hazard Emergency Response Act (AHERA) Building Inspectors. The Building Inspectors will collect samples using a clean knife, chisel, or coring tool to penetrate all layers of the material. At least 1 teaspoon of the material will be collected for analysis and placed in a laboratory-provided bag labeled with the location and sample identification. Prior to sampling potentially friable materials, the Building Inspector will don an air purifying half-face respirator fitted with P-100 cartridges and wet the sampling area with distilled water.

The samples will be labeled using the following format:

“Approximate stationing/coordinates/location-PACM  
(to connote that the sample is potential ACM)-date (mmdyyy)”

For example, a sample of material collected from the western sidewall of the excavation at roadway corridor station 305+25 on September 26, 2018 will be labeled “STA305+25-WSIDEWALL-PACM-09262018”.

### **2.1.4 Water Sample Collection Procedures**

Representative water samples will be collected, as needed, to characterize potentially contaminated water encountered during construction activities (e.g., stormwater or surface water runoff within an excavation, groundwater collected from excavations/trenches or from monitoring wells, dewatering fluids). Water samples will be collected into the appropriate laboratory-supplied sample containers directly, using a disposable bailer, or using peristaltic pump and disposable polyethylene tubing, as appropriate. Samples from a dewatering fluids treatment system will be collected from a sample port downstream of the final treatment vessel. Samples collected directly from the excavation for metals analyses will be field-filtered using an in-line 0.45 micron filter, and samples collected for TPH or semivolatile organic compound (SVOC) analysis will be centrifuged at the laboratory prior to testing. Samples collected from a dewatering treatment system will not require filtration.

### **2.1.5 Waste Laboratory Analysis**

If needed, stockpile and other waste characterization samples will be sent to a laboratory for analysis of constituents typically required by waste disposal facilities and for analytes detected in samples collected from locations near the roadway during previous investigations, where available. Wood

debris will generally not be analyzed for waste characterization except if necessary for acceptance by a recycling or disposal facility, when intermingled with soil and/or MSW, and/or if field observations indicate the presence of wood preservatives (i.e. creosote) or impacts of other contaminants (e.g., petroleum product).

Each waste characterization sample will be analyzed for the following:

- Toxicity characteristic leaching procedure (TCLP) Resource Conservation and Recovery Act (RCRA) 8 metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) by EPA Method 6010C/7470A.

Samples displaying indications of contamination based on visual or olfactory field observations and/or samples collected from material excavated from areas previously sampled may be analyzed for one or more of the following, depending on field screening results:

- Northwest total petroleum hydrocarbon (NWTPH) diesel-range extended (Dx) method;
- NWTPH gasoline-range extended (Gx) method;
- VOCs by EPA Method 8269;
- SVOCs by EPA Method 8270;
- Polychlorinated biphenyls (PCBs) by EPA Method 8082;
- Asbestos by polarized light microscopy with dispersion staining by EPA Method 600/R-93/116.

Samples found to contain oil-range petroleum hydrocarbons through the NWTPH-Dx analysis will also be analyzed for:

- PCBs by EPA Method 8082.

Select wood debris samples may be analyzed for recycling or other beneficial reuse, such as for use as hog fuel using:

- High heat British thermal unit (BTU/pound [lb]) – Method ASTM International [ASTM] D2015.

The samples will typically be run on 5-day turnaround times (TATs) given sufficient lay-down area for the stockpiles. Faster TATs may be requested if the stockpile(s) removal needs to be expedited.

### **2.1.6 Stormwater/Groundwater/Dewatering Fluid Laboratory Analysis**

If necessary, samples of stormwater, groundwater, or dewatering fluids collected from excavations, trenches, or dewatering systems and/or from the treatment system will be analyzed for constituents specified by the appropriate permit, which is likely to include, but may not be limited to:

- Diesel- and oil-range petroleum hydrocarbons by NWTPH-Dx;
- Gasoline-range extended petroleum hydrocarbons NWTPH-Gx;
- VOCs by EPA Method 8269.

Ecology may also have specific sampling and analysis requirements for groundwater if evidence of a release (e.g., sheet/liquid-phase product in groundwater) is discovered.

## **2.2 Landfill Gas Monitoring/Sampling**

Confirmation sampling will include collecting monitoring data using field instruments from LFG monitoring wells, and potentially in utility vaults, installed within the roadway alignment.

### **2.2.1 Landfill Gas Measurements**

LFG measurements from soil vapor monitoring wells (and possibly utility vaults) installed within the roadway right-of-way will be collected during conditions of falling barometric pressure. Prior to collecting the LFG measurements from a well, field personnel will purge a minimum of 10 casing volumes of soil vapor from the probe using a Landtec GEM 5000 (or similar) LFG analyzer. During well purging, LFG drawn from the well casings will be analyzed for methane, oxygen, carbon dioxide, and balance gases to evaluate for potential migration of LFG into the roadway prism from LFG and/or wood debris remaining outside the limits of excavation. Field personnel will record readings at the time when gas concentrations demonstrate stability after 10 casing volumes are purged. This survey of LFG conditions will occur at each of the newly installed LFG monitoring wells.

The accuracy of the LFG field analyzer will be checked daily and the unit will be calibrated, as necessary. If the readings are outside of the manufacturer's recommendations, the unit will be calibrated in the field in accordance with the manufacturer's recommended procedures.

### **2.2.2 Landfill Gas Sampling**

In addition to the data collected using the portable LFG analyzer, samples of LFG will be collected from LFG monitoring wells during sampling events to be conducted one and three months following completion of roadway construction (and potentially as required by Ecology, thereafter, as part of a long-term monitoring plan for the Site associated with a final cleanup action plan). The samples will be collected into certified-clean 6-liter stainless-steel Silonite canisters. The samples will be collected over an 8-hour period using a flow-control valve to prevent overdraw. The duration of sampling will help to capture temporal variability in discharge rates.

The samples will be submitted to an accredited laboratory for analysis of VOCs by EPA Compendium Method TO-15.

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## 3.0 QUALITY ASSURANCE AND QUALITY CONTROL

This section describes the quality assurance/quality control (QA/QC) procedures in support of roadway construction. This section describes the project team organization and responsibilities, the quality assurance objectives, laboratory analytical methods, QA/QC requirements and corrective actions for this project.

### 3.1 Project Team Organization and Responsibilities

The project team organizational structure was developed based on the requirements of the field and laboratory activities. The key positions/contractors and associated responsibilities are described below.

- Consultant Project Manager (LAI): Responsible for implementation of all aspects of the project plans. Specific responsibilities include overseeing that all technical procedures are followed, reporting of deviations from the project plans to the City, and overseeing that data collected will satisfy the quality assurance objectives.
- Analytical Laboratory: Responsible for providing sample bottles, performing chemical analyses per the SAP, and reporting of data as required by the SAP.
- Field Sampling Personnel (LAI): Responsible for implementing sampling procedures as specified in the project plans, and notifying the consultant project manager of any deviations from the project plans.

### 3.2 Quality Assurance Objectives

The QA objectives for this project are to develop and implement procedures that will ensure collection of representative data of known, acceptable, and defensible quality. The data quality parameters used to assess the acceptability of the data are representativeness, comparability, precision, accuracy, bias, and completeness, as described below.

- Representativeness expresses the degree to which data accurately and precisely represent an actual condition or characteristic of a population. Representativeness can be achieved by selecting appropriate sampling locations and by using appropriate sampling methods.
- Comparability expresses the confidence with which one data set can be evaluated in relation to another data set. For this work, comparability of data will be established through the use of standard analytical methodologies with analytical limits of quantitation that can meet screening-level criteria to the extent practicable and by using standard reporting formats.
- Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average values. Analytical precision is measured through matrix spike/matrix spike duplicate (MS/MSD) samples and/or through laboratory control sample/laboratory control sample duplicate (LCS/LCSD) samples for organic analysis and through laboratory duplicate samples for inorganic analyses. The quantitative relative percent difference (RPD) for laboratory duplicates, MS/MSD, and field duplicates will be used to assess sampling and analytical precision.

- Accuracy is an expression of the degree to which a measured or computed value represents the true value. Field accuracy is controlled by adherence to sample collection procedures as outlined in this SAP.
- Bias is the systematic or persistent distortion of a measured process that causes errors in one direction. Bias of the laboratory results will be evaluated based on analysis of method blanks and matrix spike samples.
- Completeness is a measure of the proportion of data obtained from a task sampling plan that is determined to be valid. It is calculated as the number of valid data points divided by the total number of data points requested.

### **3.3 Field and Laboratory Quality Control Procedures**

Field and analytical laboratory quality control samples will be collected to evaluate data precision, accuracy, representativeness, completeness, bias, and comparability of the analytical results for the site characterization. The quality control samples and the frequency at which they will be collected and/or analyzed are described below.

#### **3.3.1 Blind Field Duplicates**

A blind field duplicate will be collected at a frequency of at least 1 per 20 waste characterization samples per chemical analysis, and not less than one field duplicate. The blind field duplicate will consist of a split sample collected at a single sample location, after homogenization of the sample; blind field duplicates for volatiles samples (if collected) will not be homogenized. Blind field duplicate results will be used to evaluate data precision. Acceptance criteria for blind field duplicate samples are 35 percent RPD for soil.

#### **3.3.2 Field Trip Blanks**

A laboratory-supplied trip blank will be analyzed for volatile analyses (if needed) to evaluate whether cross-contamination between samples occurs during sample transport. The trip blank will be stored with all volatile sample containers throughout the field investigation until samples are delivered to the laboratory.

#### **3.3.3 Laboratory Matrix Spike/Matrix Spike Duplicate**

A minimum of one laboratory MS/MSD sample will be analyzed per 20 samples, or one MS/MSD sample per batch of samples if fewer than 20 samples will be analyzed. These analyses will be performed to provide information on accuracy and to verify that extraction and concentration levels are acceptable. The laboratory spikes will follow EPA guidance for MS and MSD samples.

#### **3.3.4 Laboratory Duplicates**

A minimum of one laboratory duplicate sample per 20 samples, or one laboratory duplicate sample per batch of samples if fewer than 20 samples are contained in a batch, will be analyzed. These analyses will be performed to provide information on the precision of chemical analyses. The laboratory duplicates will follow EPA guidance in the analytical method.

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### 3.3.5 Laboratory Method Blanks

A minimum of one laboratory method blank per 20 samples, one every 12 hours, or one per batch of samples analyzed (if fewer than 20 samples are contained in a batch) will be analyzed for all parameters to assess possible laboratory contamination. Method blanks will contain all reagents used for analysis. The generation and analysis of additional method, reagent, and glassware blanks may be necessary to verify that laboratory procedures do not contaminate samples.

### 3.3.6 Laboratory Control Sample

A minimum of one LCS per 20 samples, or one LCS per sample batch if fewer than 20 samples are contained in a batch, will be analyzed for all parameters.

### 3.3.7 Surrogate Spikes

All project samples analyzed for organic compounds will be spiked with appropriate surrogate compounds as defined by the analytical methods.

## 3.4 Laboratory Quality Assurance/Quality Control

QA/QC for chemical testing includes laboratory instrument and analytical method QA/QC. Instrument QA/QC monitors the performance of the instrument and method QA/QC monitors the performance of sample preparation procedures. The analytical laboratory will be responsible for instrument and method QA/QC.

When an instrument or method control limit is exceeded, the laboratory will contact the project manager immediately. The laboratory will be responsible for correcting the problem and will reanalyze the samples within the sample holding time if sample reanalysis is appropriate.

## 3.5 Corrective Actions

Corrective actions will be needed for two categories of nonconformance:

- Deviations from the methods or QA requirements established in this document
- Equipment or analytical malfunctions.

Corrective action procedures to be implemented based on detection of unacceptable data are developed on a case-by-case basis. Such actions may include one or more of the following:

- Altering procedures in the field or laboratory
- Using a different batch of sample containers
- Performing an audit of field or laboratory procedures
- Reanalyzing samples (if holding times allow)
- Resampling and analyzing
- Evaluating sampling and analytical procedures to determine possible causes of the discrepancies
- Accepting the data without action, acknowledging the level of uncertainty
- Rejecting the data as unusable.

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During field operations and sampling procedures, the field personnel will be responsible for conducting and reporting required corrective actions. A description of any action taken will be entered in the daily field notebook. The project manager will be consulted immediately if field conditions are such that conformance with this SAP is not possible.

During laboratory analysis, the laboratory QA officer will be responsible for taking required corrective actions in response to equipment malfunctions. If an analysis does not meet the data quality objectives outlined, corrective action will follow the guidelines in the noted EPA analytical methods and the EPA guidelines for data validation for organics and inorganics analyses (EPA 1999, 2004). At a minimum, the laboratory will be responsible for monitoring the following:

- Calibration check compounds must be within performance criteria specified in the EPA method or corrective action must be taken prior to initiation of sample analysis. No analyses may be performed until these criteria are met.
- Before processing any samples, the analyst should demonstrate, through analysis of a reagent blank, that interferences from the analytical system, glassware, and reagents are within acceptable limits. Each time a set of samples is extracted or there is a change in reagents, a reagent blank should be processed as a safeguard against chronic laboratory contamination. The blank samples should be carried through all stages of the sample preparation and measurement steps.
- Method blanks should, in general, be below instrument detection limits. If contaminants are present, then the source of contamination must be investigated, corrective action taken and documented, and all samples associated with a contaminated blank reanalyzed. If, upon reanalysis, blanks do not meet these requirements, LAI will be notified immediately to discuss whether analyses may proceed.
- Surrogate spike analysis must be within the specified range for recovery limits for each analytical method used or corrective action must be taken and documented. Corrective action includes: 1) reviewing calculations, 2) checking surrogate solutions, 3) checking internal standards, and 4) checking instrument performance. Subsequent action could include recalculating the data and/or reanalyzing the sample if any of the above-described checks reveal a problem. If the problem is determined to be caused by matrix interference, reanalysis may be waived if so directed following consultation with LAI. If the problem cannot be corrected through reanalysis, the laboratory will notify LAI prior to data submittal so that additional corrective action can be taken, if appropriate.
- If the recovery of a surrogate compound in the method blank is outside the recovery limits, the blank will be reanalyzed along with all samples associated with that blank. If the surrogate recovery is still outside the limits, LAI will be notified immediately to discuss whether analyses may proceed.
- If quantitation limits or matrix spike control limits cannot be met for a sample, LAI will be notified immediately to discuss the corrective action required.
- If holding times are exceeded, all positive and undetected results may need to be qualified as estimated concentrations. If holding times are grossly exceeded, LAI may determine the data to be unusable.

If analytical conditions are such that nonconformance is indicated, LAI will be notified as soon as possible so that any additional corrective actions can be taken. The laboratory project manager will then document the corrective action by a memorandum submitted to LAI. A narrative describing the anomaly; the steps taken to identify and correct the anomaly; and any recalculation, reanalyses, or re-extractions will be submitted with the data package in the form of a cover letter.

### **3.6 Data Verification and Validation**

All site characterization data will be verified and validated to determine whether the results are acceptable and meet the quality objectives. Prior to submitting a laboratory report, the laboratory will verify that all the data are consistent, correct, and complete, with no errors or omissions.

Validation of the data will be performed by LAI following the guidelines in the appropriate sections of the EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review (EPA 1999, 2004) and will include evaluations of the following:

- Chain-of-custody records
- Holding times
- Laboratory method blanks
- Surrogate recoveries
- Laboratory MS/MSD
- Blank spikes/LCS
- Laboratory duplicates
- Corrective action records
- Completeness
- Overall assessment of data quality.

In the event that a portion of the data is outside the data quality objective limits or the EPA guidance (EPA 1999, 2004), or sample collection and/or documentation practices are deficient, corrective action(s) will be initiated. Corrective action will be determined by the field coordinator and LAI's QA officer in consultation with the LAI project/task manager and may include any of the following:

- Rejection of the data and resampling
- Qualification of the data
- Modified field and/or laboratory procedures.

Data qualification arising from data validation activities will be described in the data validation report, rather than in individual corrective action reports.

### **3.7 Data Management Procedures**

All laboratory analytical results, including QC data, will be submitted electronically to LAI. Electronic format will include a scanned PDF of the original laboratory data package and comma-separated value



(CSV) files that will be downloaded directly to an Excel® spreadsheet and/or to the project database. The laboratory data package should include a case narrative along with analytical and quality control results. Following validation of the data, any qualifiers will be added to the Excel spreadsheets and project database. All survey data will be provided electronically in a format that can be downloaded into an Excel spreadsheet. All field data will be entered into an Excel spreadsheet and verified to determine all entered data are correct and without omissions and errors.

## **4.0 EQUIPMENT DECONTAMINATION**

The decontamination procedures described below are to be used by field personnel to clean sampling and related field equipment. Deviation from these procedures will be documented in field records.

### **4.1 Sampling Equipment**

Sampling equipment (e.g., stainless-steel bowls, stainless-steel spoons, hand-auger, etc.) will be cleaned using a three-step process, as follows:

- 1) Scrub surfaces of equipment that would be in contact with the sample with brushes using an Alconox solution.
- 2) Rinse and scrub equipment with clean tap water.
- 3) Rinse equipment a final time with deionized water to remove tap water impurities.

Decontamination of reusable sampling devices will occur between each sample collection.

### **4.2 Heavy Equipment**

Excavation equipment should be “dry broomed” to remove the substantial accumulated debris on the excavation bucket between excavations. LFG probe equipment (e.g., the LFG probe rigs and drilling equipment that is used downhole, or that contacts material and equipment going downhole) will be cleansed by a hot water, high-pressure wash before each use and at completion of the project. Potable tap water will be used as the cleansing agent.

## **5.0 USE OF THIS PLAN**

This sampling and analysis plan has been prepared for the exclusive use of the City of Yakima for specific application to the Former Yakima Landfill Site roadway corridor project. Reliance on this report by third parties, or others who do not have a contractual relationship with the City or LAI on this project is at their sole risk. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by LAI, shall be at the user's sole risk. LAI warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

## **6.0 REFERENCES**

- Barr/Fulcrum. 2019. Revised Final Remedial Investigation Work Plan, Yakima Mill Site (aka Boiese Cascade Mill Site). January.
- EPA. 1999. USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. EPA 540/R-99/008. US Environmental Protection Agency. October.
- EPA. 2004. Final: USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. US Environmental Protection Agency. October.
- LAI. 2018. Draft: Interim Action Work Plan, Remedial Investigation, Closed City of Yakima Landfill Site, Yakima, Washington. Landau Associates, Inc. September 24.

**Table 1**  
**Soil Screening Levels**  
**Closed City of Yakima Landfill Site**

CAS Number	Chemical Name	Screening Level (mg/kg)	Method B Preliminary Soil Cleanup Level (mg/kg)	Background Soil Metals Concentrations Statewide (mg/kg) 90 percentile value (a)	Method A Soil Unrestricted Land Use (mg/kg)	ALS Global	
						Reporting Limit (mg/kg)	Quantitation Limit (mg/kg)
<b>PETROLEUM HYDROCARBONS</b>							
	TPH, diesel-range organics	2,000	--	--	2,000	25	11.8
	TPH, heavy oils	2,000	--	--	2,000	50	22.9
	TPH, mineral oil	4,000	--	--	4,000	50	22.9
	TPH, gasoline-range organics, benzene present	30	--	--	30	3	1.46
	TPH, gasoline-range organics, no detectable benzene	100	--	--	100	3	1.46
<b>METALS</b>							
7440-38-2	arsenic	20	0.26	7.0	20	1	0.730
7440-39-3	barium	824 (b)	824	--	--	0.5	0.140
7440-43-9	cadmium	2.0	0.69	1.0	2.0	0.5	0.225
	calcium	--	--	--	--	50.0	22.4
7440-47-3	chromium (total)	see Cr III or Cr VI	1,000	42	see Cr III or Cr VI	0.5	0.37
16065-83-1	chromium(III)	2,000	120,000	--	2,000	0.5	0.37
18540-29-9	chromium(VI)	19	3.8	--	19	5	2.70
7439-89-6	iron	151 (b)	151	43,100	--	50	33.6
7439-92-1	lead	250	108	17	250	0.5	0.235
	magnesium	--	--	--	--	50	27.9
7439-96-5	manganese	11,000	11,000	1,100	--	0.5	0.290
7440-09-7	potassium	--	--	--	--	50	17.8
7782-49-2	selenium	400	0.52	--	--	5	3.21
7440-22-4	silver	400	0.054	--	--	0.5	0.230
7440-23-5	sodium	--	--	--	--	50	26
7439-97-6	mercury	2.0	0.11	0.070	2.0	0.02	0.00407
<b>CONVENTIONALS</b>							
	chloride	--	--	--	--	1.0	0.92
16984-48-8	fluoride	3,200	3,200	--	--	1	NA
14797-55-8	nitrate	130,000	130,000	--	--	3	NA
14797-65-0	nitrite	8,000	8,000	--	--	1	NA
	sulfate	--	--	--	--	2.0	2.0
7664-41-7	ammonia	--	--	--	--	0.5	0.5
	TOC	--	--	--	--	5	5
	pH	--	--	--	--	1	1

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CHLORINATED PESTICIDES							
319-84-6	hexachlorocyclohexane;alpha	0.16	0.0004	--	--	0.005	0.005
58-89-9	lindane (gamma-BHC)	0.010	0.001	--	0.010	0.005	0.005
319-85-7	hexachlorocyclohexane;beta-	0.56	0.0005	--	--	0.005	0.005
76-44-8	heptachlor	0.22	0.002	--	--	0.005	0.005
319-86-8	hexachlorocyclohexane;delta-	--	--	--	--	0.005	0.005
309-00-2	aldrin	0.059	0.010	--	--	0.005	0.005
1024-57-3	heptachlor epoxide	0.11	0.017	--	--	0.005	0.005
57-74-9	chlordane	2.9	0.21	--	--	0.1	0.1
115-29-7	endosulfan	0.005 (b)	0.003	--	--	0.005	0.005
72-55-9	dde (4,4'-DDE)	2.9	0.017	--	--	0.005	0.005
60-57-1	dieldrin	0.063	0.005	--	--	0.005	0.005
72-20-8	endrin	24	0.002	--	--	0.005	0.005
72-54-8	ddd (4,4'-DDD)	0.009 (b)	0.009	--	--	0.005	0.005
50-29-3	ddt (4,4'-DDT)	3.0	0.14	--	3.0	0.005	0.005
72-43-5	methoxychlor	400	0.048	--	--	0.005	0.005
8001-35-2	toxaphene	0.91	0.91	--	--	0.25	0.25
POLYCHLORINATED BIPHENYLS							
12674-11-2	aroclor 1016	5.6	0.011	--	--	0.01	0.01
11104-28-2	aroclor 1221	--	--	--	--	0.02	0.02
11141-16-5	aroclor 1232	--	--	--	--	0.01	0.01
53469-21-9	aroclor 1242	--	--	--	--	0.01	0.01
12672-29-6	aroclor 1248	--	--	--	--	0.01	0.01
11097-69-1	aroclor 1254	0.50	0.010	--	--	0.01	0.01
11096-82-5	aroclor 1260	0.50	0.23	--	--	0.01	0.01
	pcb mixtures	1.0	0.50	--	1.0	--	--

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VOLATILE ORGANIC COMPOUNDS							
75-71-8	dichlorodifluoromethane	16,000	20	--	--	0.01	0.0011
74-87-3	chloromethane	--	--	--	--	0.01	0.000665
75-01-4	vinyl chloride	0.0002 (b)	0.0002	--	--	0.01	0.0000286
74-83-9	bromomethane (methyl bromide)	110	0.052	--	--	0.01	0.000555
75-00-3	chloroethane	--	--	--	--	0.01	0.000665
56-23-5	carbon tetrachloride	14	0.002	--	--	0.01	0.000699
75-69-4	trichlorofluoromethane	24,000	34	--	--	0.01	0.000585
75-15-0	carbon disulfide	8,000	5.7	--	--	0.01	0.00068
67-64-1	acetone	72,000	29	--	--	0.05	0.00129
75-35-4	dichloroethene;1,1-	4,000	0.0004	--	--	0.01	0.0000297
75-09-2	methylene chloride (dichloromethane)	0.020	0.020	--	0.020	0.02	0.00138
107-13-1	acrylonitrile	1.9	0.0002	--	--	0.05	0.000713
1634-04-4	methyl tert-butyl ether (MTBE)	0.10	560	--	0.10	0.01	0.00069
156-60-5	dichloroethene;1,2-,trans	1,600	0.54	--	--	0.01	0.000661
75-34-3	dichloroethane;1,1-	180	0.042	--	--	0.01	0.000669
78-93-3	methyl ethyl ketone (2-butanone)	48,000	48,000	--	--	0.05	0.000979
156-59-2	dichloroethene;1,2-,cis	160	0.080	--	--	0.01	0.000721
110-54-3	hexane;n-	4,800	4,800	--	--	0.20	0.061800
594-20-7	dichloropropane;2,2-	--	--	--	--	0.01	0.000684
74-97-5	bromochloromethane	--	--	--	--	0.01	0.00119
67-66-3	chloroform	0.008 (b)	0.008	--	--	0.01	0.000685
71-55-6	trichloroethane;1,1,1-	2.0	1.6	--	2.0	0.01	0.000616
563-58-6	dichloropropene;1,1-	--	--	--	--	0.01	0.000616
107-06-2	dichloroethane;1,2-	11	0.002	--	--	0.01	0.0000175
71-43-2	benzene	0.030	0.007	--	0.030	0.005	0.0000222
79-01-6	trichloroethene (TCE)	0.030	0.017	--	0.030	0.01	0.0000478
78-87-5	dichloropropane;1,2-	28	0.003	--	--	0.01	0.000619
74-95-3	dibromomethane	--	--	--	--	0.01	0.000783
75-27-4	bromodichloromethane (dichlorobromomethane)	16	0.0004	--	--	0.01	0.000693

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542-75-6	dichloropropene; 1,3-, trans (1,3-dichloropropene)	10	0.002	--	--	0.01	0.000735
108-10-1	methyl isobutyl ketone (4-methyl-2-pentanone)	6,400	4.2	--	--	0.05	0.000682
108-88-3	toluene	7.0	4.7	--	7.0	0.01	0.000708
10061-01-5	dichloropropene;1,3-, cis	--	--	--	--	0.01	0.000714
79-00-5	trichloroethane;1,1,2-	18	0.003	--	--	0.01	0.000737
591-78-6	hexanone;2-	--	--	--	--	0.05	0.000475
142-28-9	dichloropropane;1,3-	--	--	--	--	0.01	0.000717
127-18-4	tetrachloroethene (PCE)	0.050	0.007	--	0.050	0.01	0.0000458
124-48-1	dibromochloromethane (chlorodibromomethane)	12	0.005	--	--	0.01	0.00106
106-93-4	dibromoethane; 1,2- (EDB)	0.005	0.0001	--	0.005	0.005	0.000023
108-90-7	chlorobenzene	1,600	0.87	--	--	0.01	0.000737
630-20-6	tetrachloroethane;1,1,1,2-	38	0.010	--	--	0.01	0.000573
100-41-4	ethylbenzene	6.0	0.60	--	6.0	0.01	0.000723
108-38-3	xylene;m-	16,000	14	--	--	0.02	0.0013
106-42-3	xylene;p-	16,000	17	--	--	0.02	0.0013
100-42-5	styrene	16,000	2.2	--	--	0.01	0.000558
95-47-6	xylene;o-	16,000	15	--	--	0.01	0.000623
1330-20-7	xylene	9.0	9.1	--	9.0	0.01	0.000623
75-25-2	bromoform	130	0.028	--	--	0.01	0.000793
98-82-8	cumene (isopropylbenzene)	8,000	7.4	--	--	0.01	0.000605
79-34-5	tetrachloroethane;1,1,2,2-	5.0	0.001	--	--	0.01	0.000763
96-18-4	trichloropropane;1,2,3-	0.033	0.0002	--	--	0.01	0.000803
108-86-1	bromobenzene	--	--	--	--	0.01	0.000767
103-65-1	propylbenzene; n-	8,000	8,000	--	--	0.01	0.000737
95-49-8	chlorotoluene, 2-	--	--	--	--	0.01	0.000766
108-67-8	trimethylbenzene; 1,3,5-	800	800	--	--	0.01	0.000552
106-43-4	chlorotoluene, 4-	--	--	--	--	0.01	0.0011
98-06-6	butylbenzene; tert-	8,000	8,000	--	--	0.01	0.000711
95-63-6	trimethylbenzene; 1,2,4-	--	--	--	--	0.01	0.000596
135-98-8	butylbenzene; sec-	8,000	8,000	--	--	0.01	0.000649



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						Reporting Limit (mg/kg)	Quantitation Limit (mg/kg)
99-87-6	isopropyltoluene, p-	--	--	--	--	0.01	0.000531
541-73-1	dichlorobenzene;1,3-	--	--	--	--	0.01	0.000778
106-46-7	dichlorobenzene;1,4-	190	0.13	--	--	0.01	0.000721
104-51-8	butylbenzene, n-	--	--	--	--	0.01	0.001
95-50-1	dichlorobenzene;1,2-	7,200	4.9	--	--	0.01	0.000776
96-12-8	dibromo-3-chloropropane;1,2-	1.3	0.0005	--	--	0.05	0.000912
120-82-1	trichlorobenzene;1,2,4-	0.056 (b)	0.056	--	--	0.01	0.000676
87-68-3	hexachlorobutadiene	13	0.47	--	--	0.01	0.000802
87-61-6	trichlorobenzene;1,2,3-	--	--	--	--	0.01	0.000723
SEMIVOLATILE ORGANIC COMPOUNDS							
110-86-1	pyridine	80	0.037	--	--	0.1	0.0549
62-75-9	nitrosodimethylamine;N-	0.020	0.020	--	--	0.1	0.0334
108-95-2	phenol	24,000	11	--	--	0.1	0.0495
62-53-3	aniline	180	0.032	--	--	0.1	0.0576
111-44-4	bis(2-chloroethyl)ether	0.91	0.005	--	--	0.25	0.12
95-57-8	chlorophenol;2-	400	0.47	--	--	0.25	0.122
100-51-6	benzyl alcohol	8,000	3.4	--	--	0.1	0.0636
95-48-7	cresol;o- (2-methylphenol)	4,000	2.3	--	--	0.1	0.0422
39638-32-9	bis(2-chloroisopropyl) ether	--	--	--	--	0.25	0.157
	cresol; m- & p- (3&4-Methylphenol) (c)	2.0 (b)	2.0	--	--	0.1	0.0531
621-64-7	nitroso-di-n-propylamine;N-	0.14	0.009	--	--	0.25	0.116
67-72-1	hexachloroethane	25	0.080	--	--	0.1	0.0254
98-95-3	nitrobenzene	160	0.10	--	--	0.1	0.0242
78-59-1	isophorone	1,050	0.041	--	--	0.1	0.0875
88-75-5	nitrophenol, 2-	--	--	--	--	0.1	0.0385
105-67-9	dimethylphenol;2,4-	1,600	1,600	--	--	0.1	0.0798
65-85-0	benzoic acid	320,000	257	--	--	1	0.888
111-91-1	bis(2-chloroethoxy)methane	--	--	--	--	0.25	0.15
120-83-2	dichlorophenol;2,4-	240	0.17	--	--	0.5	0.306

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						Reporting Limit (mg/kg)	Quantitation Limit (mg/kg)
106-47-8	chloroaniline;p- (4-chloroaniline)	5.0	0.010	--	--	1	0.705
87-65-0	dichlorophenol;2,6-	--	--	--	--	0.25	0.229
59-50-7	methylphenol; 4-chloro-3-	--	--	--	--	0.5	0.402
77-47-4	hexachlorocyclopentadiene	480	160	--	--	0.1	0.0308
88-06-2	trichlorophenol;2,4,6-	80	0.016	--	--	0.1	0.0494
95-95-4	trichlorophenol;2,4,5-	8,000	29	--	--	0.1	0.049
91-58-7	chloronaphthalene, 2-	--	--	--	--	0.1	0.0395
88-74-4	nitroaniline, 2-	800	0.77	--	--	0.1	0.0235
131-11-3	dimethyl phthalate	--	--	--	--	0.1	0.0526
606-20-2	dinitrotoluene;2,6-	0.67	0.010	--	--	0.1	0.0462
99-09-2	nitroaniline, 3-	--	--	--	--	1	0.722
51-28-5	dinitrophenol;2,4-	160	0.13	--	--	0.1	0.0657
100-02-7	nitrophenol, 4-	--	--	--	--	0.1	0.0678
132-64-9	dibenzofuran	80	80	--	--	0.1	0.0402
121-14-2	dinitrotoluene;2,4-	3.2	0.005	--	--	0.1	0.0268
58-90-2	tetrachlorophenol;2,3,4,6-	2,400	2,400	--	--	0.1	0.062
84-66-2	diethyl phthalate	64,000	73	--	--	0.1	0.0524
7005-72-3	phenylether; 4-chlorophenyl-	--	--	--	--	0.1	0.0516
100-01-6	nitroaniline, 4-	--	--	--	--	0.25	0.158
534-52-1	methylphenol; 4,6-dinitro-2-	--	--	--	--	0.1	0.0354
86-30-6	nitrosodiphenylamine;N-	0.10 (b)	0.10	--	--	0.1	0.0424
103-33-3	azobenzene	9.1	9.1	--	--	0.1	0.0548
101-55-3	phenylether; 4-bromophenyl-	--	--	--	--	0.1	0.0453
118-74-1	hexachlorobenzene	0.63	0.016	--	--	0.1	0.0448
86-74-8	carbazole	--	--	--	--	0.25	0.134
84-74-2	di-butyl phthalate (di-n-butyl phthalate)	8,000	57	--	--	0.1	0.0422
85-68-7	butyl benzyl phthalate	530	2.3	--	--	0.1	0.028
91-94-1	dichlorobenzidine;3,3'-	0.213 (b)	0.037	--	--	0.25	0.213
117-81-7	bis(2-ethylhexyl) phthalate	2.6 (b)	2.6	--	--	0.1	0.0274
117-84-0	di-n-octyl phthalate	800	800	--	--	0.1	0.0271

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						Reporting Limit (mg/kg)	Quantitation Limit (mg/kg)
91-20-3	naphthalene	5.0	4.5	--	5.0	0.02	0.00319
91-57-6	methyl naphthalene, 2-	320	320	--	--	0.02	0.00388
90-12-0	methyl naphthalene, 1-	35	35	--	--	0.02	0.00319
208-96-8	acenaphthylene	--	--	--	--	0.02	0.00284
83-32-9	acenaphthene	66 (b)	66	--	--	0.02	0.00264
86-73-7	fluorene	101 (b)	101	--	--	0.02	0.00385
87-86-5	pentachlorophenol	0.0769 (b)	0.004	--	--	0.1	0.0769
85-01-8	phenanthrene	--	--	--	--	0.02	0.00509
120-12-7	anthracene	2,275 (b)	2,275	--	--	0.02	0.00434
206-44-0	fluoranthene	85 (b)	85	--	--	0.02	0.00413
129-00-0	pyrene	655 (b)	655	--	--	0.02	0.00446
56-55-3	benzo[a]anthracene	1.4	0.068	--	--	0.02	0.00329
218-01-9	chrysene	140	0.1	--	--	0.02	0.00448
205-99-2	benzo[b]fluoranthene	0.18 (b)	0.18	--	--	0.02	0.00437
207-08-9	benzo[k]fluoranthene	0.57 (b)	0.57	--	--	0.02	0.00362
50-32-8	benzo[a]pyrene	0.10	0.14	--	0.10	0.02	0.00355
193-39-5	indeno[1,2,3-cd]pyrene	1.4	1.1	--	--	0.02	0.00422
53-70-3	dibenzo[a,h]anthracene	0.14	0.14	--	--	0.02	0.00499
191-24-2	benzo(g,h,i)perylene	--	--	--	--	0.02	0.00563
	cPAH TEQ	0.10	--	--	0.10	--	--

**Abbreviations and Acronyms:**

BHC = benzene hexachloride

BTEX = Benzene, Toluene, Ethylbenzene, Xylenes

CAS = Chemical Abstracts Service

DDD = dichlorodiphenyldichloroethane

DDE = dichlorodiphenyldichloroethylene

DDT = dichlorodiphenyltrichloroethane

mg/kg = milligram per kilogram

PAH = Polycyclic Aromatic Hydrocarbon

PCB = Polychlorinated biphenyl

SEMI = Semivolatile

TPH = Total Petroleum Hydrocarbon

VOL = Volatile

**Notes:**

-- = Not Available

(a) PTI. 1989. Background Concentrations of Selected Chemicals in Water, Soil, Sediments, and Air of Washington State, Draft Report. April.☐

(b) PSL reflects consideration of protection of groundwater criteria based on RI groundwater sample analytical results.

(c) Screening level for m- &amp; p-cresol based on criteria for m-cresol (3-methylphenol), as it is more conservative than the criteria for p-cresol (4-methylphenol).